"Estimation and Costing of a Building Using Visual Basic Application"

A PROJECT REPORT

Submitted in partial fulfillment of the requirements for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

Under the supervision of

Mr. Santu Kar

(Assistant Professor)

&

Mr. Bhibhas paul

(Assistant Professor)

By

Shubhendu Katna (131708)

&

Shivam Behl (131605)

to

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

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CERTIFICATE

This is to certify that the work which is being presented in the project title **" Estimation And Costing of A Building Using Visual Basic Application"** in partial fulfillment of the requirements for the award of the degree of Bachelor of technology submitted in Civil Engineering Department, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out by **Shubhendu Katna(131708) & Shivam Behl (131605)** during a period from August 2016 to May 2017 under the supervision of Mr. **Santu Kar,** Assistant Professor& Mr Bhibhas Paul, Jaypee University of Information Technology, Waknaghat.

The above statement made is correct to the best of my knowledge.

Date:

Dr.Ashok Kumar Gupta   Mr santu kar   External

Professor & Head of Department   Associate professor

Civil Engineering Department   Civil Engineering Department

JUIT Waknaghat   JUIT Waknaghat

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ABSTRACT

Certain softwares such as visual basic is helpful in making lengthy and tough data based calculations easy and as in solving complex problems in civil engineering

In this project we are using visual basic software for cost estimation of a building by using Central PWD plinth area rates (1.10.2012). The rates applied in the Microsoft spreadsheet are further used by the application based software made in visual basic to ultimately take out the cost of the structure. Basic excel functions such as VLOOKUP,. workbook, index match using data lists data menu options, data filtering options in excel.

Two types of structures have been included naming 1.RCC framed structures 2. Load bearing structures for buildings as schools, colleges, hospitals, residential building

The use of this project is to make office development apps for civil engineering for easy cost estimation to avoid manual labour and time wastage by making such modules to precise and efficient calculations in civil field.

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CHAPTER 1 - INTRODUCTION

1.1 General Introduction

Programming implies outlining an arrangement of directions to educate the PC to complete certain occupations that are especially quicker than individuals can do. The most punctual programming dialect is called machine dialect that utilizations double codes involves 0 and 1 to speak with the PC. Machine dialect is to a great degree hard to learn Fortunately, researchers have designed abnormal state programming dialects are Java, Visual Basic and so forth. Visual Basic is an abnormal state programming dialect that developed from the before DOS form called BASIC. Essential means Beginners All-purpose Symbolic Instruction Code. The code looks a lot like English Language. Presently, there are numerous variants of Visual Basic accessible in the market, the most recent being Visual Basic 2015 that is packaged with other programming dialects, for example, c#. In any case, the most well know one and still generally utilized by humorous VB developers is none other than Visual Basic 6. VISUAL BASIC is a VISUAL Programming Language since writing computer programs is done in a graphical situation. In VB6 you simply need to move any graphical protest anyplace on the frame and tap on the question enter the code window and begin programming. The extension must be characterized, reported and concurred before any coding is begun.

Also, obviously, the determinations must be set in cement - any progressions will bring about extra expenses. The more parts of the venture scope that are recognized, the more exact cost estimations and the framework configuration process will be. Characterizing the degree is the most critical piece of the underlying arranging process. An all-around characterized venture will define the limits of the work to be finished.

1.2. Introduction to MS excel

Exceed expectations is the spine to any custom constructed budgetary model, and requires having great specialized aptitudes.

By associating with a database (Oracle, IBM, SQL, Server, OLAP) Excel can recover information from your corporate databases and documents, you don't need to retype the information that you need to examine in Excel. You can likewise invigorate your money related spreadsheets and synopses naturally from the first source database at whatever point the database is refreshed with the new data.

A capable and simple to utilize operational so money related model in Excel furnishes choice imprints with expository capacities to survey the results of a scope of situations.

