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Estimation And Costing Of A Residential Building

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Abstract: Before undertaking the construction of a project it is necessary to know its probable cost which is worked out by estimating. Building Estimation and Costing is a vital part of Civil Engineering. No project can begin without the total Building Estimation and Costing done by the Engineer.

An estimate is the anticipated or probable cost of a work and is determined theoretically by mathematical calculations based on the drawing (plans, section.etc.), specifications and current rates. The entire Cost of construction and the infrastructure used for the purpose of construction is estimated and the final costing is done. An estimate is prepared by computing or calculating the quantities required and then calculating the cost at suitable rates, to get the expenditure likely to be incurred in the construction of a building or structure. The primary object of the estimate is to enable one to know beforehand, the cost of the work and hence its feasibility can be determined i.e., whether the project could be taken up within funds available or not. It also gives an idea of time required for the completion of the work. It is also required for inviting tenders and to arrange contract and to control the expenditure during the execution.

The main objective of the project is to estimate the total cost required to construct a given residential building. Estimating involves preparing detailed estimate, calculating the rate of each unit of work and preparing abstract of estimate.

Index Terms **– Building, drawings, Construction, infrastructure.**

I. INTRODUCTION

1.1 INTRODUCTION

Before undertaking the construction of a project it is necessary to know its probable cost which is worked out by estimating. Building Estimation and Costing is a vital part of Civil Engineering. No project can begin without the total Building Estimation and Costing done by the Engineer.

For all engineering works it is required to know beforehand its probable cost of construction known as estimated cost. If the estimated cost is greater than the money available, then attempts are made to reduce the

cost by reducing the work or by changing the specifications. From this the importance of estimate for engineers may be understood. In preparing an estimate, the quantities of different items of work are calculated by simple mensuration method and from these quantities the cost is calculated. The subject of estimating is simple, but knowledge of drawing is essential. One who understands and can read drawing may find out the dimensions – lengths, breadths, heights, etc. from the drawing without difficulty and may calculate the quantities.

1.2 OBJECTIVE OF THE WORK

The main objective of the project is to calculate the quantities of different items of work and estimate the total cost required to construct a residential building with a plot area of 20.2mX25.2m in which built-up area is 9.8mX15.7m. In the building there are two bedrooms, living room, sitting, kitchen, bathroom and toilet. Various items of works which we have to calculate are

- Earthwork excavation and filling
- Plain Cement Concrete in foundation and plinth
- Reinforced Cement Concrete in columns, beams, slabs
- Reinforcement in footing, columns, plinth beams, lintel beams, sunshades, roof beams and slab
- Wood work for doors and windows
- Plastering, Painting for wood work and walls, Architectural features

1.3 NEED FOR ESTIMATION AND COSTING

Estimate gives an idea of the cost of the work and hence its feasibility can be determined i.e. whether the project could be taken up with in the funds available or not.

- Estimate gives an idea of time required for the completion of the work.
- Estimate is required to invite the tenders and Quotations and to arrange contract.
- Estimate is also required to control the expenditure during the execution of work.
- Estimate decides whether the proposed plan matches the funds available or not.

II. LITERATURE REVIEW

Literature Review: Estimation and Costing of a Residential Building

1. **B.P. Sinha (2011)**, in *"Construction Estimating and Costing"*, provides a comprehensive guide to the estimation process used in building construction. The author outlines various methods like detailed and approximate estimation, emphasizing their importance in the initial stages of construction projects. The book

highlights that precise estimation is critical for budget control, material procurement, and resource planning in residential construction.

