MOHAMED SATHAK AJ COLLEGE OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

CE8701 ESIMATION COSTING AND VALUATION ENGINEERING

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COURSE MATERIAL

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UNIT I QUANTITY ESTIMATION

1.INTRODUCTION

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 requirement are necessary for preparing an estimate.

a) Drawings like plan, elevation and sections of important points.

b) Detailed specifications about workmanship & properties of materials etc.

c) Standard schedule of rates of the current year.

NEED FOR ESTIMATION AND COSTING

1. 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.

2. Estimate gives an idea of time required for the completion of the work.

3. Estimate is required to invite the tenders and Quotations and to arange contract.

4. Estimate is also required to control the expenditure during the execution of work.

5. Estimate decides whether the proposed plan matches the funds available or not.

PROCEDURE OF ESTIMATING OR METHOD OF ESTIMATING.

Estimating involves the following operations

1. Preparing detailed Estimate.

2. Calculating the rate of each unit of work

3. Preparing abstract of estimate

DATA REQUIRED TO PREPARE AN ESTIMATE

1. Drawings i.e.plans, elevations, sections etc.

2. Specifications.

3. Rates.

DRAWING

If the drawings are not clear and without complete dimensions the preparation of estimation become very difficult. So, It is very essential before preparing an estimate.

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:

a) Single units work like doors, windows, trusses etc., are expressed in numbers.

b) Works consists linear measurements involve length like cornice, fencing, hand rail, bands of specified width etc., are expressed in running metres (RM)

c) Works consists areal surface measurements involve area like plastering, white washing, partitions of specified thickness etc., are expressed in square meters (m2)

d) Works consists cubical contents which involve volume like earth work, cement concrete, Masonry etc are expressed in Cubic metres.

Sl. No.	Particulas of item	Units of Measurement	Units of payment
I	Earth work: 1. Earth work in Excavation 2. Earthwork in fillingin foundation trenches 3. Earth work in filling in plinth	 Cum Cum Cum	 Per%cum Per%cum Per%cum
II	Concrete: 1. Lime concretre in foundation 2. Cement concrete in Lintels 3. R.C.C.in slab 4. C.C. or R.C.C. Chujja, Sunshade 5. L.C. in roof terracing (thickness specified) 6. Cement concrete bed 7. R.C. Sunshade (Specified Width & Hight	 Cum Cum Cum Cum Sqm Cum Cum	 Percum Percum Percum Percum perSqm Percum 1m
III	Damp ProofCource (D.P.C) (Thickness should be mentioned)	Sqm	Persqm

IV	Brick work: 1. Brickwork in foundation 2. Brick work in plinth 3. Brick work in super structure 4. Thin partition walls 5. Brick work in arches 6. Reinforced brick work (R.B.Work)	 Cum Cum Cum Sqm Cum Cum	 Percum Percum Percum persqm Percum Percum
V	Stone Work: Stone masonry	 Cum	 PerCum

VI	Roofing 1. R.C.C. and R.B.Slab roof (excluding steel) 2. L.C. roof over and inclusive of tiles or brick or stone slab etc (thickness specified) 3. Centering and shuttering form work 4. A.C.Sheet roofing	 Cum Sqm Sqm Sqm	 PerCum persqm persqm persqm
VII	Plastering, points&finishing 1. Plastering-Cement or Lime Mortar (thickness and proportion specified) 2. Pointing 3. White washing, colour washing, cement wash (number of coats specified) 4. Distempering (number of coats specified)	 Sqm Sqm Sqm Sqm Sqm	 persqm persqm persqm persqm persqm

RULES FOR MEASUREMENT :

The rules for measurement of each item are invaribly described in IS- 1200. However some of the general rules are listed below.

1. Measurement shall be made for finished item of work and description of each item shall include materials, transport, labour, fabrication tools and plant and all types of overheads for finishing the work in required shape, size and specification.

2. In booking, the order shall be in sequence of length, breadth and height or thickness.

3. All works shall be measured subject to the following tolerances.

i) Linear measurement shall be measured to the nearest 0.01m.

ii) Areas shall be measured to the nearest 0.01 sq.m

iii) Cubic contents shall be worked-out to the nearest 0.01 cum

4. Same type of work under different conditions and nature shall be measured separately under separate items.

5. The bill of quantities shall fully describe the materials, proportions, workmanships and accurately represent the work to be executed.

6. In case of masonary (stone or brick) or structural concrete, the categories shall be measured separately and the heights shall be described:

a) from foundation to plinth level

b) from plinth level to First floor level

c) from Fist floor to Second floor level and so on.

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:

a) Long wall - short wall method

b) Centre line method.

c) Partly centre line and short wall 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. To get the 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.

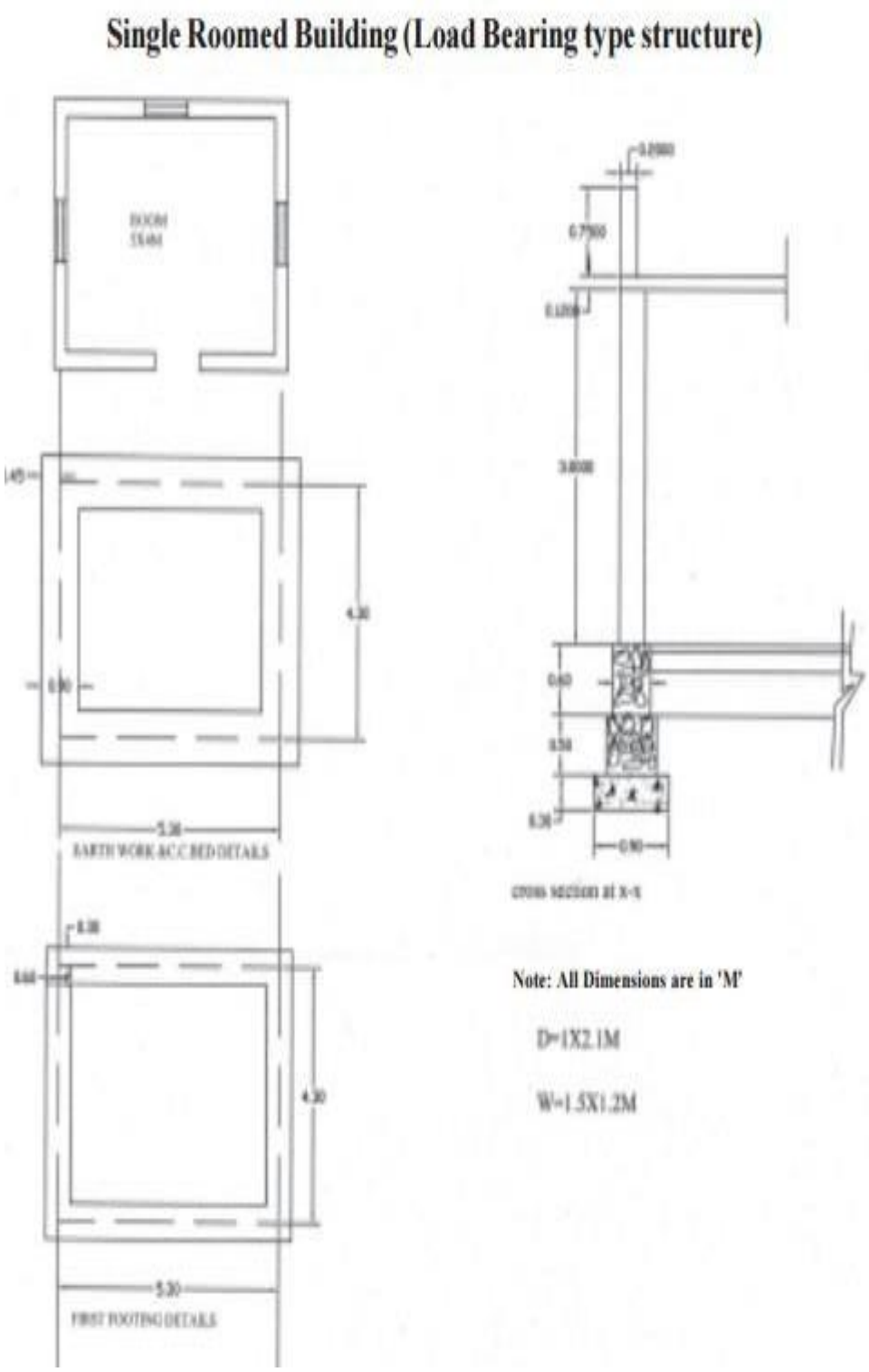
b) Centre line method:

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.

c) Partly centre line and partly cross wall method:

This method is adopted when external (i.e., alround the building) wall is of one thickness and the internal walls having different thicknesses. In such cases, centre line method is applied to external walls and long wall-short wall method is used to internal walls. This method suits for different thicknesses walls and diffeent level of foundations. Because of this reason, all Engineering departments are practicing this method.

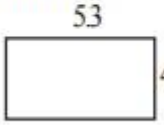
I. Example 1: From the given figure below calculate the detailed and abstract estimate for the single roomed building (Load bearing type structure) by a) long wall & short wall method (b) Centre Line Method



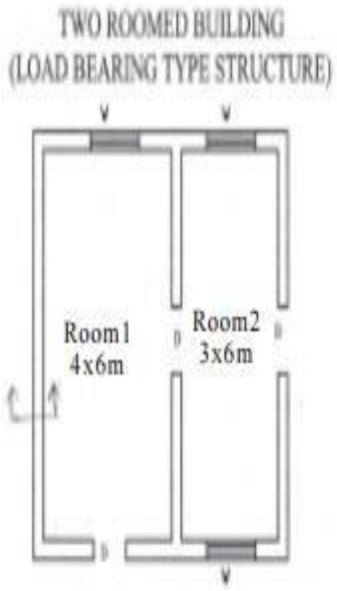
Long wall - Short wall Method

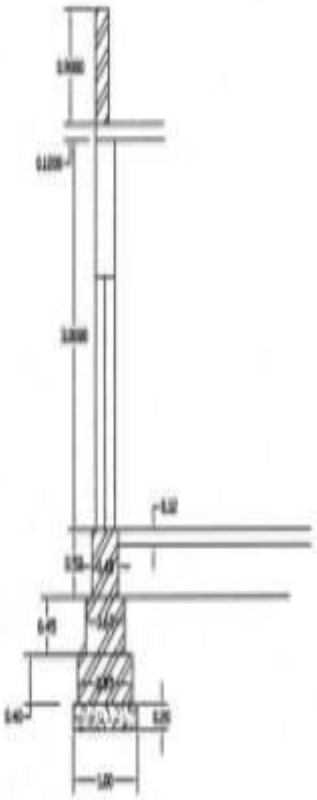
S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1.	**Earth Work excavation for foundation**						
	a) Long walls	2	6.2	0.9	1.4	15.264	L=5.3+.45+.45=6.2 D=0.3+0.5+0.6=1.4
	b) Short walls	2	3.4	0.9	1.4	8.568	L=4.3-0.45-0.45=3.4
					Total	**24.192**	**m^3**
2.	**C.C.(1:4:8) bed for** foundation						
	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 Wall	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
					Total	**17.28**	**m^3**

