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Estimating and Costing of Individual Villa

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ABSTRACT: Estimating is the technique of calculating/computing the various quantities and the expected expenditure to be incurred on a particular work/ project. For all engineering works it is required to know beforehand the probable cost of construction known as the estimated cost. Necessary for preparing an estimate are drawings like plan, elevation and sections of important points, detailed specifications about workmanship & properties of materials, Standard schedule of rates of the current year. Estimate is required to invite the tenders and Quotations and to arrange contract, also required to control the expenditure during the execution of work. Estimate decides whether the proposed plan matches the funds available or not.

In this project we estimate the quantities required for the construction of the individual villa and later calculate the cost by preparing the abstract of cost.

KEYWORDS: Estimate, standard schedule, abstract estimate, specifications, lumpsum, carpet area, quotations etc.

I.INTRODUCTION

“What is the purpose and necessity of studying this subject?” This is the first question which arises in mind. The answer lies in the following questions:-Has one got enough money to spend on the construction?

Has one got ample time that one can wait for the completion of the construction?

Has one got resources that one can arrange any amount of desired material to be used in construction ?

If the answer is *YES*, then the study of this subject is useless. But if the answer is

NO, then the question arises, “which are the factors necessitating the study of this subject.” Any person indulged in the Civil Engineering profession can clearly think of these factors i.e. set amount of funds, costly labor (skilled and unskilled), difficulty in getting good building materials, particularly cement and day to day rising cost of steel, bricks, timber etc. Also *economy* and *standard* of the construction are two important things required. Standard of construction can be achieved by careful supervision and selecting proper specifications whereas for Economy, planning is a must. The total quantity of various materials used in construction, if known before hand, can help the planning towards economy.

TYPES OF ESTIMATES

The estimates may be divided in to the following categories:-

- Preliminary or Approximate estimate.
- Rough cost estimate based on plinth area.
- Rough cost estimate based on cubic contents.
- Detailed estimate.
- Annual repair estimate.
- Special repair estimate.
- Revised estimate
- Supplementary estimate.

II.RELATED WORK

METHODS OF TAKING OUT QUANTITIES:

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

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

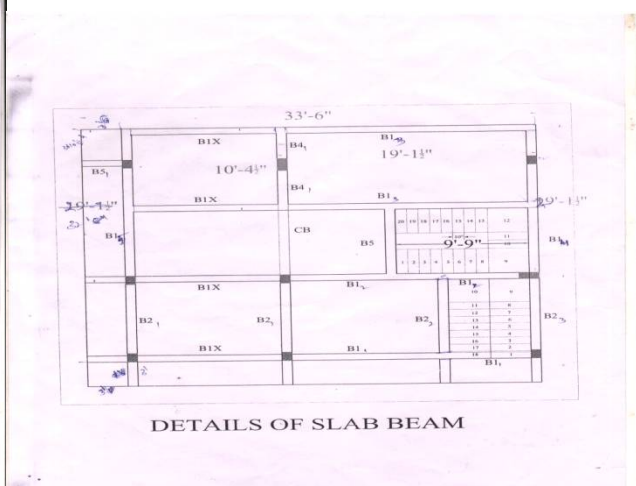
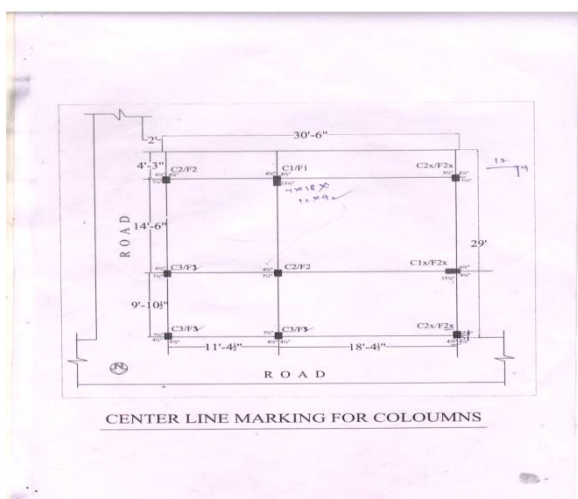
b) Centre line method:

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 main wall, the centre line length gets reduced by half of breadth for each junction. Such junction or joints are studied carefully 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., all round 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 different level of foundations. Because of this reason, all Engineering departments are practicing this method

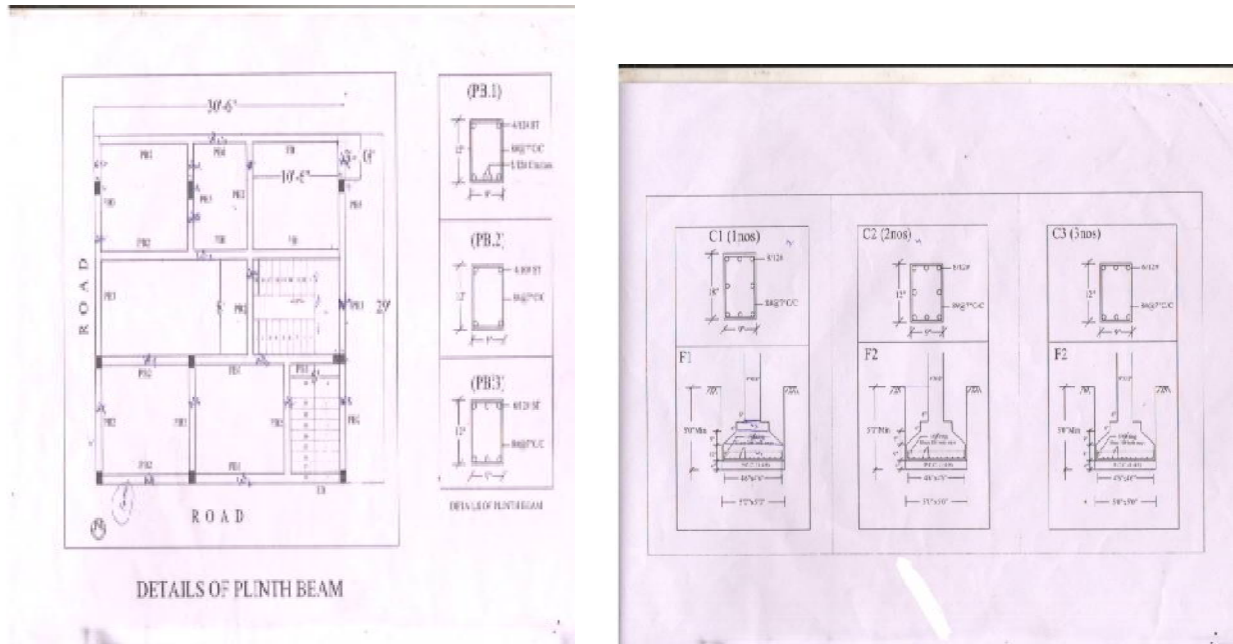
VILLA DETAILS:



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III.DETAILS OF MEASUREMENT AND CALCULATION OF QUANTITIES

The measurements and calculations were made by 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.

S.NO	DESCRIPTION OF WORK	NO	LENGTH(m)	BREADTH(m)	DEPTH(m)	QUANTITY	NET QUANTITY
1	EXCAVATION	3	1.524m	1.524m	1.524m	3.5396cu.m	10.6188cu.m
2	FOUNDATION-V1F1	1	1.376m	1.3716m	0.3048m	0.5734cu.m	9.9312cu.m
	V2F1	1	1.0033m	1.3716m	0.2286m	0.3145cu.m	
	V3F1	1	0.5334m	0.5334m	0.1524m	0.0433cu.m	
	V1F2	1	1.376m	1.376m	0.3048m	0.5734cu.m	
	V2F2	1	1.0033m	1.3716m	0.2286m	0.3145cu.m	
	V3F2	1	0.5334m	0.5334m	0.1524m	0.0433cu.m	
	TOTAL FOUNDATION	9				0.9312cu.m	
3	PCC	9	1.3716m	1.3716m	0.1524m	0.2867cu.m	2.5803cu.m

