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# ESTIMATING AND BUDGETING A MEDIUM SCALE BUILDING

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**Abstract -** *The goal of estimating is to create a thorough and financial framework for a medium-sized construction project. Inaccurate estimations and cost overruns, which are frequent in the construction sector, are addressed in this project. In this instance, precise cost estimation is accomplished using labour and material lists extracted from the architectural plan. Using AutoCAD, create the 2BHK home design, section view, footing layout, and beam column layout. Then, use Microsoft Excel to create the entire estimation for the medium-sized construction. The entire cost of the materials, including transportation, as well as the complete cost of all labour, both skilled and unskilled, with a 10% profit, will be included in the rate analysis. The cost of the tools and the plan will also be taken into account. The projected value will then be compared to a residential structure in real time. We can prepare a precise number of materials by applying this precise estimation, which will limit the amount of cement used and, consequently, the environmental carbon footprint. With this precise material estimate, the majority of construction pollution will be minimized and air pollution will be managed. So we plan to review the existing estimation and budgeting methods and develop a new framework and test its applicability. To avoid the conditions like failure of work due to lack of time and the increase in the cost of construction with the wastage of materials which leads to the environmental pollution, we adopted the methods to overcome these problems.*

***Key Words*: AutoCAD, Microsoft Excel, Quantity Estimation, Scheduling of Rates, Carbon Foot Print.**

## 1. INTRODUCTION

Estimating is aimed to developing a comprehensive and budgeting framework for a medium scale building project. Here the project addresses the challenges of inaccurate estimates and cost overruns, which are common in the construction industry. In this case accurate cost estimation is achieved based on lists of materials and labors, which are taken from architectural plan. If the funds availability are less than the estimated cost the work is divide in phases and consider alternate solution in design specification.

So we plan to review the existing estimation and budgeting methods and develop a new framework and test its applicability. To avoid the conditions like failure of work due to lack of time and the increase in the cost of construction with the wastage of materials which leads to the environmental pollution, we adopted the methods to overcome these problems.

And then we will prepare the 2d plan using AutoCAD and we will prepare the whole estimation of the medium scale building using excel. And we are going to analyze the budget using the analysis of rate method. Finally the total estimation of the medium scale building will be analyzed. In the analysis of rate, the total cost of the materials including carriage will be taken and the total expenditure on various types of labors, skilled and unskilled contractors with the profit of 10% will be taken and then the tools and plant expenditure will also be included while calculating it.

### 1.1 Benefits of Planning

The benefits of effective planning, estimation and scheduling of construction projects are reduced cost overruns, reduced construction time. Planning is the process of discovering all the activities necessary to successfully finish the project and it also aims upon the future course of action. Estimation is a computation of the quantities required and expenditure likely to be incurred the construction of a work. Detailed specifications gives the nature, quality and class of work, materials to be used in the various parts of work, quality of the material, their proportions, method of preparation, workmanship and description of execution of work are required.

It is most commonly used for creating and modifying 2D and designs for professional drafting with detail measurement information about the conceptual sign and layout of the product, Users can customize the CAD software with available add- on pps as per project requirements. User specialized tool setting can be done to view and design product in wireframe and surface modelling. Widely preferred in the industries of mechanical, telecom, civil, architectural engineering. It stands on demand to students and industries because of its requirements.

1. To improve the quality of design.

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2. To create a database for manufacturing.

3. To improve communication through documentation.

### 1.2 Rules of measurement

The rules of measurement of each item are 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, labor, fabrication tools and plant and all types of overheads for finishing the work in required shapes, size, and specification.

2. 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.

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

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

**The categories shall be measured separately and the heights shall be described:**

1. From foundation to plinth level

2. From plinth level to first floor level

3. From first floor to second floor level and so on.

**Data required to prepare Estimate:**

a) Drawing i.e. plans, elevations, sections etc.

b) From plinth level to first floor level

c) From first floor to second floor level and so on.

## 2. Quantity and Cost Estimation

1) To design the critical structural members of footing, column, beam and slab using IS:456-2000.

2) To produce a structure capable of resisting all applied loads without failure during its intended life.

3) The benefits of effective planning, estimation of a construction projects are reduced cost overruns, reduced construction time.

4) Plotting the drawing of G residential building

5) To draw the structure in AutoCAD

6) Structural elements are designed manually as per IS: 456-2000.

## 3. METHODOLOGY

AutoCAD is used to create a 2D drawing and can be export in 3D models, as well as electrical diagrams, construction drawings and more. Primary source to determine the total cost of the project is plan of the project. By using auto cad software the plan and the sectional elevation view of the G residential building is drawn in the AutoCAD software for further estimation of the project. These drawing include floor plans, layout plans, sectional view and detailed drawings.

### 3.1 Study area details

**1) Project location:** Kannankattupalayam, A.Chettipalayam, Erode (DT), TamilNadu.

**2) Type of building:** Ground floor Residential Building.

**3) Total area:** 1900 Sq ft.

4) **Type of soil:** Red soil.