Centre Line Method

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1.	**Earth Work excavation** for foundation 	1	19.2	0.9	1.4	24.192	m^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	m^3
4.	**Brick masany** with CM(1:6) for superstructure	1	19.2	0.3	0.3	17.28	m^3

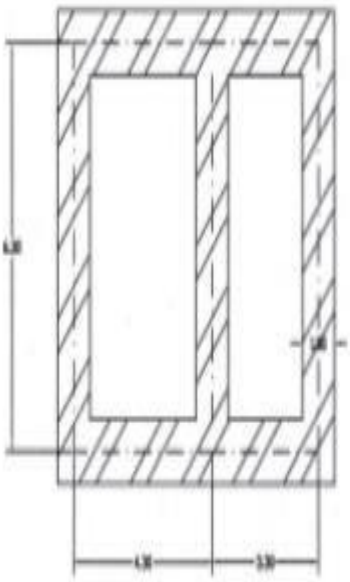
Example :2 :-From the given figure below calculate the details and abstract estimate for the double roomed building (Load bearing type structure) by a) long wall & short wall method (b) Centre Line Method





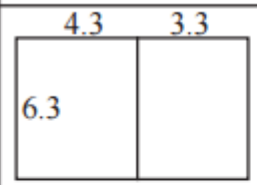
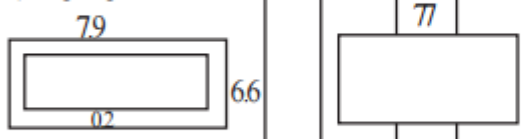
D=1x2.1
W=1.5x1.2

Note: All Dimensions are in 'M'



Plan for first footing

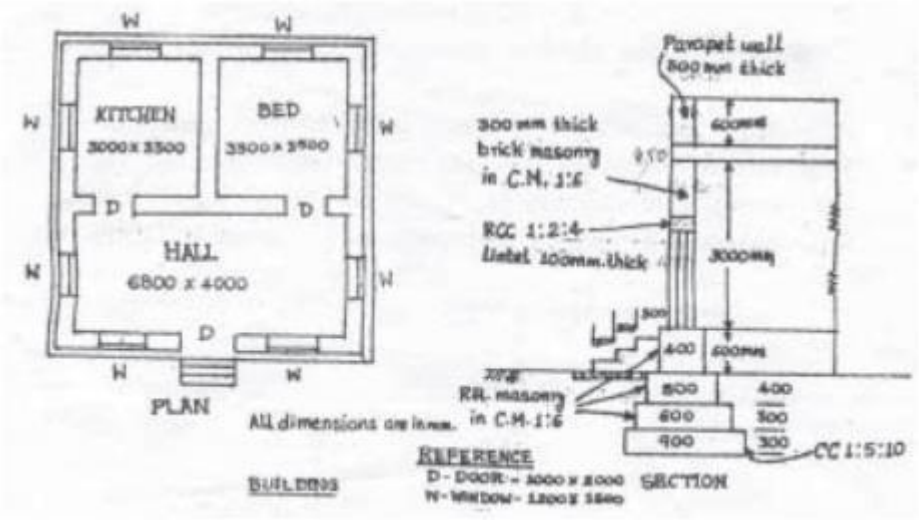
S.No.	Particulars of Items	No	L	B	H	Q	Explanation
1.	**Earth Work excavation** for foundation						
	a) Long walls	2	8.6	1.0	1.05	18.05	L=7.6+0.5+0.5=8.6
	b) Short walls	3	5.3	1.0	11.05	16.70	L=6.3-0.5-0.5=5.3
					Total	**34.75**	**m^3**
2.	**C.C.(1:4:8) bed for** foundation						
	a) Long walls	2	8.6	1.0	0.2	3.44	
	b) Short walls	3	5.3	1.0	0.2	3.18	
					Total	**6.62**	**m^3**
3.	**Brick masanory for** footings with CM (1:4) first footing						
	a) Longwalls	2	8.45	0.85	0.4	5.746	L=7.6+0.425+0.425=8.45
	b) Short walls	3	5.45	0.85	0.4	5.560	L=6.3-0.425-0.425=5.45
	2nd fooring						
	a) Long walls	2	8.20	0.6	0.45	4.428	L=7.6+0.3+0.3=8.2
	b) short walls	3	5.70	0.6	0.45	4.617	L=6.3-0.3-0.3=5.7
	ii) for base ment	2	8.00	0.4	0.4	2.560	L=7.6+0.2+0.0=8.0
	long walls	3	5.90	0.4	0.4	2.832	L=6.3-0.2-0.2=5.9
	short walls						
	iii) for super structure	2	7.90	0.3	3.0	14.22	L=7.6+0.15+0.15=7.9
	long walls	3	6.00	0.3	3.0	16.20	L=6.3-0.15-0.15=6.0
	short walls						
	iv) Parapet wall						
	a) long walls	2	7.90	0.2	0.70	2.212	
	b) Shot walls	2	6.20	0.2	0.70	1.736	
					Total	**60.11**	
	Deductions for openings						
	Doors	3	1.0	0.3	2.1	1.89	
	Windows	3	1.5	0.3	1.2	1.62	
	Lintels over doors	3	1.20	0.3	0.10	0.108	
	windows	3	1.70	0.3	0.10	0.153	
	Net B.M.=60.11-377=56.34m^3				Total	**3.771**	

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
							
	Total centre line length =(4.3+3.3)2+6.3x3=34.1m						
1.	**Earth work excavation**	1	33.1	1.0	1.05	34.75	L=34.1-2x1/2=33.1
2.	**C.C.(1:4:8) bed for foundation**	1	33.1	1.0	0.20	6.62	**m^3**
3.	**Brick masonry with CM(1:4)**						
	a) for foundation						
	i) first footing	1	33.25	0.85	0.40	11.30	L=34.1-0.85=33.25
	ii) 2nd footing	1	33.50	0.60	0.45	9.045	L=34.1-0.6x2/2
	b) for basement	1	33.7	0.40	0.40	5.392	L=34.1-0.4x2/2
	c) for super structure	1	33.80	0.30	3.0	30.42	L=34.1-0.3x2/2
	d) for parapet wall						
							
	Total centre line length =2(7.7+6.4)=28.2	1	28.2	0.2	0.70	3.948	
					Total	**60.10**	**m^3**
	Deductions for Openings Doors	3	1.0	0.3	2.1	1.89	
	windows	3	1.5	0.3	1.2	1.62	
	Lintels Doors	3	1.2	0.3	0.1	0.108	
	Windows	3	1.7	0.3	0.1	1.153	
					Total	**3.771**	**m^3**
	Net B.M.=60.11-3.771=56.34m^3						
4.	Quantity of R.C.C.Roof, Plastering for walls and cealing and flooring, White washing is same as Longwall & Short wall method.						

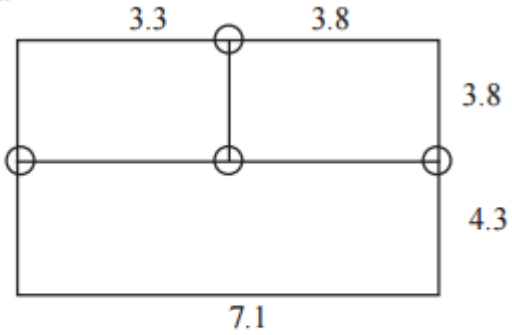
Abstract estimate of two roomed building (Load bearing type structure)

S.No.	Description of item	Quantity	Unit	Rate	Per	Amount
1.	Earth work excavation	34.75	m^3	465	$10m^3$	1615.90
2.	Cement concrete(1:4:8)	6.62	m^3	1545	$1m^3$	10228.00
3.	Sand filling in basement	12.036	m^3	195.20	$10m^3$	235.00
4.	Brick masonry in country Bricks of standard size in CM(1:8)	56.34	m^3	2291	m^3	129075.00
5.	R.C.C. (1:2:4) for lintels, beams etc.	3.303	m^3	6030	m^3	19918.00
6.	R.C.C.(1:2:4) for slabs,	6.26	m^3	6030	m^3	37748.00
7.	Cement concrete (1:5:10) for flooring	4.2	m^3	1452	m^3	6098.40
8.	Supplying and fixing of country wood for doors.	6.3	m^3	1650	m^2	10395.00
9.	Supplying and fixing of country wood for windows and ventilators.	5.4	m^2	2300	m^2	12420.00
10.	Plastering to all exposed surfaces of brick work and basement with C.M (1:5)	222.72	m^2	582	$10m^2$	12962.30
11	White washing with best shell lime	264.72	m^2	116	$10m^2$	3070.75
12	Flooring with spartek tiles set in C.M (1:3)	42	m^2	4230	$10m^2$	17766.00
13	Painting with ready mixed enamel paint	25.305	m^2	335	$10m^2$	8477.17
						128090.00
14	Provision for water supply and sanitary arrangements @12.5%					16011.25
15	Provision for electrification @7.5%					9606.75
16	Provision for architectural appearance @2%					2561.80
17	Provision for unforeseen items 2%					2561.80
18	Provision for P.S.and contingencies @4%					5123.60
				Grand Total		**163955.23**

Example 3 :- From the given figure below calculate the details and abstract estimate for the single Storeyed residential building with no of rooms (Load bearing type structure) by Centre Line Method



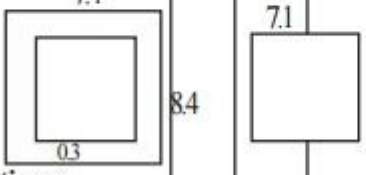
Centre line diagram



Total centre line length =(3.3+3.8)3+3.8×3+4.3×2=41.3m

no of T Junctions = 4

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1.	Earth work Excavation	1	39.5	0.9	1.0	35.55	41.3-4x0.9/2=39.5
2.	C.C. bed (1:5:10)	1	39.5	0.9	0.3	10.665	m^3
3.	R.R. Masonary in CM 1:6						
	1st Footing	1	40.1	0.6	0.3	7.218	41.3-4x0.6/2=40.1
	IInd Footing	1	40.3	0.5	0.4	8.06	41.3-4x0.5/2=40.3
	Basement	1	40.5	0.4	0.6	9.72	41.3-4x0.4/2=40.5
					Total	**25.00**	m^3
4.	Damp proof course over basement alround the building with CC (1:2:4)	1	40.5	0.6	---	16.2	m^2
	Deduct for Door sills	3	1.0	0.3		- 0.9	m^2
	Net Quantity =16.2-0.9=15.3sq.m				---		
5.	First class brick work in wall in						
	a) superstructure with CM1:6	1	40.7	0.3	3.0	36.63	L =41.3-4x0.3/2
	b) Parapet wall	1	30.4	0.3	0.6	5.472	L=2(7.1+8.1)
					Total	**42.102**	m^3
	Deductions:						
	Doors	3	1.0	0.3	2.0	1.80	
	Windows	8	1.4	0.3	0.1	0.336	projection on either side
					Total	**6.564**	
	Net Quantity of BM = 42.102-6.564 = 35.538m^3						
6.	Plastering with 12mmth in CM1:5	1x2	40.1	---	3.0	240.6	L=41.3-4x0.3=40.1
	Deductions for openings						