Great money related administration and monetary administration are at the centre of good administration. They help to drive execution by supporting successful basic leadership, helping the proficient running of associations and boosting the compelling utilization of assets, Great money related administration is additionally fundamental to keep up the stewardship and responsibility of open assets. The way government bodies gather, break down and use money related administration data specifically impacts on the execution of their associations and the connivance of their goals.

1.3. Introduction to VBA

Visual fundamental for applications, excels effective inherent programming dialect, permits you to effortlessly consolidate client composed capacity into a spreadsheet. Client can UN doubted Black-Scholes and binomial option costs.

For instance, on the off chance that you think VBA is something elusive which you will never generally need to know. VBA is presently the center large scale dialect for all Microsoft's office items, including Word. It has likewise been joined into programming from different merchants. You require not compose confounded projects utilizing VBA will make it less demanding for you to break down generally complex issues for yourself.

VBA was expelled from, Mac Excel 2008, as the designers did not trust that an opportune discharge would permit porting the VBA motor locally to Mac OS X. VBA was reestablished in the following adaptation, Mac Excel 2011.

VBA code connects with the spreadsheet through the Excel protest demonstrate, vocabulary recognizing spreadsheet objects, and an arrangement of provided capacities or techniques that empowers perusing and keeping in touch with the spreadsheet and cooperation with its clients (for instance, through custom toolbars or order bars and message box). Client made VBA subroutines these activities and work like macros created utilizing the full scale recorder, however are more adaptable and effective.

1.4. Advantages of using VBA

VBA, or Visual essential for applications, is the straightforward programming dialect that can be utilized to create macros and complex program. The upside of which are: -

- The capacity to do what you ordinarily do in Excel, yet a thousand times speedier.

- The ease with which you can work with huge arrangements of information.

- The task can be performed without any prior knowledge of excel

- Excel always executes the task in the same way

1.5 Need of Study

Programs provide students to learn of modern engineering tools. Computing and information infrastructures must be in place to support the scholarly activities of the students and faculty and the educational objectives of the program and institution

Spreadsheet has powerful features such as data lists, referencing, Vlookup and programming abilities which can be used as an effective tool for solving difficult engineering problems

It allows us to use the data and to make calculations by applying in applications created by visual basic software, not only it helps in making estimations around cost as we have used in this project but also can be used in other disciplines such as structural engineering

The use of excel and its VBA programming abilities makes it an efficient and powerful tool in developing applications for teaching civil engineering concepts.

1.6 Objectives of Study

- To learn about and use of Visual Basic Application software and its application for civil engineering problems with the help of using Microsoft spreadsheet

- To create an estimation application using modules and forms in Visual Basic that can use data from excel sheet and apply calculations for the desired output

- To validate cost and estimation of building using visual basic code and data from Excel sheets

1.7 SCOPE

The scope of the project is to take out the cost a RCC based structure or a load bearing structure depending on the type of the building used by using CPWD plinth area rate norms which have been used as an input in a visual basic application which uses the inputted data from excel to generate the cost of the building.

CHAPTER 2

LITERATURE REVIEW

2.1 GENERAL

Courses about programming have been part of student curriculum for quite some time now. Typical civil engineering problems can be presented through programming concepts.

Rasdorf indicated in the late 70's that civil engineering programs should embrace the idea of needing to learn programming in curriculum,the argument has been that "students must be prepared to use computer methods and applications as part of the basic education

Programming applications such as VBA should be introduced in engineering disciplines for effective and as well as efficient way of solving data problems.

Excel using VBA robust capabilities is an powerful tool for civil engineering concepts spreadsheets helps in solving complex problems , create graphs and charts and generate useful reports

Hegazy and Ersahin used excel and vba to develop an information system for sub-contractors, and alternative methods of construction for various tasks.

Powerful and infrequently used features in excel include data lists, data menu options, data filtering and vlookup . other features such as the Match, Index and offset are other functions that provide control over data. The functions with the use of visual basic makes it an efficient applications for solving complex civil engineering problems

Visual basic applications can be mainly used in two areas of civil engineering

 1) Construction management

2) Structural engineering

Examples include construction data management, tct analysis optimum mark-upestimation, simulating and scheduling construction actives with uncertain durations, scheduling linear and repetitive projects, schedule and cost control

, optimization of construction operations, design of bolted steel connections and analysis and design of different steel members such as beam, columns, base plates etc.

