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COMPARATIVE ANALYSIS OF EXPECTED COST OF CONSTRUCTION OF MULTISTORIED RC STRUCTURE

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Abstract - *Before taking up any work for its execution, the owner or builder should have a thorough knowledge about the volume of work. If the probable cost is higher than the costumer budget the engineer will calculate the estimate by using suitable alternative method (Whichever is applicable by considering the safety factor). The probable cost can be determined theoretically by using Plan, Drawing and current market rates of construction materials. The cost of construction calculated by using thumb rule is not as much as accurate. Hence to get better accuracy of the construction we use software for calculating the more accurate estimation of building construction.*

The methodology adopted for the project is compared of both manual investigation and software investigation. At the use of manual method we use the L-B-D method, by using this method we calculate the quantities different residential buildings. On the other hand by using software method, we find out more accurate estimation of construction building than the manual methods.

Key Words: **Comparative, Expected Cost, Multi-storeyed, RC Structure**

1. INTRODUCTION

Before taking up any work for its execution, the owner or builder should have a thorough knowledge about the volume of work. It can be completed within the limits of his funds or the probable cost that may be required to complete the proposed work. It is therefore necessary to prepare the probable cost or estimate for the proposed work from its plan and specification. Otherwise, it may so happen that the work has to be stopped before its completion due to the shortage of funds or of materials. Thus an estimate for any construction work may be defined as the process of calculating the quantities and costs of the various items required in connection with the work. It is prepared by calculating the quantities, from the dimensions on the drawings for the various items required to complete the project and multiplied by unit cost of the item concerned. To prepare an estimate, drawing consisting of the plan, the elevation and the section passing through the components, along with a detailed specification giving specific description of all workmanship, properties and proportion of materials, are required.

Before undertaking any project it is necessary to calculate the probable cost, because the customer one who approaches for any project will ask for probable cost so that they can check whether the total cost lies in their budget. If the probable cost is higher than the costumer budget the engineer will calculate the estimate by using suitable alternative method (Whichever is applicable by considering the safety factor). The probable cost can be determined theoretically by using Plan, Drawing and current market rates of construction materials. The cost of construction calculated by using thumb rule is not as much as accurate hence to get better accuracy of the construction we use software for calculating the more accurate estimation of building construction.

The Cost Calculator aims to provide you with an estimate of the likely construction costs associated with your proposed development or remodeling. One contractor quotes one amount, while a second quotes something totally different. When estimating the mean material needs for a construction project you are looking to determine the average amount that will be needed. This is extremely useful with dealing with materials that are easily arranged or that flow. Cement,

gravel, rocks, and sand are on the top of the most lists.

CalQuan India is a software solution provider for Civil Engineering & Infrastructure development companies since 2000. This software used for Highway, Canals, Dams, Tunnels, Airports, Railways. This is useful for quantity calculation, cross section drawing generation, planning etc. KrossX is the first software developed by company for Road Design Projects. By using this software we can find out various quantities required for completion of road project such as Volume, Cutting, Filling, Plan etc. CalQuan Also Develops some different software's required for civil engineering works such as LDT (Land Development Tool), B.Est (Building Estimation), PTM (Planning, Tracking & Monitoring).

In this project we are working on the B.Est Software. This software is established on 1st January 2015, Sponsored by Ultra-tech Company. The software has been launched by company at Constro-2016 as a Desktop view. And On 27th November 2015 Ultra-tech company launched the software on the web site.

2. METHODOLOGY

The methodology adopted is comparison of both Manual method as well as Software method. That is after calculating estimation by manually we compare the same estimation with our estimation software to get better accuracy of the estimated work.

Manual Method

It includes the estimation of Building by using different methods such as given below

Quick Estimation or Approximate Estimation
Detailed Estimation or L.B.D. (Length-Breadth-Depth) Estimation

Purpose of approximate estimate

Approximate estimate gives rough idea of the cost required to complete the building. For government project approximate estimate is required for budget provision and administrative approval. This type of estimate is helpful to fix the tax. For existing building if valuation has to be done approximate estimate plays the important role.