2. **Rangwala, S.C. (2013)**, in *"Estimating, Costing and Valuation"*, explains the methodology for calculating quantities of materials, labor, and costs associated with different components of a residential structure. The author stresses the role of specifications and rate analysis, which are essential to ensure accurate project budgeting and schedule adherence.
3. **Ahuja and Dozzi (1994)**, in their study on *"Project Management Techniques in Planning and Controlling Construction Projects"*, emphasize the integration of cost estimation with project scheduling. The study suggests that incorporating estimation into early planning helps in minimizing cost overruns and ensuring timely project delivery.
4. **Patil et al. (2017)** conducted a case study titled *"Estimation and Costing of Residential Building using Microsoft Excel"*. They demonstrate how digital tools like Excel can simplify quantity take-off and automate calculations, thus reducing human error and improving efficiency. Their study also proves beneficial for small-scale contractors and civil engineering students.
5. **Nirav M. Vekariya & H. S. Jadav (2015)**, in their research paper *"Cost Estimation of Building Construction using Excel"* published in the *International Journal of Engineering Trends and Technology (IJETT)*, emphasized the use of spreadsheets for preparing estimates. They found that using templates in MS Excel allows quick and accurate quantity takeoff, material scheduling, and budget analysis.
6. **Desai and Desai (2016)**, in their paper *"A Study on Estimation and Costing of Residential Building by Long Wall and Short Wall Method"*, explore different estimation methods and conclude that the center line method is faster and more convenient than the long wall-short wall method for buildings with repetitive structures.
7. **P.M. Waghmare et al. (2018)** conducted an analysis titled *"Estimation and Costing of a G+1 Residential Building Using AutoCAD and MS Excel"*. Their findings revealed that combining software tools for drawing and calculation results in improved accuracy, reduced wastage, and better time management.
8. **Puri et al. (2020)**, in their research paper *"Cost Planning and Estimation for Residential Buildings using BIM Tools"*, discuss the shift towards Building Information Modeling (BIM) for estimation purposes. The study emphasizes that BIM-based estimation provides more accurate quantity take-offs and allows real-time updates to the cost plan with design changes.
9. **Kadam et al. (2019)** in their study *"Comparative Study on Estimation of a Residential Building by Different Methods"*, compare traditional and modern estimation methods and conclude that automated estimation techniques are more time-efficient and reduce the chances of manual errors.
10. **Mokashi and Patil (2021)**, in their work on *"Detailed Estimation and Costing of a Low-Cost Residential Building"*, focus on sustainable materials and cost-effective construction practices. Their findings help in identifying cost-saving opportunities without compromising on quality and structural integrity.

III. PROCEDURE OF ESTIMATING

3.1 PROCEDURE 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

3.1.1 Preparing detailed Estimate

The complete work is divided into various items of work such as earthwork concreting, brickwork, R.C.C. Plastering etc., The details of measurements of each item of work are taken from drawings and entered in respective columns of prescribed Performa. The quantities are calculated by multiplying the values that are in numbers column to Depth column as shown below:

Table 3.1 Details of Measurements Form

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

IV. METHODOLOGY

4.1 DESCRIPTION OF RESIDENTIAL BUILDING

The plot area of the residential building is 20.20mX25.20m. Out of this the built up area is 9.80mX15.70m. The ground floor area is divided into number of rooms such as sitting, living room, kitchen, 2 bedrooms, bathroom, toilet, etc. The dimension of each room is as follows:

Sitting	5.00mX4.00m
Living room	5.00mX4.30m
Kitchen	3.00mX2.90m
Bedroom 1	4.20mX4.00m
Bedroom2	4.70mX4.00m
Bathroom	2.80mX2.40m

Toilet	1.80mX2.00m
Dressing mirror	1.20mX0.20m

Above the roof there is a parapet wall of height 2.00m. Over the staircase there is an RCC slab at a height of 3.00m from the roof, for the over head water tank. A syntex tank of capacity 1000 litres is placed on this roof. A parapet wall is also provided for this roof with a height of 1.5m.

There are 12 numbers of doors in the building with different sizes. Following are the sizes, description and details of the doors:

D01: The size of this door is 1.21mX2.13m. There are 3 doors of this size. This door is a double leaf shutter door, with Sal wood door frame of size 75mm x 100mm along with flush door shutter.
D02: The size of this door is 1.06mX2.13m. There are 5 doors of this size. This door is a single leaf shutter door, with Sal wood door frame of size 75mm x 100mm along with flush door shutter.
D03: The size of this door is 0.75mX2.13m. There are 2 doors of this size. This door is a single leaf shutter door, with Sal wood door frame of size 75mm x 100mm along with flush door shutter.
D06: This is the main entrance door of the building with dimension of 3.00mX2.90m. This is a rolling shutter gate made up of iron.
D07: This is the side entrance door of the building with dimension of 1.00mX2.50m. This is a Collapsible steel shutters gate made up of iron.
There are 8 numbers of windows in the building with different sizes. Following are the sizes, description and details of each window:
W01: The size of this window is 1.60mX1.20m. There are 4 windows of this size. W02: The size of this window is 1.20mX1.00m. There is only one window of this size. W03: The size of this window is0.60mX1.60m. There are 2 windows of this size.
W04: The size of this window is 0.60mX1.20m. There is only one window of this size. The different items of work which should be calculated and estimated are:

1. Earthwork in excavation
2. Plain cement concrete in foundation
3. Random Rubble stone masonry
4. Coursed Rubble stone masonry
5. Flush Pointing to Coursed Rubble stone masonry
6. V.R.C.C. work

4.2 CALCULATION OF REINFORCEMENT

1. Footings: There are 38 footings. In the footing, bars of 12mm are provided each way at spacing of 200 mm. The typical section of the footing is shown in the fig 4.1.