2.2 VBA used for other projects

Here are certain examples that have been used to create applications using vba

in this paper applications are given for 2 areas in civil engineering

 1) Construction management and

2) Structural engineering

2.2.1 Examples for construction management

(a) Management of construction information application which uses data –forms option for records and for editing data sort and referencing is also important part. By allocating the resource code and vlookup and other functions you can take control over the data list.

(b) The second example shows analyzation for contractors bidding for a job. The method applied for calculating the cost is done by probability distribution. The calculation is further done on the basis of Freidman's probability model

(c) The third example shows the scheduling done in construction technology management using Program Evaluation and Review Technique (PERT) Weighted average of the three times is used to calculate the overall project duration namely 1) pessimistic time 2) most likely time 3) optimistic time and further the expected time is calculated using the " normdist" function .

(d) In the last VBA application spreadsheet was made with a VBA macro code which was written for time-cost trade-of-analysis. The application outputs method of construction for different projects based on their corresponding activities such as type of construction,method, resource etc. And using the results a project file will be made by VBAmacro which will finally generate the complete schedule of the project.

2.2.3 Structural application

(a) This application focuses to construct the shear force and bending moment's diagrams from the spreadsheet for any structural member. In the figure mentioned below the most critical values in the structural member can also be seen which is very important for a structural engineer

Span-Distance along span		Moment	Shear
1		0.00	0.00	-10.00
2		0.10	-1.01	-10.12
3	Cantilever ZA	0.20	-2.02	-10.25
4		0.30	-3.06	-10.37
5		0.40	-4.10	-10.50
6		0.50	-5.16	-10.62
7		0.60	-6.22	-10.74
8		0.70	-7.30	-10.87
9		0.80	-8.40	-10.99
10		0.90	-9.50	-11.12
11		1.00	-10.62	-11.24
12		0.00	-10.62	14.49
13		1.50	9.72	12.63
14		3.00	27.27	10.77
15		4.50	42.03	8.91
16		6.00	53.99	7.05
17		7.50	63.17	5.18
18		9.00	69.55	3.32
19		10.50	73.14	1.46
20	Span AB	12.00	73.93	-0.40
21		13.50	71.94	-2.26
22		15.00	67.15	-4.12
23		16.50	59.57	-5.98
24		18.00	49.20	-7.85
25		19.50	36.03	-9.71
26		21.00	20.08	-11.57
27		22.50	1.33	-13.43
28		24.00	-20.21	-15.29