Project Title	Residential plan from Kolhapur
Plot Area	272.15 m^2
Total Built-Up Area	90.56 m^2

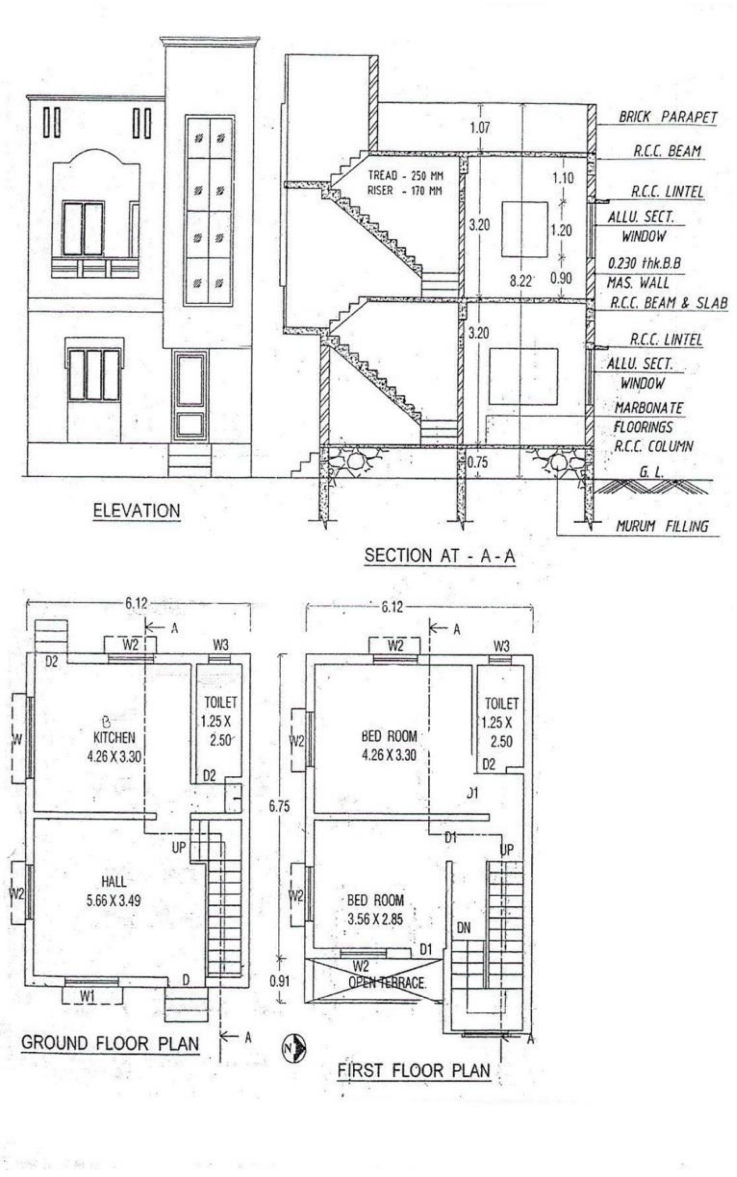

Fig -1 Residential Plan (G+1)

Table -1: Manual Estimation for Residential Plan

Sr. No.	Description	Quantity	Unit	Rate (Rs.)	Total (Rs.)
1	Excavation	21.16	m^3	138	2920.08
2	PCC	8.296	m^3	3805	8951.15
3	Footing	6.039	m^3	4945	40334.3
4	Murum Filling	3.525	m^3	58	218.24
5	Column	6.61	m^3	7375	49254.8
6	Plinth Brick	10.1	m^2	4917	26447.9
7	Plinth Beam	1.99	m^3	7242	38122.0
8	Plinth Filling	33.34	m^3	58	109054
10	Lintel	0.17	m^3	7441	54489.8
11	Chajja	0.56	m^3	8305	101636.
12	Beam	6.9	m^3	7441	112412.
13	Slab	9.07	m^3	7794	10205.1
14	Int Plaster & Ceiling	249.3	m^2	148	7062.65
15	Ext Plaster	178.9	m^2	336	52703.3
16	Ceiling Int	66.09	m^2	148	58497.4
17	Whitewash Int	249.3	m^2	6	67772.8
18	WhitewashExt	178.9	m^2	6	5113
19	Painting Inl+Ceiling	249.3	m^2	35	3533.4
20	Painting Ext	178.9	m^2	17	1799.28
21	Flooring	74.84	m^2	1055	15311.4
22	Woodwork	0.316	m^2	96131	3798.48
				Total	**537717**

Software Method

After launching the software, it reads various types of windows, in some of which, the admin has to input the suitable data and in some windows, the end user gets the direct output. The front display of the software, after launching will show the following windows

1) Log In:-

In the log in window, the admin have to input the project data, such as the name of the project, number of floors etc. Here the display also asks, if the end user will need the detailed estimate or the estimate calculated by using the LBD format.