5) **Safe Bearing Capacity of soil (SBC):** 200 kN/m2

Plot area selection is most important to build a residential house. The site should be located in a desirable area with a strong sense of community, convenient access to services, and balance between seclusion and proximity to amenities. Easy access to conventional transportation is vital, not only for current needs but also for preserving property value in the future. Additionally, proximity to transportation links, shopping centers, and community facilities is essential for s comfortable and convenient living experience.

**Factors to be considered while selecting the building site are as follows:**

1) Availability of public utility services, especially water, electricity, sewage disposal.

2) Location with respect to school, college and public building.

3) Easy drainage.

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4) Transportation facility.

5) Climatic conditions.

6) Environmental factors like neighborhood, accessibility.

### 3.2 MICROSOFT

Microsoft excel is used for resource allocation and scheduling can streamline the project work management and ensuring the efficient use of labor and materials. Microsoft excel is an effective tool for scheduling the material and cost of labor and also it is a step by step methodology technique for planning and detailing the project. They are used for estimation of quantity and abstract estimation would make more efficient in estimating in projects. A excel is used for the easy estimation of quantity and cost of each material and the calculation of total building estimation. To start the estimation, we have to list the items required. Then by the calculation the quantity will be arrived. The units for each item will noted as the area plays the main role in estimation of each thing. After calculating each unit, the total quantity will be estimated finally.

### 3.3 AUTOCAD

AutoCAD is an application for 2D drawing and computer aided design and drafting for various fields in engineering like civil, mechanical, and electrical, architecture and etc. Developed an estimation for the residential building G. For this estimation purpose at first we have to develop the 2D plan of entire building. Then the detailing should be done. To do the work easier, we can use the tools like AutoCAD.

### 3.4 DESIGN METHODOLOGY

A reinforced concrete structure should be so designed that it fulfils its intended purpose during its life time with:

1) Adequate safety, in terms of strength and stability.

2) Adequate serviceability in terms of stiffness and durability.

3) Reasonable economy.

The following are used for the design of reinforced concrete structures/ elements:

1) Working Stress Method (WSM)

2) Limit State Method (LSM) in this project, we used limit state method of design. So, let us discuss the concept of limit state method.

### 3.5 METHODS OF TAKING QUANTITIES

The quantities such as earthwork excavation, foundation concrete, brick work in plinth and superstructure etc., can be done by any of these following methodologies,

a) Long wall – short wall method

b) Center line method

c) Partially center line and short wall method

***Long wall – Short wall method:***

The long wall-short wall method is the most straightforward way to compute the estimate. Another name for this technique is the Cross Wall Method. Multiplying the out-to-out length by the wall's width and height yields the wall's quantities. Both the foundation concrete and each concrete can use this procedure. The width of the specific footing should be the center length, and each footing should be taken independently.

To find:

Long wall length out to out = center to center length + one breadth Short wall length in to in = center to center length – one breadth

This method is simple and accurate and there is no chance of any mistake.

***Center line method:***

This approach works best if the building is about rectangular in shape and the offsets are symmetrical. Determine the total length of the center lines of all the walls of the same kind, both short and long, with the same kind of footings and foundations. Then, multiply the center length by the corresponding height and width to determine the quantities. Here, the length will stay the same for all footings, the superstructure, the excavation in the foundation, and the concrete in the foundation.

### 3.6 DETAILED ESTIMATION

Detailed cost estimates are created following administrative approval of the preliminary estimate. The entire project is broken down into tasks like plastering, RCC, bricklaying, concreting, and so forth. Measurement information is extracted from the drawings and recorded in the appropriate fields. As demonstrated here, the quantities are

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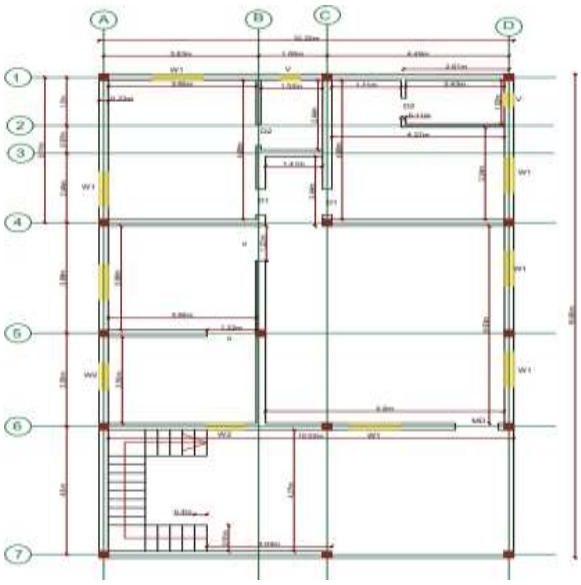
computed by multiplying the values in the numbers column by the depth column. Detailed cost estimates are created following administrative approval of the preliminary estimate. The entire project is broken down into tasks like plastering, RCC, bricklaying, concreting, and so forth. Measurement information is extracted from the drawings and recorded in the appropriate fields. As demonstrated here, the quantities are computed by multiplying the values in the numbers column by the depth column.