(a) Bending Moment and Shear Force Values.
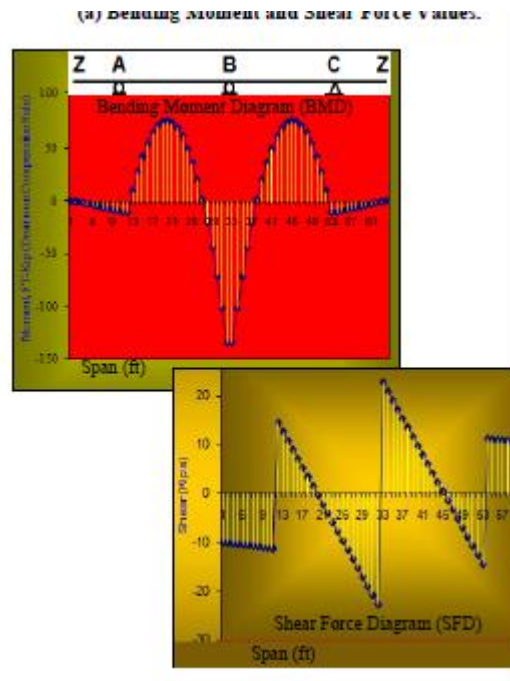
Fig 1 (InputData)   Fig 2 (Diagrams shown on the basis of output)
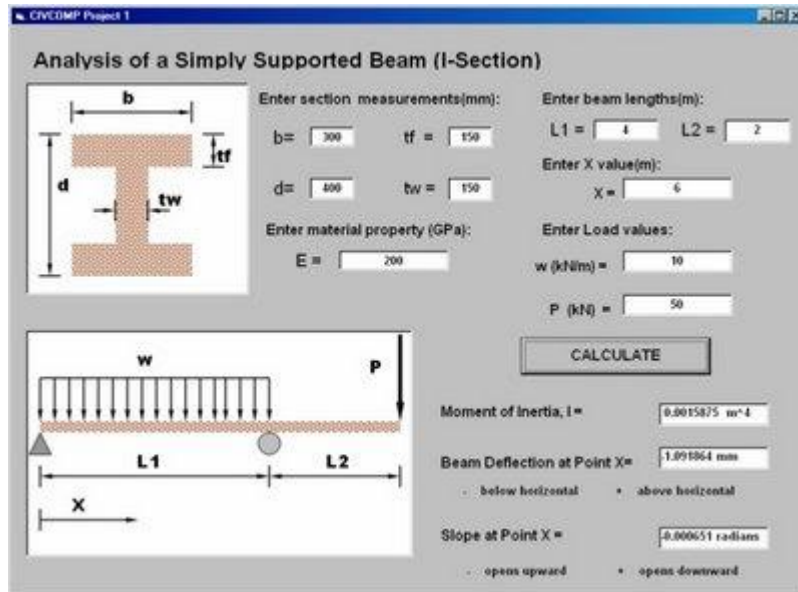
13

Figure 3(Input data for I-section)

(b) Beam deflection application: the purpose of this software is used to solve the elastic deflection and slope of a beam.

The inputs for the application are cross section dimension and properties of the I section and the respective beam loading and lengths. The outputs are the moment of inertia of the I section, the beam deflection and slope at specified point X from left end. This application can be used to demonstrate the effect of section properties in mechanics of materials or structural analysis including beam loading and lengths on elastic deflection and slopebeam; therefore by calculating the beam at different values of X, the shape of the elastic curve can be drawn

(c) Open channel flow: this application determines the normal depth of an open channel using manning equation. Theshape of the cross –section (rectangle, trapezoid, and triangle), the system of units taken has to be selected. The inputs include the dimension of the cross-section and manning equation parameters S, n and Q. The result is the normal depth of flow. This software application can be used in the courses Fluid Mechanics or Hydraulics.
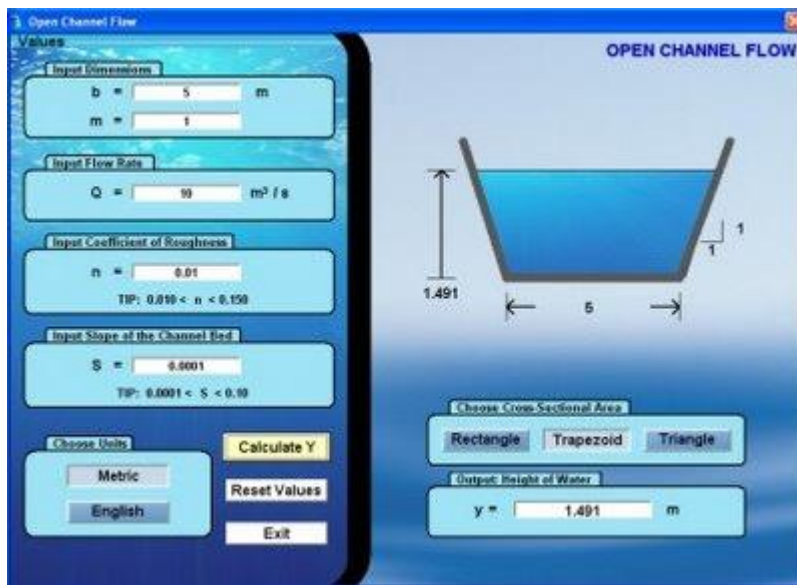

Figure 4(Visual Basic application for open channel flow)