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4	COLUMNS-C1	2	10.3584m	0.4572m	0.2286m	1.0826cu.m	2.16522cu.m
	C2	4	10.3584m	0.3048m	0.2286m	0.7217cu.m	2.8895cu.m
	C3	3	10.3584m	0.3048m	0.2286m	0.7217cu.m	2.1651cu.m 7.21982cu.m
5	PLINTH BEAM						
	PB1	1	3.2385m	0.0348m	0.2286m	0.2256cu.m	
	PB2	1	5.0292m	0.3048m	0.2286m	0.3504cu.m	
	PB3	1	4.8006m	0.3048m	0.2286m	0.33449cu.m	
	PB4	1	3.2385m	0.3048m	0.2286m	0.2256cu.m	
	PB5	1	2.6289m	0.3048m	0.2286m	0.18317cu.m	
	PB6	1	2.6289m	0.3048m	0.2286m	0.18317cu.m	
	PB7	1	2.7813m	0.3048m	0.2286m	0.19379cu.m	
	PB8	1	2.7501m	0.3048m	0.2286m	0.18848cu.m	
	PB9	1	4.1148m	0.3048m	0.2286m	0.2867cu.m	
	PB10	1	5.3721m	0.3048m	0.2286m	0.3743cu.m	
	PB11	1	8.8138m	0.3048m	0.2286m	0.6141cu.m	
	PB12	1	4.1148m	0.3048m	0.2286m	0.2867cu.m	
	PB13	1	8.8138m	0.3048m	0.2286m	0.6141cu.m	
	PB14	1	2.2479m	0.3048m	0.2286m	0.1566cu.m	
PB15	1	1.1811m	0.3048m	0.2286m	0.08229cu.m		
		1	1.1811m	0.3048m	0.2286m	0.08229cu.m	4.38178cu.m
6	SLAB BEAM-B1-1	1	5.2578m	0.4191m	0.2286m	0.5037cu.m	
	B1-2	1	5.292m	0.4191m	0.2286m	0.48182cu.m	
	B1-3	2	5.4286m	0.4191m	0.2286m	0.5255cu.m	
	B1-4	1	4.3561m	0.4191m	0.2286m	0.4173cu.m	
	B1-5	1	5.0419m	0.4191m	0.2286m	0.4830cu.m	
	B1-X	4	3.1623m	0.4191m	0.2286m	0.3029cu.m	
	B2-1	2	2.6289m	0.4191m	0.2286m	0.2518cu.m	
	B2-2	1	2.7813m	0.4191m	0.2286m	0.26646cu.m	
	B2-3	1	2.7051m	0.4191m	0.2286m	0.25916cu.m	
	B4-1	1	2.7051m	0.4191m	0.2286m	0.25916cu.m	
	B5	1	2.4384m	0.4191m	0.2286m	0.2336cu.m	
	B5-1	1	0.9144m	0.4191m	0.2286m	0.0876cu.m	
	CB	1	2.4384m	0.1143m	0.2286m	0.0637cu.m	
						6.34774cu.m	
7	SLAB	1	10.2108m	9.7336m	0.15m	14.9081cu.m	
8	PLINTH BEAM SLAB	1	9.1964m	8.8392m	0.3048m	25.0463cu.m	
9	WALLS-W1	1	8.9154m	3.048m	0.2286m	6.2120cu.m	
	W2	1	8.8392m	3.048m	0.2286m	6.1589cu.m	
	W3	1	7.9248m	3.048m	0.2286m	5.5217cu.m	
	W4	1	5.1054m	3.048m	0.2286m	3.5573cu.m	
	W5	1	5.2197m	3.048m	0.2286m	3.6369cu.m	
	W6	1	8.382m	3.048m	0.2286m	5.8403cu.m	
	W7	1	8.6106m	3.048m	0.2286m	5.9996cu.m	
	W8	1	2.7051m	3.048m	0.1143m	0.9424cu.m	
	W9	1	2.7813m	3.048m	0.1143m	0.9689cu.m	
		3				119.3412cu.m	