We can save one or more projects as per requirements. After logging in, it moves to the next window.

Fig -2 Login Window

Fig -3 New Project Input Window

2) Estimation- Input Data:-

The estimation- input data asks few questions regarding the project. By using the inputted data in this window, the software calculates the cost of various items on the basis of various item rates, the admin had input before.

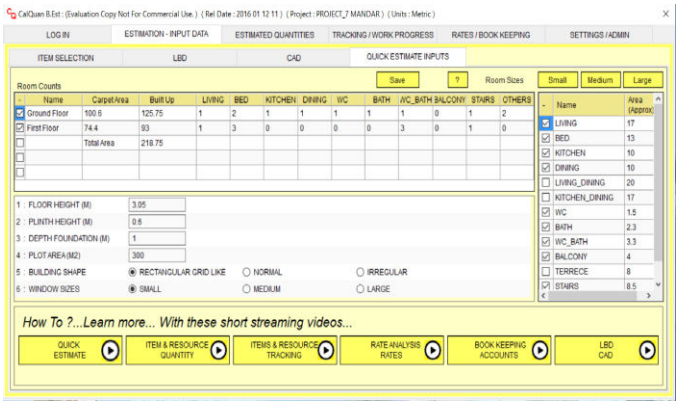

Fig -3 Estimation Input Data Window

3) Estimated Quantities:-

On the basis of inputted data, the various coefficients derived by study and research, the total estimated data results in this window. The estimation on the basis of LBD format, as well on the detailed estimate by quick estimate, calculated by the software, the user gets the total estimate, with detailed quantities, in this window.

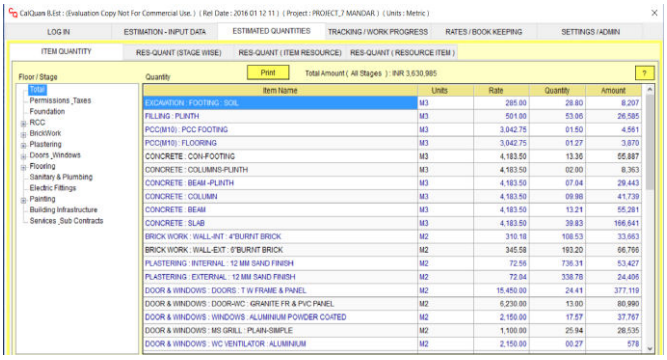

Fig -4 Estimated Quantities Window

4) Settings/ Admin;-

For an admin, the settings and admin window plays an important role while running this software successfully. Only the admin can change the settings of the software when necessary, through this window. This window consists of various sub- category windows through which one can input or change the data whenever required.

A) Units:-

In this, we can add or change the units of various quantities such as meter, feet, inch for length and for area and volume accordingly.

B) Items:-

The various types of items can be added here, which are necessary for the calculation of the estimation.

C) Resources:-

The resources according to the necessary items are inputted in the window of the resources.

D) Res- composition, Percentage Heads and Percentage Comp.:-

In these three windows, the admin has to fill up the data according to the formalities and other charges that should be counted in the estimation process.

E) Questions:-

The questions to be asked to the customer, which will be displayed on the front window, can be added, deleted or changed in this window of the questions.

F) Lookup:-

In this window, the all data inputted in the previous windows will show up here.

G) Pre pros:-

This is the go- before-process, window. In this the all calculations needed to get the final estimate are included.

F) Item eq.:-

The various types of equations, which are needed to calculate the estimate by using the coefficients derived, are inputted in this window.