2.2 Summary

VBA program window

(a) The VBA menu bar – is used for menu command shortcut keys

(b) Tool bar – just like any other toolbar VBA also has an tool bar with various commands

(c) Project explorer window displays a tree diagram of the current workbooks used

(d) Code window – every object in the project has to be associated with the code window

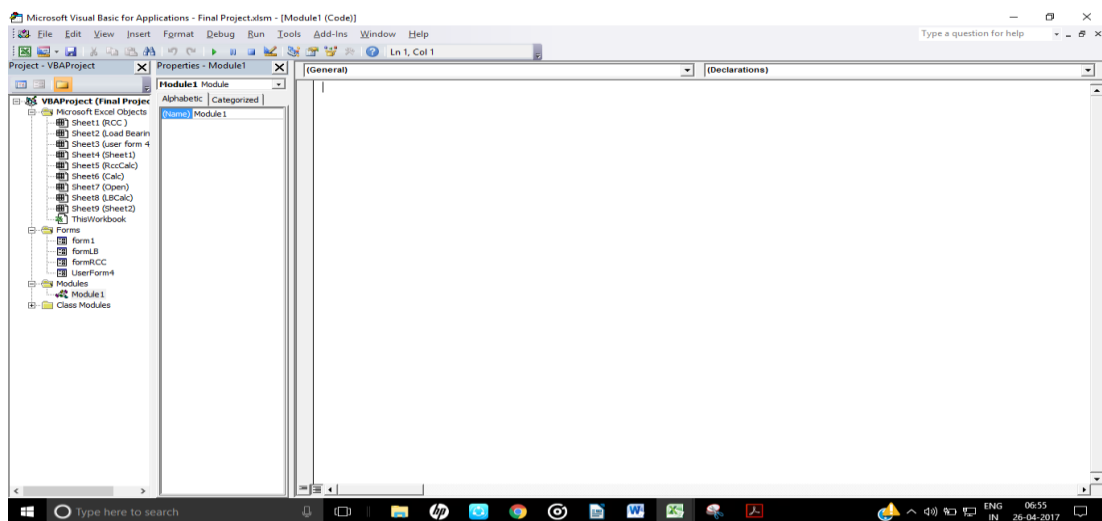(e) Immediate code window – is useful for executing VBA statements directly and for debugging the code

Figure 5(Visual Basic code window)

VBA module

Modules are composed of VBA editors and which the vba code is stored. The vba module has its own window which can be viewed by double clicking on it. The code is written in the module to control the specified program

Macro recorder

It has the function of recording every task performed with Microsoft excel the task can be performed again and again with the help of a button for example converting numbers to decimal places and it can applied to any range by using the desired macro.

CHAPTER 3
CREATING USERFORM AND INPUT DATA

3.1 First Userform

Figure 6 (Userform 1)

3.2 Userform for RCC based structure

Figure 7(Userform 2)

3.3 Userform for Load Bearing Structure

Figure 8(Userform 3)

3.4 Input for RCC type structure

	Description	Office/College/Hospital		Schools	Hostels	Residential	
6							
7							
8	RCC framed structure upto six storeys						
9	Floor height 3.35 mtr.	23500		17000			
10	Floor height 2.90 mtr.				16500	16000	
11							
12	RCC FRAMED STRUCTURE (Normal Buildings)						
13							
14	RCC framed structure upto six storeys						
15	Floor height 3.35 mtr.	19000		15200			
16	Floor height 2.90 mtr.				15000	14500	
17							
18	EXTRAS FOR						
19	Every additional storey over six storeys upto nine	560		560	560	560	
20	Every additional storey over nine storeys upto twelve	580		580	580	580	
21	Every 0.3 mt deeper height of floor above normal floor height		270	270	270	270	
22	Every 0.3 mt higher plinth over normal plinth height of 0.6 mt		270	270	270	270	
23	Every 0.30 mt deeper foundations over normal depth of 1.20 mt	1.20 mt	270	270	270	270	
24	Making stronger foundations to take load of one additional floor		2270	2270	2270	2270	
25	Strip foundations in poor soil having bearing capacity <10 tons/sqmt		520	520	520	520	