	Doors	3x2	1.0	---	2.0	12.0	
	windows	8x2	1.2	---	1.5	28.8	
					Total	**40.8**	m^2
	Plastering for parapet wall (sides)	1x2	30.4	---	0.6	36.48	
	Top	1	30.4	0.3	---	9.12	
					Total	**45.60**	m^2
	Net Plastering = 240.6-40.8+45.6=245.4 m^2						
7.	Flooring with 25mm th CC(1:2:4)						
	Kitchen	1	3.0	3.5	--	10.5	
	Bed	1	3.5	3.5	--	12.25	
	Hall	1	6.8	4.0	--	27.20	
	Sills of Doors	3	1.0	0.3	--	0.90	
8.	Ceiling = Same as				Total	**50.85**	m^2
	Flooring					50.85	m^2
9.	white washing = Same as Plastering for walls and ceiling 245.4+50.85 = 296.25 m^2						
10.	RCC(1:2:4) for						
	a) Slab	1	7.40	8.40	1.5	9.324	
	b) lintels over Doors	3	1.2	0.3	0.1	0.108	
	Windows	8	1.4	0.3	0.1	0.336	
	c) beams	1	40.7	0.3	0.3	3.663	
					Total	**13.431**	m^3
11	Supply & Fixing of best country wood for						
	a) Doors	3				3Nos.	
	b) Windows	8				8 Nos	
12	Painting with ready mixed synthetic enamil paints two coats over primary coat for new wood for						
	a) Doors	2¼x3	1.0	--	2.0	13.50	
	b) Windows	2¼x8	1.2	--	1.5	32.40	
						45.90	m^2
13	2% unforeseen items						
14	4% P.S & contingencies and round off.						

FIXING OF RATE PER UNIT OF AN ITEM:

The rate per unit of an item includes the following:

Quantity of material and 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.

ii) 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.

iii) Cost of equipment (T&P): Some works need special type of equipment, tools and plant. In such case, an amount of 1 to 2% of estimated cost is provided.

iv) 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.

METHODS OF PREPARATION OF APPROXIMATE ESTIMATE:

Preliminary or approximate estimate is required for studies of various aspects of work of project and for its administrative approval. It can decide, in case of commercial projects, whether the net income earned justifies the amount invested or not. The approximate estimate is prepared from the practical knowledge and cost of similar works. The estimate is accompanied by a report duely explaining necessity and utility of the project and with a site or layout plan. A percentage 5 to 10% is allowed for contingencies. The following are the methods used for preparation of approximate estimates.

a) Plinth area method

b) Cubical contents methods

c) Unit base method.

a) Plinth area method:

The cost of construction is determined by multiplying plinth area with plinth area rate. The area is obtained by multiplying length and breadth (outer dimensions of building). In fixing the plinth area rate, carefull observation and necessary enquiries are made in respect of quality and quantity aspect of materials and labour, type of foundation, hight of building, roof, wood work, fixtures, number of storeys etc.,

As per IS 3861-1966, the following areas include while calculating the plinth area of building.

a) Area of walls at floor level.

b) Internal shafts of sanitary installations not exceeding 2.0m2 , lifts, airconditionsing ducts etc., c) Area of barsati at terrace level:

Barsati means any covered space open on one side constructed on one side constructed on terraced roof which is used as shelter during rainy season.

d) Porches of non cantilever type.

Areas which are not to include

a) Area of lofts.

b) Unenclosed balconies.

c) Architectural bands, cornices etc.,

d) Domes, towers projecting above terrace level.

e) Box louvers and vertical sunbreakers.

b) Cubical Contents Method:

This method is generally used for multistoreyed buildings. It is more accurate that the other two methods viz., plinth area method and unit base method. The cost of a structure is calculated approximately as the total cubical contents (Volume of buildings) multiplied by Local Cubic Rate. The volume of building is obtained by Length x breadth x depth or height. The length and breadth are measured out to out of walls excluding the plinth off set.

The cost of string course, cornice, carbelling etc., is neglected.

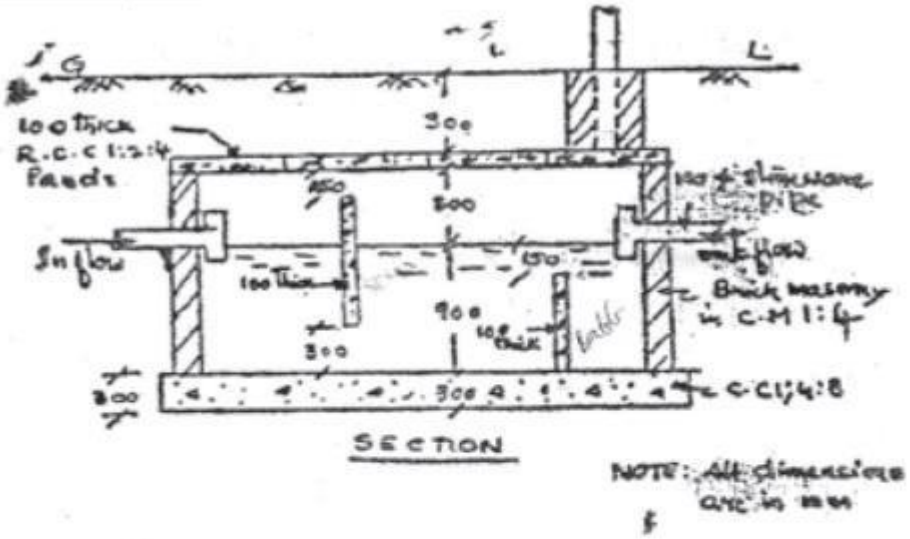
The cost of building= volume of buildings x rate/ unit volume.

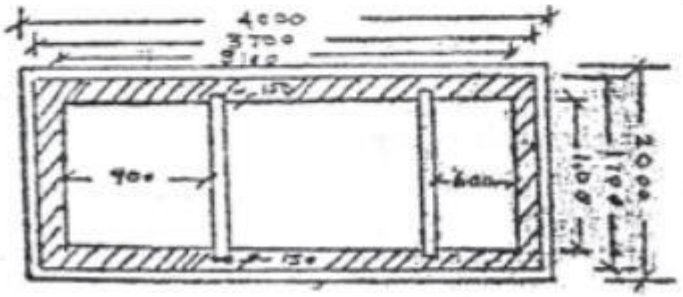
c) Unit Base Method:

According to this method the cost of structure is determined by multiplying the total number of units with unit rate of each item. In case schools and colleges, the unit considered to be as 'one student' and in case of hospital, the unit is 'one bed'. the unit rate is calculated by dividing the actual expenditure incured or cost of similar building in the nearby locality by the number of units.

Example 8.4:- Calculate the quantities of different items of the figure shown in below

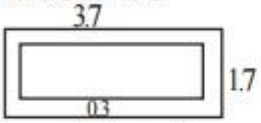
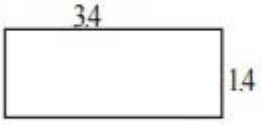
SEPTIC TANK

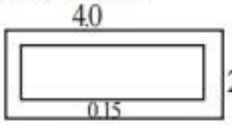
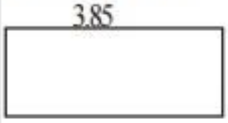