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10	DEDUCTIONS						
	Door1	4	1.8288m	0.9144m	0.2286m	0.38227cu.m	
	Door2	4	1.8288m	0.7620m	0.2286m	0.3185cu.m	
	Window1	5	0.9144m	0.4572m	0.2286m	0.0955cu.m	
	Window2	2	0.4572m	0.3048m	0.2286m	0.03185cu.m	
	t.v of deduction	3					2.48436cu.m
11	PLASTERING OF WALL						
	C1	1	61.1886m	3.048m	0.016m	2.9840cu.m	
	C2	1	61.1886m	3.048m	0.004m	0.7460cu.m	
12	COMPOUND WALL	1	36.928m	2.1336m	0.2286m	18.011cu.m	
13	PLASTERING OF COMPUND WALL						
	C1	1	36.928m	2.1336m	0.0016m	1.2606cu.m	
	C2	1	36.928m	2.1336m	0.004m	0.315156cu.m	
14	FLOORING(8'*12'')						
	GF	1	-	-	-	2139.06sq.m	
	FF	1	-	-	-	2446.30sq.m	
	SF	1	-	-	-	2446.30sq.m	
15	LINTELS	8	1.1176m	0.1016m	-	4.47sq.m	35.76sq.m
16.	STAIRCASE FF,SF						
	Waist slab	4	2.7127m	0.1143m	0.9144m	0.2835cu.m	1.134cu.m
	Steps	18	0.15875m	0.2540m	0.9144m	0.0184cu.m	0.3318cu.m
	Landing of steps	1	0.6604m	1.8288m	0.1143m	0.13804cu.m	0.13804cu.m
	GF						
	Waist slab	2	2.6008m	0.1143m	0.9144m	0.271825cu.m	0.54365cu.m
	Steps	20	0.24765m	0.1651m	0.9144m	0.01870cu.m	0.373872cu.m
	Landing of steps	1	0.6604m	0.1524m	0.1143m	0.13804cu.m	0.13804cu.m

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LATERAL TIES/STIRRUPS: Vol. 5, Issue 6, June 2016							
S . N O	DESCRIPTION OF WORK	DIAMETER OF BAR (mm)	NO OF BARS	LENGTH	TOTAL LENGTH	WEIGHT OF BAR	NET WEIGHT
1	FOOTING F1 X direction Y direction F2 X direction Y direction 8 f2	10 10 10 10	11 11 10 10	1.6256m 1.6256m 1.6256m 1.6256m	17.8816m 17.8816m 16.256m 16.256m	22.048012kgs 20.043648kgs	180.397196kgs@10mm
2	COLUMN C1 Lateral ties Long bars 2c1 C2 Lateral ties Long bars1 Long bars 4c2 C3 Lateral ties Long bars 3c3	8 12 8 12 12 8 12	60 8 60 8 6 60 6	1.3124m 10.3584m 1m 5.1792m 5.1792m 1m 10.3584m	78.744m 82.8672m 60m 41.4336m 31.0752m 60m 62.1504m	31.064508kgs 73.5612kgs 23.67kgs 64.36606kgs 23.67kgs 55.1709kgs	62.129016kgs@8mm 147.1224kgs@12mm 165.69kgs@8mm 257.4642kgs@12mm 71.07kgs@8mm 15.5127kgs@12mm
3	PLINTH BEAM PB1 Stirrups Long bars Continuous Crancked 4PB1 PB2 Stirrups Long bars 10PB2 PB3 Stirrups Long bars 5PB3	8 12 12 8 10 8 12	33 4 2 21 4 16 6	1m 5.6007m 5.60574m 1m 3.4671m 1m 2.667m	33m 22.4028m 11.21148m 21m 13.8684m 16m 16.002m	13.0185kgs 19.88696kgs 9.9524kgs 8.2845kgs 8.54986kgs 6.312kgs 14.2049kgs	52.074kgs@8mm 79.54584kgs@12mm 39.8096kgs@12mm 82.845kgs@8mm 85.4986kgs@10mm 31.56@8mm 71.0254kgs@12mm