Figure 9(Input Rates for RCC framed structure)

26	Resisting Earthquake forces					1140	1140	1140	1140
27	RCC Raft foundations(ground floor only)					6450	6450	6450	6450
28	Pile foundation upto a depth of 15 mts(on ground floor only)					11750	11750	11750	11750
29	Stronger structural members to take load btw 500kg/sqm-1000kg/sqm)					1500	1500	1500	1500
30	Larger modules over 35 sqm.					1500	1500	1500	1500
31									
32	BASEMENT FLOOR								
33	Floor ht. 3.35 mtrs with normal water proofing					19000	-	-	-
34	EXTRA FOR BASEMENT WITH								
35	Every 0.3mt additional height(above 3.35mt.)					2320	-	-	-
36	Reduction for every 0.5 mt less height of basement than normal height					-1280	-	-	-
37									
38	FIRE FIGHTING								
39	With wet riser system					500	500	500	500
40	With sprinkler system					750	750	750	750
41									
42	FIRE ALARM SYSTEM								
43	Manual Fire Alarm System					-	-	-	300
44	Automatic Fire Alarm System					500	500	500	500

Figure 10(Input rates for RCC framed structure)

45					
46 Operation Theatre(OPD)(Extra provision)	2150 -	-	-	
47				
48 Pressurized mechanical ventilation system in the basements	650	650	650	650
49				
50 STILT PORTION				
51 Stilt Portion of Multistorey RCC structure(upto height 3.35mt)	9850	9850	9850	9850
52 Every 0.30 mt additional height (above 3.35 mt)	450	450	450	450
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				

Open / user form 4 / Sheet1 / **RCC** / RccCalc / Load Bearing / Calc / Sheet2

Ready   100%

Figure 11(Input rates for RCC framed structure)

3.5 Input for Load Bearing structure

	Sl. No	Description	Non-Residential Buildings				
			office/college/hospitals	school	hostel	Type - 1,2,3 & servant quarters	Type -IV qtrs
1							
2	LOAD BEARING CONSTRUCTION						
3							
4							
5							
6							
7	1		2	3	4	5	6	7
8		2 LOAD BEARING CONSTRUCTION					
9		2.1 Floor height 3.35mt					
10	2.1.1	Single storeyed	15000	14000			
11	2.1.2	Doubled storeyed	14300	12200			
12	2.1.3	Three storeyed	15000	14000			
13	2.1.4	Four storeyed	16000	14000			
14		2.2 Floor height 2.90mt					
15	2.2.1	Single storeyed			13300	11600	12800
16	2.2.2	Doubled storeyed			11700	11300	12400
17	2.2.3	Three storeyed			13300	11600	12800
18	2.2.4	Four storeyed			14000	12200	13500
19		2.3 Scooter&Cycles sheds				10500	10500
20		2.4 Garrages				10000	10000
21		2.5 Extra for					
22	2.5.1	Every 0.3mt. Additional height above normal height 3.35mt/2.90 mt	270	270	270	270	270
23	2.5.2	Every 0.3mt. Higher plinth over normal plinth height of 0.60 mt.(on ground floor area only)	270	270	270	270	270
24	2.5.3	Every 0.3 mt deeper foundations over normal depth of 1.20 mt.(on G.F area)	270	270	270	270	270
25	2.5.4	Making stronger foundations to take load of one additional floor at a later date (a.f only)	780	780	780	780	780

Figure 12(Input rates for Load bearing structure)

CHAPTER 4
CASE STUDY 1
(For RCC based Structure)

4.1 Data input taken

(a) For User Form 1

Name of Project	Housing Project
Plinth Area	300sq/m
Type of Building	Residential
Type of structure	RCC