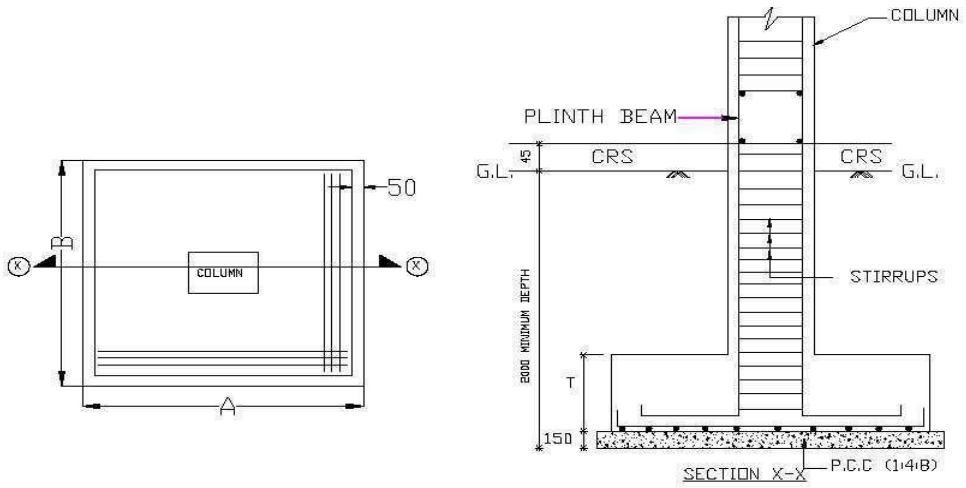

Fig 4.1 Typical Section of footing

Table 4.1 Schedule of Footing

Footings	Size			Reinforcement
	A	B	T	
F1	1400	1400	400	Ø12 @ 200 E.W.
F2	1600	1600	400	Ø12 @ 200 E.W.
F3	1600	2400	400	Ø12 @ 200 E.W.
F4	1000	2000	300	Ø12 @ 200 E.W.
F5	1200	1200	300	Ø12 @ 200 E.W.
F6	1000	1000	300	Ø12 @ 200 E.W.

Table 4.2 Schedule of Beams

Beam	Size		Bottom Bars		Top Bars		Stirrups	
	W	H	A	B	C	D	Size	Spacing at support, mid span and support
B1	200	500	2- Ø16	-	2- Ø16	2- Ø16	Ø8	@125, @175, @125
B2	200	600	2- Ø16	2- Ø16	3- Ø16	3- Ø16	Ø8	@125, @175, @125
B3	200	500	2- Ø16	-	2- Ø16		Ø8	@125, @175, @125
B4	200	500	2- Ø16	2- Ø16	2- Ø16	2- Ø16	Ø8	@125, @175, @125
B5	600	200	4- Ø16	-	4- Ø16		Ø8	@125, @175, @125
CB1	200	500	2- Ø16	-	2- Ø16		Ø8	@125, @175, @125

GENERAL ABSTRACT	
Estimating and Costing of an RCC Residential Building as per SSR 2010-11	
Name of the Estimate	Amount As per Work done Estimate
Ground Floor	2245524.77
First Floor	421452.68
Electrical	34007.63
Sanitary	160288.40
Sub Total	2861273.48
Add 4% Vat	114450.94
Add 3% Supervision charges	85838.20
Add 1% Consultant Charges	28612.73
Add 1.14% QualityTesting charges	32618.52
Grand Total Rs.	3122793.88

V. CONCLUSION

The entire cost of construction work and the infrastructure used for the purpose of construction is estimated.

The final costing is done as per the Standard Schedule of Rates 2010-2012. Final cost of the work is Rs. 31, 22,794.

Finally we conclude that the abstract estimate of construction work for the given residential building is economical and feasible.