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4	SLAB BEAM						
	B1- Stirrups	8	38	1.2362m	46.975m	18.5316kgs	333.5688kgs@8mm
	Long bar	16	4	5.6007m	22.4028m	35.35609kgs	636.4095kgs@16mm
	Continuous	16	2	5.60742m	11.21484m	17.69926kgs	318.58668kgs@16mm
	Crancked						
	18B1	8	15	1.2362m	18.543m	7.3152kgs	87.7524kgs@8mm
	B2- Stirrups						
	Long bars	12	4	2.7813m	11.1252m	9.8758kgs	118.5096@12mm
	Continuous Crancked	12	1	2.78634m	2.78634m	2.4734kgs	29.6808@12mm
	12B2						105.3384kgs@8mm
	B1X-Stirrups	8	18	1.2362m	22.2516m	8.7782kgs	262.6452kgs@16mm
	Long bars	16	4	3.4671m	13.8684m	13.8684kgs	34.674kgs@8mm
	12B1x	8	25	1.2362m	29.2979m	11.5580kgs	57.024kgs@16mm
	B4- Stirrups	16	4	3.0099m	12.0396m	19.0008kgs	32.6025kgs@12mm
	Long bars	12	4	3.0099m	12.0396m	10.6875kgs	24.8715kgs@8mm
	3B4						25.9746kgs@12mm
B5-1-Stirrups	8	17	1.2362m	21.0154m	8.2905kgs	71.6877kgs@8mm	
Long bars	12	4	2.4384m	9.7536m	8.6582kgs	68.1828kgs@12mm	
3B5-1	8	7	1.2362m	8.6534m	3.4137kgs		
B5-2- Stirrups	12	4	0.9144m	3.6576m	3.2468kgs		
Long bars							
21B5-2							
5	SLAB						
	X-direction						
	Continuous	8	24	10.2108m	245.059m		245.7887kgs@8mm
	Crancked	8	25	10.21416m	255.354m		
	Extra	8	48		122.6256m		
	Y-direction			2.5547m	623.0386m	245.7887kgs	
	Continuous						244.40879kgs@8mm
Crancked	8	25		243.84m			
Extra	8	26	9.7536m	253.68096m			
	8	50	9.75696m	122.02m			
			2.4404m	619.54096m	244.4089kgs		
6	STAIR CASE						
	X-direction						
	Continuous	10	4	2.6008m	10.4032m		
	Crancked	10	4	2.605m	10.42m		
	Extra	10	8	0.6552m	5.2176m		96.324kgs@10mm
	6sc				26.0408m	16.054kgs	
	Y-direction						
	Continuous	10	7	0.9144m	5.4864m		
Crancked	10	6	0.9144m	6.4302m			
Extra	10	14	0.9144m	2.7672m		54.315kgs@10mm	
6sc				14.6838m	9.0525kgs		

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IV.RESULTS

MATERIAL DETAILS:					
S.NO	DESCRIPTION OF WORK	VOLUME	CEMENT(bags)	SAND(kgs)	AGGREGATE(kgs)
1.	FOUNDATION	9.9312cu.m	75	5551	11103
2.	PCC	2.5803cu.m	9	1710	3420
3.	COLUMNS	7.21982cu.m	66	4781	9562
4.	PLINTH BEAM	4.38178cu.m	39	2903	5805
5.	SLAB BEAM	6.34774cu.m	57	4205	8409
6.	SLAB	14.9081cu.m	297	29626	59251
7.	PLINTH BEAM SLAB	25.0463cu.m	222	16591	33181
8.	WALLS	116.85684cu.m	113	33656	-
9.	PLASTERING OF WALL	2.9840cu.m 0.7460cu.m	15 8	4297 1074	- -
10.	COMPOUND WALL	18.011cu.m	18	5187	-
12.	PLASTERING OF COMPOUND WALL	1.2606cu.m 0.315156cu.m	6 3	1815 454	- -
13.	LINTEL	35.76sq.m	1	129	-
14.	SUNSHADE	0.48447cu.m	7	322	644
15.	STAIR CASE	2.659402cu.m	28	2073	4146
16.	TOTAL		964	114374	135521

STEEL CALCULATION:

Steel calculations

- Requirements for steel calculations:
 - 1.Diameter of bar
 - 2.Length of bar
- Based on this two we can calculate the amount of steel that will be used.
 - 1.For 1m steel the weight = area*density of steel
Area is based on diameter.
 - 2.Hooked bar length = $L+18 d$
 - 3.Crancked bar length = $L+0.84d$
 - 4.Overlapped bar length = $L+50d$
 - 5.Development length = $16d \geq 18 \text{ inches}$
- Standard covers for reinforcement
 1. $\leq 0.3m$ l or b - 1inch cover
 2. 0.4 to $0.5m$ l or b - 2inch cover
 3. $\geq 0.6m$ l or b - 4inch cover