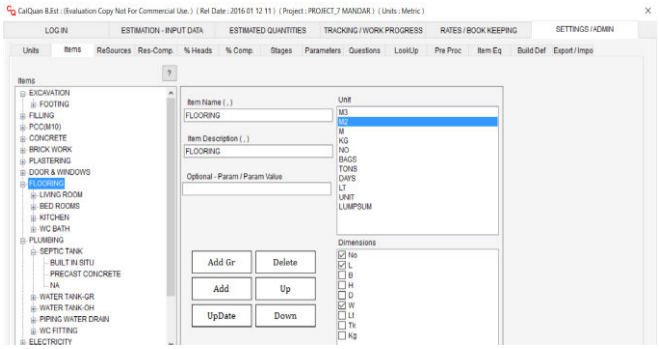

Fig -5 Setting and Admin Window

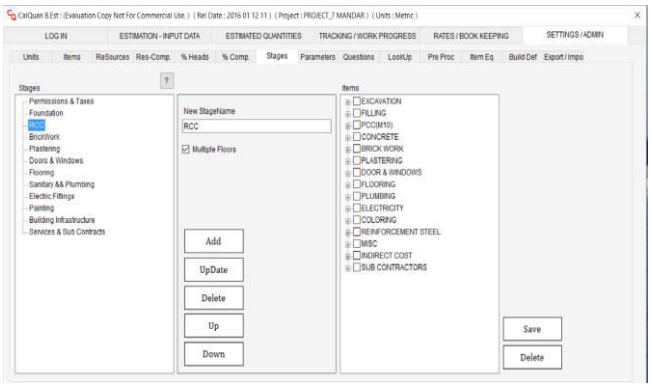

Fig -6 Setting and Admin Window

Research

The table below gives more details idea about construction cost for each activity

Table -2 Research Work

Sr. No.	Contract Code and Name	Cost per Sqft (Rs.)	% of total cost
	A. Consultants		
1	Architectural designing	21.85173	1.3
2	Structural designing	7.283911	0.5

3	Services	13.11104	0.7
4	Model making	1.098774	0.2
5	Plot Survey	0.137347	0.0
	Total	**43.83311**	**2.7**
	B. Civil Works		
1	Excavation	15.96403	0.9
2	Anti termite treatment	0.106861	0.0
3	Sub structure Waterproo fing,	3.965101	0.2
4	RCC works, Block work, Plaster, Misc civil works	966.7697	52.0
	Total	**986.8057**	**53.1**
	C. Finishing Works		
1	Flooring	142.01	7.6
2	Kitchen Platform with Sink	21.41376	1.2
3	Entrance lobby & signage	9.15645	0.5
4	Wood works	67.81992	3.6
5	Waterproofing	12.74205	0.7
6	Gypsum Plaster	36.52273	2.0
7	P.O.P false ceiling	6.498941	0.3
8	External Painting	20.82378	1.1
9	Internal Painting	21.26266	1.1
10	staircase painting	1.912218	0.1
11	Lift Shaft Painting	0.345885	0.0
12	Duct Painting	2.53158	0.1
13	Ceiling paint	7.623122	0.4
14	Aluminium Window	46.1979	2.5
15	M.S Railing	11.16349	0.6
16	Facade work	6.190976	0.3
	Total	**419.6929**	**22.6**
	D. Services		
1	Plumbing& pumping	51.57279	2.8
2	CP Sanitary	44.45325	2.4
3	Firefighting	23.43493	1.3
4	Electrical	76.44474	4.5
5	Lifts	82.40805	4.5
6	IBMS	16.33613	0.9
7	Solar water system	4.395096	0.3
8	DG Set	6.592644	0.4
	Total	**305.6376**	**17.1**
	Initial Total (A+B+C+D)	**1755.969**	**94.4**
	E. Others		
1	Site Establishment	33.01863	1.8

2	Electrical & water charges 1.5%	26.33954	1.4
3	Contingencies for temp. Works	17.55969	0.9
4	EHS budget	8.779847	0.4
	Construction Cost (A+B+C+D+E)	**1859.227**	**100.0**