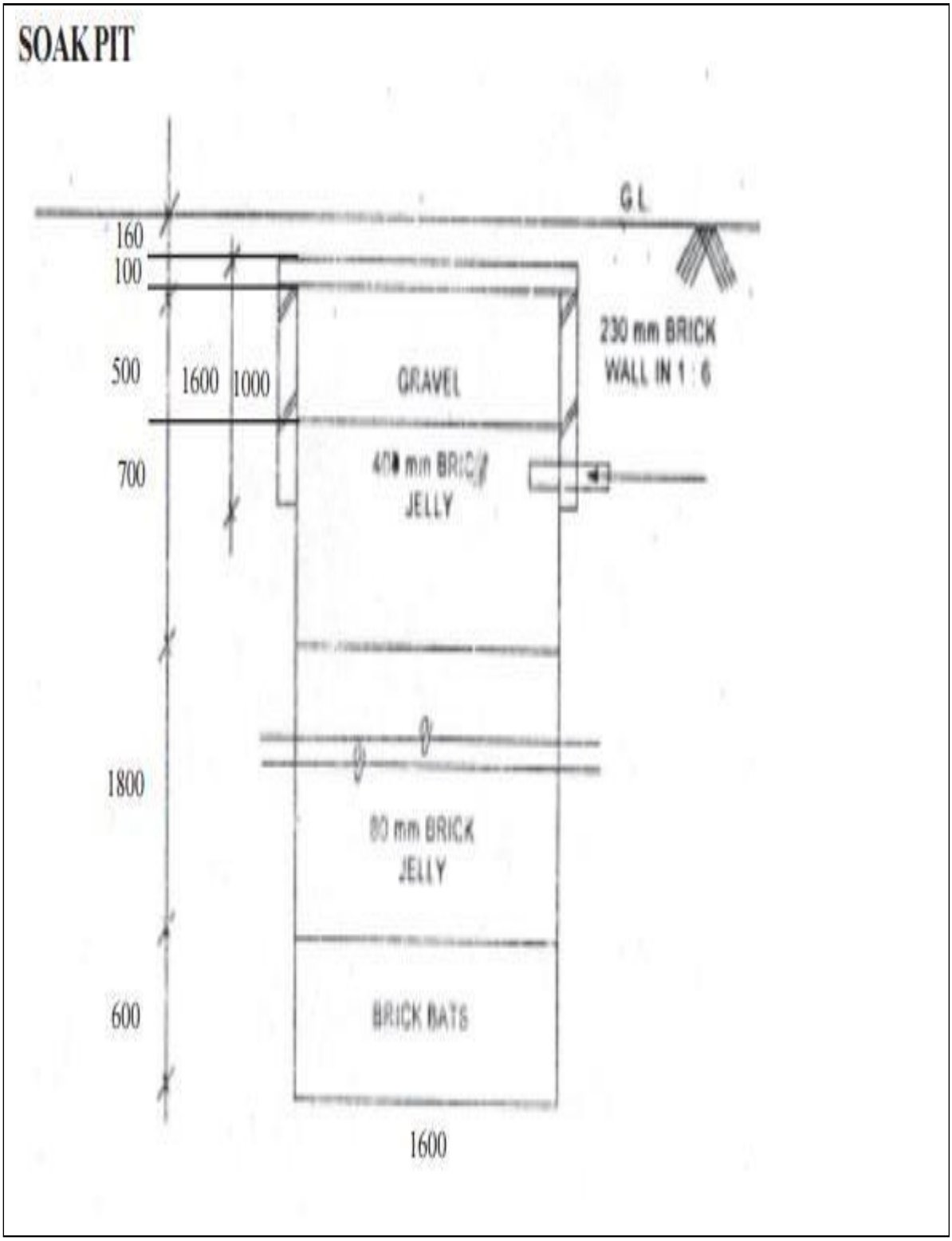


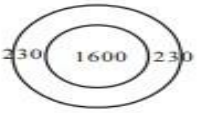
PLAN

SEPTIC TANK

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1	Earth work excation upto G.L.	1	4.0	2.0	1.9	15.2m^3	
2.	C.C. (1:4:8)bed	1	4.0	2.0	0.3	2.4m^3	
3.	Brick masonary in CM 1:4 for side walls						
							
	Long wall short wall method						
	Long wall	2	3.7	0.3	1.2	2.664	
	Short walls	2	1.1	0.3	1.2	0.792	
	(or)				Total	**3.456**	
	centre line method						
							
	total centre line length (3400+1400)2=9600	1	9.6	0.3	1.2	3.456	
4	R.C.C. (1:2:4) using 20mm HBG metal						
	a) R.C.C slab		3.70	1.70	0.1	0.629	
	b) Baffle wall		1.40	0.1	0.75	0.105	
	c) Scum board		1.40	0.1	0.75	0.105	
					Total	**0.839**	
5.	Plastering with CM(1:4)						
	with 20mm th						
	a) Inner surface of septic tank		8.40	---	1.2	10.08	(3.1+1.1)2=8.4
	b) flooring		3.1	1.1	--	3.41	
	c) Sides of Scum board	1x2	1.1	--	0.75	1.65	
	d) Top and bottom	1x2	1.1	0.1	--	0.22	
	e) sides of baffle wall	1x2	1.0	--	0.75	1.65	
	f) top of baffle wall	1x1	1.0	0.1	---	0.1	
	Deduct for Pipe openings	2	$\frac{\pi}{4}\times(0.1)^2$			0.0157	
	Total (net) Plastering				Total	**17.10**	

6.	a) Earth filling with excavated soil around the brick wall 4.0  2.0 0.15 centre line method 3.85  1.85 Total Centre line length =						
	(1.85+3.85)2=11.4	1	11.4	0.15	1.30	2.223	
	b) over R.C.C. pannels	1	3.70	1.70	0.30	1.1887	
	(neglecting the space for				Total	**4.11**	
	venti pipe footing)						
7	supply fixing of steel grills						
	including labour for fabrica-	1	0.839	x750=	6292N	62.92	
	tion @ 750N/m³					Kgs	
8	Provision of 100mm dia inlet	1x2	---	--	--	2Nos	
	and out let tees						
9.	Provision of A.C. ventilating						
	shaft 3m hight duly embed-						
	ded in b/w at bottom	1x1			1 No	1 No	
10	Provision for A.C. cowl for						
	ventilating pipe	1x1			1nos	1 No	
11	Unforcean itsm @2x				L.S	L.S	
12	P.S.& contingencies @4%				L.S	L.S	


SOAK PIT
G L
160
100
500
700
1800
600
1600
1000
GRAVEL
230 mm BRICK
WALL IN 1 : 6
JELLY
80 mm BRICK
JELLY
BRICK BATS
1600

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1.	Earth work excavation in non cohesive soils like sandy soils with an intial lead & lift						
	a) Soak pit	1	$\frac{\pi}{4}\times1.6^2$		3.86	7.76	
	b) side brick wall	1	$\frac{\pi}{4}(2.06^2-1.6^2)$		1.16	1.53	
					Total	**9.29**	
2.	Brick work in CM (1:5) with country bricks including cost and conveyance etc complete alround the pit						
		1	$\frac{\pi}{4}(2.06^2-1.6^2)$	0.9		1.19	
	centre line method						
		1	$\pi(1.83)$	0.23	0.9	1.19	
3.	supply & packing including cost & conveyance						
	a) Brick bats	1	$\frac{\pi}{4}\times1.6^2$		0.6	1.2	
	b) 80mm brick jelly	1	$\frac{\pi}{4}\times1.6^2$		1.8	3.62	
	c)40mm brick jelly	1	$\frac{\pi}{4}\times1.6^2$		0.7	1.4	
	d) gravel brick jelly	1	$\frac{\pi}{4}\times1.6^2$		0.5	1.00	
					Total	**7.22**	
4.	R.C.C.(1:2:4) slab panels (precast) using 20mm HBG metal inlcuidng cost & conveyance	1	$\frac{\pi}{4}\times2.06^2$		0.1	0.33	
5.	Filling with clay soil on top of pit upto G.L.	1	$\frac{\pi}{4}\times2.06^2$		0.16	0.53	

7.	Laying of joining 100mm popies including earth work Encavation, sand filling packing joints etc complets						
	L=12+0.23+1.6/2	1	13.03		---	13.03	RM
8	Unforcean items of work @2%	1	--		--	LS	
9	Petty supervision and contingencies @4%	1	---		---	LS	

UNIT II RATE ANALYSIS AND COSTING

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 decided 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.

1. Specifications of works and material about their quality, proportion and constructional operation method.

2. Quantity of materials and their costs.

3. Cost of labours and their wages.

4. Location of site of work and the distances from source and conveyance charges.

5. Overhead and establishment charges

6. Profit

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:

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

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

3. 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.

4. To revise the schedule of rates due to increase in the cost of material and labour or due to change in technique.

Cost of labour -types of labour, standard schedule of rates

The labour can be classified in to

1) Skilled 1st class

2) Skilled IInd Class

3) un skilled

The labour charges can be obtained from the standard schedule of rates 30% of the skilled labour provided in the data may be taken as Ist class, remaining 70% as II class. The rates of materials for Government works are fixed by the superintendent Engineer for his circle every year and approved by the Board of Chief Engineers. These rates are incorporated in the standard schedule of rates.

Example 1:- Calculate the Quantity of material for the following items.

a) R.C.C. (1:2:4) for $20m^3$ of work

b) R.C.C. (1:3:6) for $15m^3$ of work

a) Quantity of cement required $= \frac{1}{(1+2+4)} \times 1.52 \times 20 = 4.14m^3 \times \frac{1440}{50}$

$= 119.26$ bags

Quantity of Sand required $= \frac{2}{(1+2+4)} \times 1.52 \times 20 = 8.28m^3$

Quantity of cource aggreate $= \frac{4}{7} \times 1.52 \times 20 = 16.56m^3$

b) Quantity of cement required $= \frac{1}{10} \times 1.52 \times 1.5 = 2.28m^3 \times \frac{1440}{50} =$ Bags

Quantity of sand required $= \frac{3}{10} \times 1.52 \times 15 = 6.84m^3$

Quantity of CA required $= \frac{6}{10} \times 1.52 \times 15 = 13.68m^3$

Example 2:- Calculate the quantity of materials for the following items.

a) C.M. (1:4) for $1m^3$ of work

b) CM (1:6) for $1m^3$ of work

Hint: Cement will go to fill up the volds in sand. So total volume was be 4 instead of 1+4=5

a) Quantity of Cement required $= \frac{1}{4} \times 1 = 0.25m^3 = 0.25 \times \frac{1440}{50} = 7.2$ bags

Quantity of Sand required $= \frac{4}{4} \times 1 = 1m^3$

b) Quantity of cement required $= \frac{1}{6} \times 1 = 0.16m^3 = 0.16 \times \frac{1440}{50} = 4.8$bags

Quantity of sand required $= \frac{6}{6} \times 1 = 1m^3$

Example 3:-Calculate the Quantity of Cement required in bags for the following items.

a) B.M. in CM(1:3) for 15 cum of work using $0.2m^3$ of CM required for $1m^3$ of Brick work

b) RCC (1:2:4) for $20m^3$ of work

Sol : a) $1m^3$ of Brick work - $0.2m^3$ of CM(1:3)

$15\ m^3$ of Brick work $= 15 \times 0.2 = 3m^3$

Quantity of cement required in bags $= \frac{1}{3} \times 3 \times \frac{1440}{50} = 28.8$bags

b) Quantity of Cement required in bags $= \frac{1}{7} \times 1.52 \times 20 \times \frac{1440}{50} = 125$ bags

ROAD ESTIMATION

Introduction:-

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.

Lead and Lift:

Lead:

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

Lift :

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.

i.e. Upto2.0- 1 lift

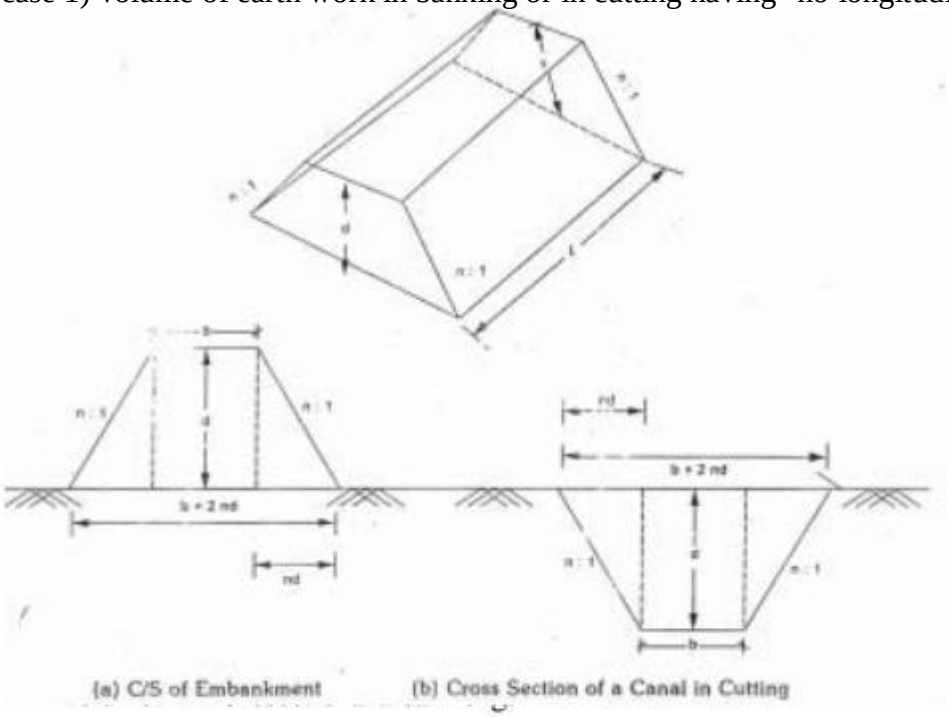
1.0 - 1 Lift

1.0 - 1 lift

Total 04 lifts 0.5 - 1 lift

Calculation of earth work for Roads:

case 1) volume of earth work in banking or in cutting having "no longitudinal slope".