(b) For User Form 2

Additional storeys over six stories	0
Floor Height	3 m
Plinth Height	1
Depth of Foundation	2.5
Stronger foundation to take load of one additional floor at later date	Yes
Earthquake force Consideration	Yes
Consideration for pile foundation upto a depth of 15mt	No
Requirement of Larger Modules over 35 sqm	No
Type of fire fighting system	Sprinkler
Provision for opd	No
Strip Foundation For Bearing Capacity Less Than 10tns/sqm	No
RCC Raft Foundation Consideration	Yes

Stronger Structural Member	No
Basement Height	No
Fire Fighting system	Automatic
Pressurized Mechanical Ventilation System	no

4.2 Result

The cost for the above case study amounts to Rs 9834000

Figure 13(Result)

Result from manual calculation of the above building:-

Additional storeys over six stories	0
Floor Height	2700
Plinth Height	810
Depth of Foundation	2160
Stronger foundation to take load of one additional floor at later date	2270
Earthquake force Consideration	1140
Consideration for pile foundation up to a depth of 15mt	0
Requirement of Larger Modules over 35 sqm	0
Type of firefighting system	750
Provision for opd	0
Strip Foundation For Bearing Capacity Less Than 10tns/sqm	0
RCC Raft Foundation Consideraion	6450
Stronger Structural Member	0
Basement Height	0
Fire Fighting system	500
Pressurized Mechanical Ventilation System	0
Total cost	((16000(acc to the plinth height value) + 2700+810+2160+2270+1140+6450+750+500 *300(plinth area) = Rs 98,34,000

CASE STUDY 2 (FOR LOAD BEARING STRUCTURE)

Name of project	Hopital Project
Plinth Area	300
Type of buiding	Hospital
Type of structure	Load bearing structure

Additional floor height req above normal depth	0
Depth of foundation over normal depth	2.5
Foundation of soil having bearing capacity<10T/SQM	no
RCC raft foundation	yes
Stronger structural member(Load 500 to 1000)	yes
Fire fighting system with	sprinkler
OPD Required	yes
Higher plinth height above normal height	1
Stronger foundation to take additional floor load	yes
Foundation req. under reamed pile of 6mt long	no
Pile foundation upto depth 15mt.	no
Larger module over 35 sqm	no
Fire alarm system	Automatic

COST CALCULATED BY Visual Basic Application

UserForm3

LOAD BEARING STRUCTURE

ADDL FLOOR HEIGHT REQ ABOVE NORMAL HEIGHT	0	HEIGHER PLINTH HEIGHT ABOVE NORMAL HEIGHT	1
DEPTH OF FOUNTDATION OVER NORMAL DEPTH	2.5	STRONGER FOUNDATION TO TAKE ADD FLOOR LOAD	Yes
FOUNDATION OF SOIL HAVING BEARING CAPACITY < 10T/SQM	No	FOUNDATION REQ UNDER REAMED LONG	No
RCC RAFT FOUNDATION	Yes	...TION UPTO DEPTH 15 mt	No
STRONGER STRUCTURAL MEMBER (LOAD 500 TO 1000)	Yes	...DULE OVER 35sqm	No
FIRE FIGHTING SYSTEM WITH	Sprinkler	...SYSTEM	Automatic
OPD REQUIRED	Yes		

Microsoft Excel

9330000

OK

SUBMIT

Conclusion and Future scope

Conclusion

The estimated result of the case study taken is equal to the manual calculated result thus the application made by use of this software is precise and accurate .Thus by using this project the cost of any rcc and load bearing building can be calculated accurately The use of this software also inculcates the further use of this application is to make calculations based on other topics as it is an easy an efficient way to solve complex problems . The use of this software will help us in speedy and efficient calculation of any input taken. Therefore by working on this project cost estimation of building can be known and calculated.

Future scope

The use of software based applications has become an essential part in any field to solve cost based problems or any algorithm problem . By using visual basic software cost estimation of a structure is efficient and can be done without any use of physical calculation . As done in this project many other applications can be made by the use of software applications such as visual basic and other applications such as rebit,staad pro ect .

The use of applications is gaining a huge popularity in the civil field. For accurate analysis of data , safe and economical construction using information based application should become a necessity and priority of common use .

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