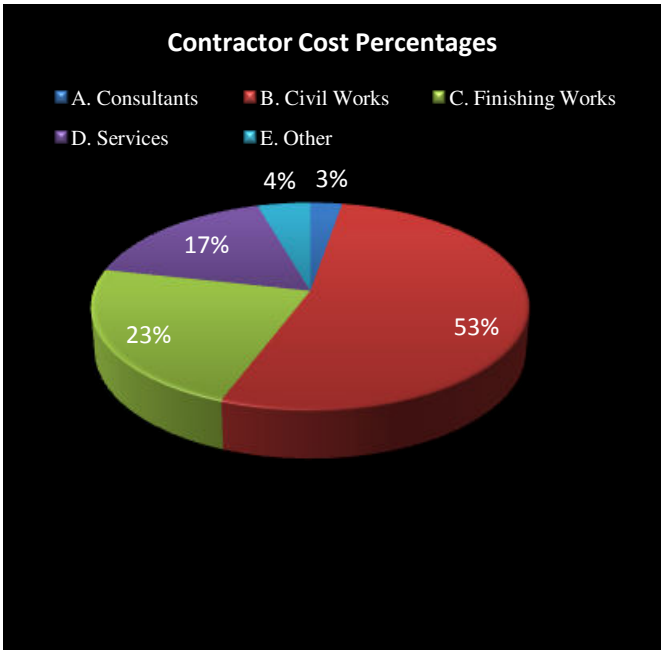

Fig -7 Contractor Cost Percentages

Calculations

Table -3 Room Average ratio

			PROJECT - 05				
	GF	GF	AREA	FF	FF	AREA	TOTAL
NAME OF ROOM	X	Y		X	Y		
LIVING ROOM	3.49	4.46	15.57	-	-	-	15.57
KITCHEN	3.3	4.26	14.06	-	-	-	14.06
BEDROOM 1	-	-	-	3.3	4.26	14.06	14.06
BEDROOM 2	-	-	-	2.85	3.56	10.15	10.15
WC BATH	1.25	2.5	3.13	1.25	2.5	3.13	6.25
STAIRS	1.2	3.8	4.56	2.4	3.8	9.12	13.68
		TOTAL	37.31			36.45	73.76

TOTAL BUILT UP AREA	90.56		
EST AREA	73.76	0.814	
GF BUILT UP AREA	45.28		
EST GFAREA	37.31	0.824	
			0.814
FF BUILT UP AREA	45.28		
EST FF AREA	36.45	0.805	

ROOM AVG RATIO					
ROOMS	GF AREA	FF AREA	TOTAL	AVG	RATIO
LIVING ROOM	15.57	-	15.57		
KITCHEN	14.06	-	14.06		
BEDROOM 1	-	14.06	14.06		
BEDROOM 2	-	10.15	10.15		
		TOTAL	53.83	13.46	0.15
WC BATH	3.13	3.13	6.25	3.13	0.03
OTHERS					
STAIRS	4.56	4.56	9.12	4.56	0.05
		TOTAL	69.20	8.65	0.10

RESULTS

After successfully working on the project we get the following results. We make a graphical representation which shows the results comparing Method VS Cost.

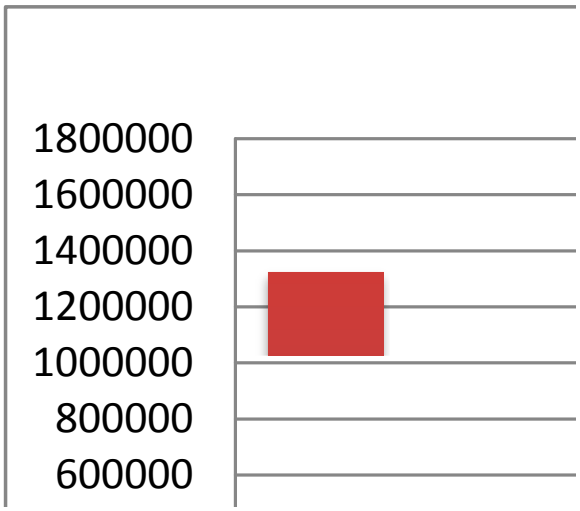

Fig -8 Results for Residential Plan

3. CONCLUSIONS

After working on the project work successfully and getting after positive results we conclude some advantages of using this software which are discussed bellow.

1. Time consuming for the estimation.
2. Manual error can be minimized.
3. Exact cost of the project can be getting easily.

4. Exact material requirements also we can get.
5. Cost variation in manual and software method is 2-3 % only.

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