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

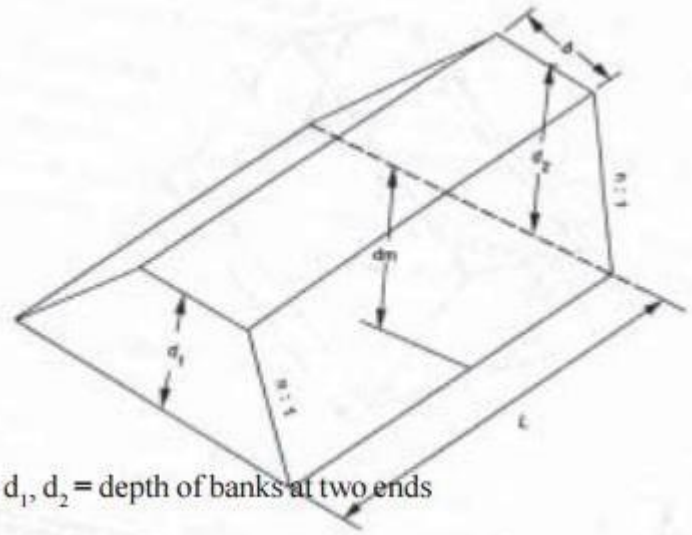
$V = (bd+2x1/2x\,ndx\,d)L$

$V = (bd+nd^2)L$

Case 2:

When the ground is in longitudinal slope or the formation has uniform gradient for alength the earth work may be calculated by the following methods.

1. By Mid Section or Mid Cordinate method.



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 $(v) = A_m \times L = (bd_m + nd_m^2) \times L$

ii) Trepezoidal formula: (for two sections)

In this method also called mean sectional area method

Let A_1 & A_2 be two areas at two ends.

$A = (bd_1 + nd_1^2)$, $A_2 = (bd_2 + nd_2^2)$

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

Volume of earth work $(v) = Am \times L$

iii) Trepezoidal formula for a series of c/s areas at equal intervals.

Let $A_1, A_2, A_3 \ldots\ldots A_n$ are the cross sectional areas along L.S of Road 'L" is the distance between two cross sections

The volume of earth work

$$V = L\left[\left(\frac{A_1 + A_n}{2}\right) + (A_2 + A_3 + \ldots\ldots + A_{n-1})\right] \text{ (or)}$$

$$= \frac{L}{2}[(A_1 + A_n) + 2(A_2 + A_3 + \ldots\ldots + A_{n-1})]$$

$$= \frac{\text{length}}{2}[\text{(sum of first and last areas)} + 2(\text{remaing Areas})]$$

iv) Prismoidal formula for a series of cross sectional areas at equal intervals.

Note : This method is adopted when there is odd number of cross sections.

Volume of earth work

$$V=\frac{L}{3}\left[(A_1+A_n)+4(A_2+A_4+A_6+.....+A_{n-1})+2(A_3+A_5+.....+A_{n-2})\right]$$

$$=\frac{length}{3}\text{(Sum of first and last areas)+4(even areas)+2(odd Areas)]}$$

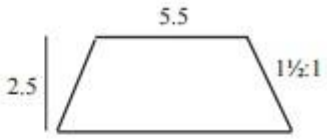
Example 7.1 : Find the volume of earth work in embankment of length 12m. Top width is 5.5m and depth is 2.5m the side slopes ara 1½:1

Sol : Top width b=5.5m

Depth d= 2.5m

side slopes =1½:1 i.e. n=1.5

length L=12m



Volume of earth work V $= (bd+nd^2)L$

$= (5.5 \times 2.5+1.5\times 2.5^2)12$

$= 77.5m^3$

Example 7.2 : The depths at two ends of an embankment of road of length 70m are 2m and 2.5m. The formation width and side slopes are 8m and 2:1 respectively. Estimate the Quantity of earth work by

a) Mid Sectional Area (ii)Mean sectional Area method.

Sol: a) b=8m, d1=2m, d2=2.5m, l=70m, n=2

Mean depth $d_m=\frac{d_1+d_2}{2}=\frac{2+2.5}{2}=2.25m$

Mid sectional Area = Am = $bdm+ndm^2=(8x2.25+2x2.25^2)2=28.125m^2$

Volume of earth work (V)= AmxL = 28.125x70=1968.75m^3.

b) Area of c/s at one end $A_1=bd_1+nd_1^2=8x2+2x2^2=24m^2$

Area of C/s at other end $A2=bd_2+nd_2^2=8\times 2.5+2\times 2.5^2=32.5m^2$

Mean Sectional Area (Am) $=\frac{A_1+A_2}{2}=\frac{24+32.5}{2}=28.25m^2$

Volume of earth work (V)=AmxL=28.25x70=1977.5m^3.

Cement concrete road

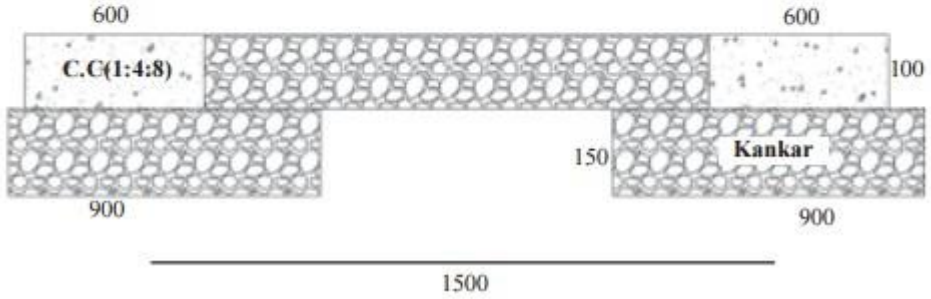
C.C. road is laid over an existing W.B.M road, In certain cases. It is laid over a prepared sub grade and a base course is provided. The concrete used for roads is M15 grade using 20mm H.B.G. metal while for base course a concrete of 1:4:8 using 40mm HBGmetal the stages of Estimations of a C.C.road is

a) Earth work excavation and deposting on the bank
b) Cement concrete (1:4:8) for base course
c) Cement concrete (1:2:8) for wearing course.

Example 8.2:- Calculation for the estimation of a C.C.road for a length of 100m and width of C.C.road is 3.50m with 100mm thickness of earh layer.

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1	C.C.(1:4:8) for base course including cost and convey-ance of all materials at site machine mixing, laying cur-ing etc.	1	100	3.5	0.1	35. cum	
2	C.C.(1:2:4) for pavement	1	100	3.5	0.1	35cum	
3	Provision for mastic pads					L.S.	
4	Unforcean items @2%					L.S.	
5	Petty supervision @4%					L.S	

Example 8.3 :- Prepare an estimate for 1 Km length of C.C. track or the fig shown below.



S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1	C.C.(1:2:4) in tracks including laying	2	1000	0.6	0.1	120m^3	
2.	laying of kankar (for loose thickness increase with $33\frac{1}{3}$%)						
	a) in between C.C tracks	1	1000	0.9	0.133	120	
	b) under C.C. tracks	2	1000	0.9	0.20	360	
						480 m^3	

UNIT III SPECIFICATIONS, REPORTS AND TENDERS

SPECIFICATIONS

a) General Specifications:

This gives the nature, quality, class and work and materials in general terms to be used in various parts of wok. It helps no form a general idea of building.

b) Detailed Specifications:

These gives the detailed description of the various items of work laying down the Quantities and qualities of materials, their proportions, the method of preparation workmanship and execution of work.

RATES:

For preparing the estimate the unit rates of each item of work are required.

1. For arriving at the unit rates of each item.
2. The rates of various materials to be used in the construction.
3. The cost of transport materials.
4. The wages of 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.

2. Water supply and sanitary arrangements.
3. Electrical installations like meter, motor, etc.,
4. Architectural features.
5. Contingencies and unforeseen items.

Ingeneral, certain percentage on the cost of estimation is alloted for the above L.S.Items.

Even if subestimates prepared or at the end of execution of work, the actual cost should not exceed the L.S.amounts provided in the main estimate.

WORK CHARGED ESTABLISHMENT:

During the construction of a project considerable number of skilled supervisors, 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. EXERC

Measurement of Materials and Works

Detailed Specifications Of Excavations, Filling And Backfilling Scope of Work The scope for work covered under this specifications pertain to excavation of foundations, trenches, pits and over areas, in all sorts of soil, soft and hard rock, correct to dimensions given in the drawing including shoring, protections of existing underground utilities of any, such as water lines, electric cables etc. dewatering and shoring if necessary, stacking the useful materials as directed within the lead specified, refilling around the foundation and into the plinth with selected useful excavated earth and disposing off the surplus earth / materials within specified lead and finishing the surface to proper levels, slopes and camber etc. all complete.

Site Clearance:

Before the earth work is started the area coming under cutting and filling shall be cleared of all obstruction, loose stones, shrubs, rank vegetation, grass, bushes and rubbish removed up to a distance of 150 metres outside the periphery of the area under clearance. This work is deemed to be included in the earthwork item rate and no separate payment will be admissible.

Roots and Vegetation clearance:

The roots of trees if any shall be removed to a minimum depth of 60 cm below ground level or a minimum of 30 cm below formation level whichever is lower and the hollows filled up with earth leveled and rammed. This work is deemed to be included in the earthwork items and no separate payment will be admissible for the work. Any material obtained from the site will be the property of the Government of India and the useful materials as decided by the Engineer-in-charge will be conveyed and properly stacked as directed within the lead specified.