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S.NO	DIAMETER	WEIGHT PER METER	MEIGHT PER 12M
1.	6	0.2219kgs	2.6633kgs
2.	8	0.3945kgs	4.734kgs
3.	10	0.6165kgs	7.398kgs
4..	12	0.8877kgs	10.625kgs
5..	16	1.5782kgs	18.93kgs
6.	20	2.4660kgs	29.59kgs
7.	22	2.983kgs	35.79kgs
8.	25	3.853kgs	49.236kgs
9.	30	5.5487kgs	66.584kgs
10	32	6.3131kgs	75.75kgs
11.	40	9.8643kgs	113.37kgs

BRICKS: NO OF BRICKS = (VOLUME OF WALL+VOLUME OF COMPOUND WALL)/0.00176
=(116.85684+18.011)/0.0017 =6742

PAINT: ASIAN PAINTS

For 12sq.m 1 liter of paint is required. So,For 265.289sq.m the amount of paint = 265.289/12= 23 liters

MARBLES:GFNO OF MARBLES= CARPET AREA/MARBLE AREA

$$= 2139.06/2.4384 = 888$$

FF, SF NO OF MARBLES = 2 (CARPET AREA/MARBLE AREA)

$$= 2 (2446.30/2.4384) = 2896$$

THEREFORE, THE TOTAL NO OF MARBLES ARE **3784** MARBLES

ABSTRACT COST:

MATERIAL COSTING				
S.NO	MATERIAL	QUANTITY	RATE PER UNIT(Rs/-)	AMOUNT (Rs/-)
1.	Cement	964kgs	350	337400
2.	Sand	114.374tonnes	1091	124782.034
3.	Aggregates	135521kgs	1	135521
4.	Steel	4191.5786kgs	37	155088.4082
5.	Bricks	67420 no	5	337100
6.	Paint	2907 sq.f	30	87210
7.	Marbles	3784 no	14	52976
8.	Doors	8 no	1500	12000
9.	Window	7 no	4710	32970
10.	Window grill	0.14	78500	10990
11.	Excavation	95.5692cu.m	567	54187.7364
12.	Total amount			Rs.1340225.1786/-

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ADDITIONAL CHARGES			
S.NO	WORK	% OF COST	AMOUNT(Rs/-)
1.	Contractors profit	30	402067.55358
2.	Electrical works	8	107218.014288
3.	Plumbing works	8	107218.014288
4.	Labour costs	25	335056.29465
5.	Water cost	1.5	20103.377679
6.	Designer and planner charges	20	268045.03572
7.	Total amount		Rs.1239708.290216/-

Therefore, total cost of project = material cost + additional charges
 $= 1340225.1786 + 1239708.290216$
 $= 2579933.468816$
 $\sim \text{Rs.}2579934/-$

TOTAL ESTIMATED COST OF THE INDIVIDUAL VILLA = Rs.2579934/-
 Add contingencies and work establishment charges – 5% of T.C
 Therefore,
TOTAL COST = Rs.2708931/-

V.CONCLUSION

1. The detailed measurement and calculation of quantities, which includes different items of work involved in construction such as excavation, concreting, brick work etc of a villa are done, followed by the preparation of abstract of cost estimated.
2. Abstract of estimated cost includes cost of each item of various works, which is calculated from quantities computed in detailed estimation. Thus estimation of budget is made.
3. Hence, we have prepared a detailed estimation of material and the cost estimated for the construction of the individual villa (just basic construction).
4. With the help of this project work we can conclude that the detailed estimation is very much accomplished and reliable method of estimation as we will take each and every aspect into consideration.

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BIOGRAPHY



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The Author has received her B.Tech Civil Engineering from CMR Institute of Technology, M.Tech in Structural Engineering from DRK College of Engineering & Technology. She is presently working as a Assistant Professor of Civil Department in VIGNAN INSTITUTE OF TECHNOLOGY & SCIENCE.