Setting out and making profiles:

Masonry or concrete pillars will be erected at suitable points in the area to serve as benchmarks for the execution of the work. These benchmarks shall be connected with G.T.S. or any other permanent benchmark approved by the Engineer-in-charge. Necessary profiles with pegs, bamboos and strings or Burjis shall be made to show the correct formation levels before the work is started. The contractor shall supply labour and materials for setting out and making profiles and Burjis for the work at his own cost and the same shall be maintained during the excavation work. The Department will show grid co-ordinate or other reference points. It shall bethe responsibility of the contractor to set out center lines correctly with reference to the drawings and install substantial reference marks. Checking of such alignment by the Department will not absolve the contractor from his responsibility to execute the work strictly in accordance with the drawings.

Excavation:

\ The contractor shall notify the Engineer-in-charge before starting excavation and before the ground is disturbed, to enable him to take existing level for the purpose of measurements. The ground levels shall be taken at 5 to 15 metres intervals in uniformly sloping ground and at closer distance where local mounds, pits, or undulations are met with, as directed by the Engineer-in-charge. Exceeding

Explain report on estimate for the construction of residential building.

Report On Estimates for the Construction of Residential Building. The detailed estimate for construction of a residential building for the Executive Engineer at Udaynagar has been prepared in compliance of S.E.'s letter no……. dated……..

There is no building for the residence of the Executive Engineer at Udaynagar and he has to live in a rented building with meager accommodation at a very high rent. It has, therefore, been proposed to construct a residential building for the Executive Engineer. The head of the accounts will be 50 civil original works, building.

The estimate provides for the following accommodation:
One drawing room, one dining room, three bed rooms, one guest room, and the necessary store kitchen, baths, front and back verandahs and motor garage per plan enclosed.

A site has already been selected having a land of 60 m 30 m (200 100') for the construction of the building having good soil and proper drainage and this much of land has to be acquired. The building shall be oriented to face north direction.

The building shall have lime concrete foundation and first class brick masonry with lime mortar up to plinth level and the superstructure shall be of first class brick work in cement mortar, 1 :6 Lintels shall be of R.B. work and roof shall be R.C.C with lime concrete terrace finishing.

The drawing and dining rooms shall have mosaic floor and other rooms 2.5 cm(1') c.c. floor over 7.5 cm (3') lime concrete. Inside and outside walls shall be 12 mm (1/2 ,) cement line plastered 1:1:6, and ceiling shall be 6 mm (1/2') cement plastered 1:3. Inside of drawing and dining rooms shall be colour washed and inside of remaining rooms shallbe white washed and outside wall be colour washed.

Doors and windows shall be 4.5 cm 13 4" thick teak wood with chaukhat o sal wood and enamel painted. All work shall be strictly as per detailed P.W.D. Specification.

The estimate has been prepared at P.W.D Schedule of rates, and for non-schedule items on analysis of rates. The foundation has been designed for a safe load of 9 tonne per sq m (8 ton per sq ft) and the R.C.C roof has been designed for a safe load of 150 kg per sq m (30 1bs per sq ft) with 1400 kg per sqcm (20000 1bs per sq in) as sage tensile stress of steel and 50 kg sq cm (750 1bs per sq in) as safe compressive stress of concrete.

All designs and calculations have been included in the estimate. Plans and drawings and site plans are also enclosed with the estimate.

Provision has been made for electrification and sanitary and water supply works and 20% of the estimated cost of the building works ahs been included for these works. As there is no sewer line in the area a septic tank shall have to be constructed for which lump sum provision of Rs.700,00 has been made in the estimate.

Provision for compound with a gate in the front and barbed wire fencing on the sides and back, and approach road have also been made in the estimate.

A statement of important materials as cement, steel, coal, etc., which shall have to be arranged by the department is also enclosed with the estimate. A rent statement is also enclosed.

The work shall be carried on contract by inviting tenders. The work shall be completed within six months from the date of start.

Explain report on estimate fix construction of a culvert.

Report on Estimate for Construction of a Culvert:
The estimate has been prepared for the construction of an arch culvert of 3m span in 15 km-300 m on Lucknow –Daulatpur road. The road at this point is flooded almost every year during the rainy reason, causing flood and damages in the area. During the last inspection the Executive Engineer has asked to prepare an estimate and this estimate has been prepared in compliance of E.E's letter no …….dated …….. the cost of construction will be met from 50 civil work special repairs.

The culvert has been designed for I.R.A Class a loading. The catchment area has been determined from the 2.5 cm (1') map of the area, which comes to 1200 acres, and the water way has been calculated by the Talbot formula a –cA 3 4 , where a = waterway in sq. ft , a= Catchment area in acres, and c= constant and has been taken as 0.2. All calculation and design have been enclosed with the estimate.

The soil has been tested and has been found to be good, and ordinary spread foundation will be sufficient. The foundation shall be of cement concrete 1:4:8 and abutments, wing walls and parapets shall be of brick masonry in 1:5 cement mortar, the arch work shall be of brick masonry in 1:3 cement mortar. Exposed surfaces shall be cement pointed 1:2. all works shall be as per detailed P.W.D Specifications.

The estimate has been prepared at P.W.D Schedule of Rates. A statement of materials, cement, bricks, coal, etc., required for the construction , has been enclosed with he estimate. The work shall be executed on contract by inviting tenders and the work shall be started after the rainy season and shall be completed within four month's time.

UNIT IV CONTRACTS

CONTRACTS

Agreements between two entities, creating an enforceable obligation to do, or to refrain from doing, a particular thing. Nature and Contractual Obligation The purpose of a contract is to establish the agreement that the parties have made and to fix their rights and duties in accordance with that agreement. The courts must enforce a valid contract as it is made, unless there are grounds that bar its enforcement.

Statutes prescribe and restrict the terms of a contract where the general public is affected. The terms of an insurance contract that protect a common carrier are controlled by statute in order to safeguard the public by guaranteeing that there will be financial resources available in the event of an accident.

The courts may not create a contract for the parties. When the parties have no express or implied agreement on the essential terms of a contract, there is no contract. Courts are only empowered to enforce contracts, not to write them, for the parties. A contract, in order to be enforceable, must be a valid. The function of the court is to enforce agreements only if they exist and not to create them through the imposition of such terms as the court considers reasonable.

It is the policy of the law to encourage the formation of contracts between competent parties for lawful objectives. As ageneral rule, contracts by competent persons, equitably mad e, are valid and enforceable. Parties to a contract are bound by the terms to which they hav e agreed, usually even if the contract appears to be improvident or a bad bargain, as long as it did not result from Fraud, duress, or Undue Influence.

The binding force of a contract is based on the fact that it evinces a meeting of minds of two parties in Good
Faith. A contract, once formed, does not contemplate a right of a party to reject it. Contracts that were mutually entered into between parties with the capacity to contract are binding

CONTRACT FOR LABOUR, MATERIAL, DESIGN, CONSTRUCTION

LABOUR CONTRACT

In labour contract the contractor undertakes contract for the labour portion. All materials for the construction are arranged and supplied at the site of work by the department or owner, the labour contractor engages labour and gets the work done according to specifications. The contract is on item rate basis for labour portion only and contractor is paid for the quantities of work done on measurement of the different items of work at the stipulated rate in the contract agreement. Materials for scaffolding, centering and stuttering and other similar materials are supplied by the department' or owner,

contractor may also use his own materials for scaffolding, centering and shuttering, etc., if provided in the agreement. Contractor uses his own tools for working, but plants and machineries are arranged by the department or owner. An agreement with all conditions of contract, rates, bill of quantities, etc., is prepared before the works given out to the contractor. This system of contract is not generally adopted in the Government department. Private buildings are however constructed by labour contract system which is less trouble some.

MATERIAL CONTRACT

In material contract the contractor undertakes contract for the material portion. All materials for the construction are arranged and supplied at the site of work by the contractor, the material contractor engages material land gets the work done according to specifications. The contract is on item rate basis for material portion only and contractor is paid for the quantities of material the different items of work at the stipulated rate in the contract agreement. Materials for scaffolding, centering and stuttering and other similar materials are supplied by the contractor, contractor may also use his own materials for scaffolding, centering and shuttering, etc., if provided in the agreement. Contractor are arranged the tools and plants and machineries. An agreement with all conditions of contract, rates, etc., is prepared before the works given out to the contractor. This system of contract is not generally adopted in the Private buildings are however constructed by material contract system which is less trouble some.

DESIGN CONTRACT

Design and Build procurement works on the basis that the main contractor is responsible for undertaking both the design and construction work on a project, for an agreed lump-sum price. Design and build projects can vary depending on the extent of the contractor's design responsibility and how much initial design is included in the employer's requirements.

Nevertheless, the level of design responsibility and input from the contractor is much greater on design and build projects than a traditional contract with a contractor's designed portion. Adequate time must be allowed to prepare the employer's requirements (the employer usually appoints consultants to facilitate this), as well as time for the contractor to prepare their proposal and tender price. It is vital that the proposal matches all of the employer's requirements before any contract is entered into. The employer has control over any design elements of the project that are included in their requirements, but once the contract is let responsibility over design passes to the contractor, so the employer has no direct control over the contractor's detailed design. The contractor can carry out the design in a number of ways. Often they will appoint their own consultants or use their own in-house team. It is also common practice for the contractor to take on the employer's consultants and continue to use them to complete the detailed design under what is known as a novation agreement. Other Features of Design and Build Procurement As design and construction can be carried out in

parallel, the overall programme• time of design and build projects can be shorter. However this depends on how much design the contractor is responsible for There is reasonable certainty over costs because the contract price is known at the• outset.

Provided the employer does not order changes during the construction of the work, the contractor will be obliged (subject to the conditions) to complete the project for the contract sum. If the employer does require design or specification changes during the construction period, the contractor advises as to the effect this may have on costs or additional time needed. Design and Build is a relatively low risk procurement option for the employer, in terms of cost and time. There can be a risk related to design and quality, particularly if the employer's requirements were not properly gathered and if insufficient time went into examining the contractor's proposal.

CONSTRUCTION CONTRACTS

A variety of factors make a construction contract different from most other types of contracts. These include the length of the project, its complexity, its size and the fact that the price agreed and the amount of work done may change as it proceeds. The structure may be a new building on virgin ground. It may involve the demolition of an existing building and its full reconstruction. It could involve partial demolition and rebuilding, or the refurbishment and extension of an existing building or structure.

This may be mostly below ground (in which case it is engineering) or above ground (in which case it is building). Building, however, includes foundations and other underground works. A building contract can consist of activities and services carried out both above and below ground. n entire contract for the sale of goods and work and labour for a lump sum price payable by instalments as the goods are delivered and the work done. Decisions have to be made from time to time about such essential matters as the making of variation orders, the expenditure of provisional and prime cost sums and extension of time for the carrying out of the work under the contract.'

It is important to realize that Lord Dip lock was referring to a contract made using a standard form of building contract. Such contracts usually make provision for interim payments at regular intervals as the work proceeds, whereas a contract that is described as entire is a product of the common law. It may make provision for stage payments, but in essence, it requires the contractor to complete all its work before any entitlement to payment arises.

CONTRACT PROBLEMS

Contract problems can arise if unclear terms and conditions are set out in the documentation, or the responsibilities for the contractor or other party aren't clearly defined. Resultantly, either party might not be willing to fulfill their side of the agreement, leading to possible problems.

DRAFTING OF CONTRACT DOCUMENTS BASED ON IBRD / MORTH STANDARD BIDDING DOCUMENTS IBRD

This Standard Bidding Document for Procurement of Goods has been prepared for use in contracts financed by the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA) to be used for the procurement of goods through International Competitive Bidding (ICB) in the projects that are financed in whole or in part by the World Bank.

They are consistent with the January 2011 Guidelines for Procurement of Goods, Works and NonConsulting services under IBRD Loans and IDA Credits & Grants by World Bank Borrowers.

These Bidding Documents for Procurement of Goods, assumes that no prequalification has taken place before bidding. To obtain further information on procurement under World Bank-assisted projects or for question regarding the use of this SBD, contact:

PART 1 – BIDDING PROCEDURES

Section I**.** Instructions to Bidders (ITB) This Section provides information to help Bidders prepare their bids. Information is also provided on the submission, opening, and evaluation of bids and on the award of Contracts. Section I contains provisions that are to be used without modification.

Section II. Bid Data Sheet (BDS) This Section includes provisions that are specific to each procurement and that supplement Section I, Instructions to Bidders.

Section III. Evaluation and Qualification Criteria This Section specifies the criteria to determine the lowest evaluated bid and the qualifications of the Bidder to perform the contract.

Section IV. Bidding Forms This Section includes the forms for the Bid Submission, Price Schedules, Bid Security, and the Manufacturer's Authorization to be submitted completed by the Bidder and submitted as part of his Bid.

Section V. Eligible Countries This Section contains information regarding eligible countries.

Section VI. Bank Policy – Corrupt and Fraudulent Practices This Section provides the Bidders with the reference to the Bank's policy in regard to corrupt and fraudulent practices applicable to this process.

PART 2 – SUPPLY REQUIREMENTS

Section VII. Schedule of Requirements This Section includes the List of Goods and Related Services, the Delivery and Completion Schedules, the Technical Specifications and the Drawings that describe the Goods and Related Services to be procured.

PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section VIII. General Conditions of Contract (GCC) This Section includes the general clauses to be applied in all contracts. The text of the clauses in this Section shall not be modified.

Section IX. Special Conditions of Contract (SCC) This Section consists of Contract Data and Specific Provisions which contains clauses specific to each contract. The contents of this Section modify or supplement, but not over-write, the General Conditions and shall be prepared by the Purchaser.

Section X. Contract Forms This Section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award. Attachment: Invitation for Bids An "Invitation for Bids" form is provided at the end of the Bidding Documents for information.

MORTH

1.This Tender Document ("Tender Document") is being issued by The Automotive Research Association of India (ARAI) on behalf of Ministry of Road Transport& Highways (MoRTH) for the selection of a successful bidder for delivery, installation, integration of systems and system checking, testing and commissioning of Vehicle Inspection Equipment's at the Centers, supply of special tools, and requisite software for smooth operation of the Centers. Design, construction & civil work of equipment foundations including allied services like test shed tri mix flooring, epoxy coating for the flooring, conducting for cables including 3 phase & Single phase cables &drainage, compressor piping will also be scope of the bidder. The suitable exhaust gas handling system is to be selected & supplied, installed & commissioned by the bidder. Bidder should also provide fresh air ducting for all underbody inspection pits. Further, these Centers should also be operated, initially for a period of 24 months, after the Centers are commissioned which includes, but not limited to, regular maintenance of the equipment's, providing all necessary consumables. The Bidder should be responsible for

Operating the Centers with Technicians, Supervisors and operators for complete in-use vehicle tests, including all tests mentioned in CMVR. Additional tests, if any, required by the executing agency for ensuring optimum safety and emission performance of inuse vehicles shall also be per formed. (The above is hereinafter collectively referred to as the "Works").

2. The information contained in this Tender Document is being provided for the limited purposes of enabling the interested parties ("Bidders") to submit a binding proposal ("Bid") for performing, executing and implementing the Works and for no other purpose. In no circumstances shall executing agencies, or their employees, advisers, consultants, contractors, servants and/or agents incur any liability arising out of or in respect of the issue of this Tender Document, or the selection procedure.

3. The possession of the Tender Document or use in any manner contrary to any applicable law is expressly prohibited. The Bidders shall inform themselves and shall observe any applicable legal requirements.

4. The information does not purport to be comprehensive or to have been independently verified. Nothing in this Tender Document shall be construed as legal, financial or tax advice. MoRTH will not be liable for any costs, expenses, however so incurred by the Bidders in connection with the preparation and submission of the Bids.

5. MoRTH reserves the right to amend this Tender Document and any information contained herein at any time to the Bidders. The amendment document shall be notified through website and such amendments shall be binding on those concerned.

6. Nothing in this Tender Document is, nor shall be relied upon as, a promise or representation as to MoRTH ultimate decision in relation to the selection process of the successful Bidder for the execution of the Contract (defined hereinafter). The Bidder(s) shall not, therefore, assume that they will have the opportunity to revise their Bids following submission except as provided in this Tender Document, without assigning any reason whatsoever. However, MoRTH reserves the right to change the basis of or the procedures (including the timetable) relating to the bidding process, reject any, or all, of the Bids, not to invite a Bidder to proceed further, not furnish a Bidder with additional information nor otherwise to negotiate with a Bidder at any time. MoRTH does not undertake to accept the lowest or indeed any Bid, without assigning any reason.

7. No person other than the one authorized by MoRTH to give any information or to make any representation not contained in this Tender Document and, if given or made, any such information or representation shall not be relied upon as having been so authorized.

8. Canvassing in any form shall result in rejection of the bid.

9. The applicant shall be deemed to have duly considered all terms of this Invitation for the bid document and acknowledge that it intends to submit bid offer in accordance with the provisions of this document having accepted the terms and conditions as have been incorporated herein and / or that may be incorporated by MoRTH through any Addendum/s.

10. This Tender Document is confidential and personal to each Bidder. The Bidders shall note that they are required to sign and submit as part of the Technical Bid, as provided in “Form b) Letter of Undertaking” of this Tender Document, a Letter of Undertaking to MoRTH which, inter alia, prohibits disclosure of any information as therein defined to any person or body corporate except as permitted by such Letter of Undertaking. The Bidders shall promptly return this Tender Document to MoRTH upon

request and shall not use the same for any purpose whatsoever other than for submission of the Bid to MoRTH for the Works. Any failure to furnish or comply with the terms of the Letter of Undertaking shall entitle MoRTH to disqualify the relevant Bidder.

12. MoRTH its employees, advisers, consultants, contractors, servants, agents do not accept any responsibility for the legality, validity, effectiveness, adequacy or enforceability of any documentation executed, or which may be executed, in relation to the Works. MoRTH or the other executing agencies shall enter into a contract individually, with the successful Bidder for performance, execution and implementation of the Works ("Contract"). No legal or other obligation shall arise between the successful Bidder and MoRTH and / or executing agencies unless and until the Contract has been formally executed by MoRTH and / or executing agencies and the successful Bidder and any conditions precedent to the effectiveness of the Contract have been fulfilled. MoRTH reserves the right not to proceed with the bidding process and to cancel the selection procedure, or any part thereof, at any time.

13. Nothing in this Tender Document shall constitute the basis of the Contract which may be concluded in relation to performance, execution and implementation of the Works nor shall such documentation/information be used in construing the Contract. Each Bidder must rely on the terms and conditions contained in the Contract, when, and if, finally executed, subject to such limitations and restrictions which may be specified in such Contract. Any reference to this Tender Document in the Contract with MoRTH or any correspondence between MoRTH and the Bidder shall not be construed as this Tender Document forming part of such contract.

14. The Bidder is prohibited from any form of collusion or arrangement by a Bidder (or its advisers or consultants) in an attempt to influence the selection and award process. Giving or offering of any gift, bribe or inducement or any attempt to any such act on behalf of the Bidder towards any officer / employee of MoRTH or to any other person in a position to influence the decision of MoRTH or any other person associated with the bidding process, for showing any favour in relation to this Bid or any other contract, shall render the Bidder to such liability / penalty as MoRTH may deem including but not limited to rejection of the Bid and forfeiture of the Earnest Money Deposit.

15. Laws of the Republic of India are applicable to this Tender Document. The courts at New Delhi shall have exclusive jurisdiction in relation to any disputes arising from this Tender Document.

16. Each Bidder's acceptance of delivery of this Tender Document constitutes its agreement to, and acceptance of, the terms set forth in this Disclaimer. By acceptance of this Tender Document, the recipient agrees that this Tender Document and any information herewith supersedes document(s) or earlier information, if any, in relation to the subject matter hereof.

17. All documents and communication will be in English only. Any document which is submitted in any other language, other than English will be acceptable only if accompanied by self- certified English translated version. MoRTH will have the right to verify the same independently.

18. A High Level Committee (HLC) is appointed by the MoRTH for their assistance to take final decisions on all important matters pertaining to this project. The committee consists of –

(i) Representative of ARAI – Chairperson
(ii) Representative of CIRT – Member
(iii) Representative of ICAT – Member
(iv) Representative of Transport Department, Odisha – Member
(v) Representative of Transport Department, Maharashtra - Member

19. Arbitration: The disputes or differences, arising from this Invitation for bid document or in any manner connected therewith shall be subject to the following dispute resolution mechanism

(i) Any dispute shall initially be referred to the designated Senior Management of the parties for amicable settlement. Parties shall nominate two persons each from their Senior Management within ten days of a dispute arising.

(ii) If no amicable settlement is arrived at within 30 days, then any party may refer the dispute to a Sole Arbitrator to be nominated by the MoRTH. The place of arbitration shall be New Delhi. All arbitration proceedings shall be conducted in English and in accordance with the provisions of the Arbitration and Conciliation Act 1996 as amended from time to time.

(iii) The Arbitration award will be final and binding upon the parties, and each party will bear its own costs of arbitration and equally share the fees of the arbitral tribunal unless the arbitral tribunal decides otherwise.

(iv) All disputes shall be subject to the exclusive jurisdiction of Courts at New Delhi only.

20. Governing Law

ARBITRATION :

Arbitration is a procedure in which a dispute is submitted, by agreement of the parties, to one or more arbitrators who make a binding decision on the dispute. In choosing arbitration, the parties opt for a private dispute resolution procedure instead of going to court.

Its principal characteristics are:

- Arbitration is consensual

Arbitration can only take place if both parties have agreed to it. In the case of future disputes arising under a contract, the parties insert an arbitration clause in the relevant contract. An existing dispute can be referred to arbitration by means of a submission agreement between the parties. In contrast to mediation, a party cannot unilaterally withdraw from arbitration.

The parties choose the arbitrator(s)

Under the WIPO Arbitration Rules, the parties can select a sole arbitrator together. If they choose to have a three-member arbitral tribunal, each party appoints one of the arbitrators; those two persons then agree on the presiding arbitrator. Alternatively, the Center can suggest potential arbitrators with relevant expertise or directly appoint members of the arbitral tribunal. The Center maintains an extensive roster of arbitrators ranging from seasoned dispute-resolution generalists to highly specialized practitioners and experts covering the entire legal and technical spectrum of intellectual property.

Arbitration is neutral

In addition to their selection of neutrals of appropriate nationality, parties are able to choose such important elements as the applicable law, language and venue of the arbitration. This allows them to ensure that no party enjoys a home court advantage.

Arbitration is a confidential procedure

The WIPO Rules specifically protect the confidentiality of the existence of the arbitration, any disclosures made during that procedure, and the award. In certain circumstances, the WIPO Rules allow a party to restrict access to trade secrets or other confidential information that is submitted to the arbitral tribunal or to a confidentiality advisor to the tribunal.

The decision of the arbitral tribunal is final and easy to enforce

Under the WIPO Rules, the parties agree to carry out the decision of the arbitral tribunal without delay. International awards are enforced by national courts under the New York Convention, which permits them to be set aside only in very limited circumstances. More than 165 States are party to this Convention.

UNIT V VALUATION

1. A property fetches a net income of Rs.900.00 deducting all outgoings. Workout the capitalized value of the property if the rate of interest is 6% per annum.

Year's purchase = 100/6 = 16.67

Capitalized value of the property = net income x Y.P

= 900 x 16.67 = Rs.15003.00

2. Find the plinth area required for the residential accommodation for an assistant Engineer in the pay scale of Rs.400.00 to 1,000 per month.

Average pay = 400+1000 /2 = Rs.700/month

Average month rent @10% of salary = 700.00/10 = Rs.70.00

Average annual rent 70.00 x 12 = Rs. 840.00

Capital cost of the building @ 6% interest = 840 x 100 / 6 = Rs.14000.00

Plinth area required @ Rs.150.00 per sq.m of

plinth area = 14000/150 = 93.33sq.m

Normally the quarters for the assistant engineer should be constructed at the cost of Rs.14000.00 having plinth area of 93.33 sq.m.

But due to the increase in the cost of construction, this may be increased by 100% and the capital cost of construction may be fixed as Rs.28,000.00 and the approximate plinth areas of 93.33

Methods for calculating depreciation

Straight line Method

Constant percentage method Sinking Fund Method Quantity Survey Method Straight Line Method In this method, it is assumed that the property losses its value by the same amount every year. A fixed amount of the original cost is deducted every year, so that at the end of the utility period, only the scrap value is left.

Annual Depreciation, D = (original cost of the asset – Scrap Value)/life in years

Constant Percentage Method or Declining balance Method

In this method, it is assumed that the property will lose its value by a constant

percentage of its value at the beginning of every year.

Annual Depreciation, D = 1-(scrap value/original value)1/life in year

Quantity Survey Method

In this method, the property is studied in detail and loss in value due to life, wear and tear, decay, and obsolescence etc, worked out. Each and every step is based is based on some logical grounds without any fixed percentage of the cost of the property. Only experimental valuer can work out the amount of depreciation and present value of a property by this method.

3. Govt. accommodation is built at the cost of Rs. 60,000/- . The water supply and sanitary and electrical installation expenditure is Rs. 15000/-. Calculate the standard rend of the building if the following rate of return are fixed: 6% on construction cost. 1 1/2 % towards maintenance of buildingwork, 4 1/2 % on installation expenditure. v. 4% on maintenance of installation. Rs. 120/- as property tax per year Cost of land is be neglected.

Solution:

(a) (i) Return on construction cost = = Rs. 3600/-

(ii) Return on installation cost = = Rs. 675/-

(iii) Cost of maintenance of building = = Rs. 900/-

(iv) Cost of maintenance of installations = = Rs. 600/-

(v) Property tax = Rs. 120/-Gross return = Rs.5895/- Standard rent = Gross rent/12 = = Rs. 491.25 P.M. (Per Month).

c) Standard rent is also equal to 6% of capital value

Capital value Construction cost = Rs. 60,000.00

Installation cost = Rs. 15,000.00 Total = Rs. 75000.00

Standard rent = = 4500/- per year

Methods of Valuation of Buildings and Properties

Following are the different methods of valuations of the property:

1. Rental Method of Valuation
2. Direct comparison with capital value
3. Valuation based on profit
4. Valuation based on cost
5. Development method of valuation
6. Depreciation method of valuation

1. Rental Method of valuation

In this method, net income from the building is calculated by deducting all the outgoings from gross rent. Year's purchase (Y.P.) value is calculated by assuming a suitable rate of interest prevailing in the market. For example, consider a rate of interest as 5%, the Year's Purchase = 100/5 = 20 years.

The net income multiplied by the year's purchase gives the capitalized value or the valuation of the property. This method is used only when the rent is known or probable rent is determined by enquiries.

2. Direct Comparison with Capital Value

When the rental value is not known, this method of direct comparison with the capital value of a similar property of the locality is used. In this case, the valuation of the property is fixed by direct comparison with the valuation or capitalized value of similar property in the locality.

3. Valuation based on Profit

This method of valuation is suitable for commercial properties such as hotels, restaurants, shops, offices, malls, cinemas, theaters etc. for which the valuation depends on the profit. In such cases, the net annual income is used from the valuation after deducting all the

outgoings and expenses from the gross income. The valuation of building or property is found by multiplying the net income by year's purchase. The valuation, in this case, can be too high in comparison with the actual cost of construction.

4. Valuation based on Cost

In this case, the actual cost of construction of the building or the cost incurred in possessing the building is considered as the basis to determine the valuation of the property. In this case, necessary depreciation is allowed and points of obsolescence are considered.

5. Development method of valuation

This method is suitable for properties which are under the developmental stage. For example, if a large place of land is to be divided into plots after provision for roads and other amenities, this method is used. The probable selling price of the plots, the area required for amenities and other expenditures for development is considered for valuation.

Development method of valuation is also used for properties or buildings which are required to be renovated by making alterations, additions, improvements etc. The value is calculated based on the anticipated net income generated from the building after renovation work is complete.

The net income multiplied by year's purchase gives the valuation of the property. The actual cost of the property with a total cost of renovation shall be compared with the anticipated value of the property to decide if the renovation is justified.

6. Depreciation Method of Valuation

Based on the depreciation method, the valuation of the buildings is divided into four parts:

1. Walls
2. Roofs
3. Floors

4. Doors and windows

Cost of each part at the present rate is calculated based on detailed measurement. The life of each part is calculated by the formula:

$$D = P [(100 – rd)/100)]^n$$

where,

D = depreciated value

r = rate

d = depreciation

n = age of building in years

rd values are considered as per following table:

Life of Building	rd
100 years	1.0
75 years	1.3
50 years	2.0
25 years	4.0
20 years	5.0

The valuation calculated is exclusive of the cost of land, amenities, water supply, electrical and sanitary fittings etc. and is used only for buildings which are well maintained. If it is not well maintained, then suitable deductions are considered in the valuation calculated above. The present values of the land, amenities, water supply, electrical and sanitary fittings should be added to find the valuation of the property.

Mortgages

A mortgage is a type of loan used to purchase or maintain a home, land, or other types of real estate. The borrower agrees to pay the lender over time, typically in a series of regular payments that are divided into principal and interest. The property then serves as collateral to secure the loan.

Types of Mortgages

Fixed-Rate Mortgages
The standard type of mortgage is fixed-rate. With a fixed-rate mortgage, the interest rate stays the same for the entire term of the loan, as do the borrower's monthly payments toward the mortgage. A fixed-rate mortgage is also called a traditional mortgage.

Adjustable-Rate Mortgage (ARM)
With an adjustable-rate mortgage (ARM), the interest rate is fixed for an initial term, after which it can change periodically based on prevailing interest rates. The initial interest rate is often a below-market rate, which can make the mortgage more affordable in the short term but possibly less affordable long-term if the rate rises substantially.

Interest-Only Loans
Other, less common types of mortgages, such as interest-only mortgages and payment-option ARMs, can involve complex repayment schedules and are best used by sophisticated borrowers. These types of loans may feature a large balloon payment at its end.

Reverse Mortgages
As their name suggests, reverse mortgages are a very different financial product. They are designed for homeowners age 62 or older who want to convert part of the equity in their homes into cash.

Difference between Mortgage and Lease:

1. Meaning:

Mortgage is nothing but a legal agreement by which a bank, building society (creditor), etc lends money at interest in exchange for taking title of the debtor’s property, with the condition that the conveyance of title by the debtor to the creditor becomes void once the debt is fully paid off.While a lease is a contractual arrangement calling for the lessee (user) to pay the lessor (owner) for use of an asset. Property, buildings and vehicles are common assets that are leased. Industrial or business equipment is also leased.

2. Parties:

The mortgage is an agreement between two parties, (i.e. the lender and the borrower) the borrower gives assurance to the lender to transfer the right to the immovable property for the security purpose. While under a lease agreement is a contract between two parties, the

less or and the lessee. The less or is the legal owner of the asset; the lessee obtains the right to use the asset in return for regular rental payments.

3. Purpose:

Under Mortgage, the mortgaging bank has an interest - and a primary lien - on the property; it is technically of the borrower. He owns it. His name is on the deed. While Lease, is merely renting of property. Lessees do not own it and the deed does not have name on it.

4. Consideration:

In Mortgage consideration in terms of Mortgage money is given. While on the other hand, in Lease consideration in terms of Lease Rent is given.

5. Essential Documents:

The terms and condition of the Mortgage is prescribed under "Mortgage deed." While on the other hand, all the terms and conditions of the Lease are given under the deed known as "Lease Deed."

6. Rights Assigned:

If borrower so decide, he can sell a mortgaged property. The mortgage balance will be paid off at the closing transaction, but the right to sell is borrower's alone. And once the mortgage is paid, the bank's interest in the property ceases to exist, so if borrower pay off the mortgage he own the property free and clear, although he will still have to pay property taxes. But on the other hand, lessee cannot simply decide to sell a property because it is merely a lease. He can, perhaps, sell a remainder interest in a long term lease, without the property owner's consent, as long as the wording of the lease conveyed that right to Lessee.