Table: 1 Detailed Estimation

| S.No | Description | Nos | Length (L) m | Breadth (B) m | Depth/Height (D/H) m | Quantity | Notes |
|---|---|---|---|---|---|---|---|
| | | | | | | | |



**2D PLAN DRAWING**

### 3.7 COMPONENTS OF BUILDING CONSTRUCTION

### 3.7.1 FOUNDATION

Foundation is the lowest part of the building or the civil structure that is in direct contact with the soil which transfers loads from the structure to the soil safely. Generally, the foundation can be classified into two, namely.

1) Shallow foundation.

2) Deep foundation.

Foundations can be categorized into two main types: shallow and deep. Shallow foundations transfer loads to nearby soil layers, whereas deep foundations extend to greater depths, typically 4-5 times deeper than their width, to transfer loads to more stable earth. Tall structures, such as skyscrapers, or those built on weak soil require deep foundations. Even if a building plans to expand vertically in the future, a deep foundation is recommended.

Table: 2 Foundation Cost

| Foundation materials | Cost |
|---|---|
| Cement | ₹ 1,03,384.51 |
| Sand | ₹ 14,261.41 |
| Aggregate | ₹ 24,083.21 |
| Shuttering | ₹ 4,43,472.68 |
| Excavation | ₹ 6,000.00 |
| Filling | ₹ 2,400.00 |
| Steel | ₹ 37,595.00 |
| Total cost | ₹ 6,31,196.81 |

### 3.7.2 BEAM

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A beam is a horizontal structural element that plays a crucial role in supporting loads, such as floors and roofs, by resisting bending and other forms of structural stress. Typically made from materials like steel, wood, concrete, or composite materials, beams transfer weight to the foundation through columns, walls, and posts. As a vital component in construction projects, beams are carefully designed and selected based onfactors such as load capacity, size, shape, and aesthetics to provide reliable support in residential, commercial, and industrial structures.

### 3.7.3 LINTEL BEAM

A lintel is a type of beam (a horizontal structural element) that spans openings such as portals, doors, windows and fireplaces. It can be a decorative architectural element, or a combined ornamented structural item. In the case of windows, the bottom span is referred to as a sill, but, unlike a lintel, does not serve to bear a load to ensure the integrity of the wall.

Table: 3 Size of Beam

| No of beam | Size of beam |
|---|---|
| **B1, B2** | 230mm X 600mm |
| **B3, B17, B23, B24, B25, B26** | 230mm X 400 mm |
| **B4, B7, B8, B9, B10, B11, B12, B13, B14, B15, B16, B18, B19,** | 230mmX230mm |
| **B20, B21** | |
| **B5, B6** | 230 mm X 650 mm |
| **B22** | 230 mm X 350 mm |

| Materials used in Beam Construction | Cost |
|---|---|
| Cement | ₹ 1,02,151.86 |
| Sand | ₹ 14,091.37 |
| Aggregate | ₹ 23,796.06 |
| Steel | ₹ 3,66,825.00 |
| Shuttering | ₹ 2,36,766.67 |
| Total cost for column | ₹ 7,43,630.97 |

Table: 4 Beam Cost

### 3.7.4 SLAB

When the slab is supported on all four edges and the ratio Ly/Lx < 2. Slab bends in twodirection and so main bars Reinforcement is provided into direction.

Figure: 1 Two way Slab

Table: 5 Size of Slab

| Slab | ly(mm) | Lx(mm) | ly/lx | Type of slab |
|---|---|---|---|---|
| S1 | 5520 | 5110 | 1.0802 3483 | 2way |
| S2 | 5110 | 4490 | 1.1380 8463 | 2way |
| S3 | 5520 | 3890 | 1.4190 2314 | 2way |
| S4 | 4490 | 3890 | 1.1542 4165 | 2way |
| S5 | 5520 | 3280 | 1.6829 2683 | 2way |

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| | | | | |
|---|---|---|---|---|
| S6 | 4490 | 3280 | 1.3689 0244 | 2way |
| S7 | 5520 | 4500 | 1.2266 6667 | 2way |
| s8 | 4500 | 4490 | 1.0022 2717 | 2way |

Table: 6 Cost of Slab

| Materials for Slab construction | Cost |
|---|---|
| Cement | ₹ 2,38,390.65 |
| Sand | ₹ 32,884.87 |
| Aggregate | ₹ 55,532.61 |
| Steel | ₹ 54,020.00 |
| Shuttering | ₹ 70,53,610.40 |
| Total cost for column | ₹ 74,34,438.53 |

### 3.7.5 COLUMN

Table: 7 Cost of column

| Materials | Cost |
|---|---|
| Cement | ₹ 28,281.47 |
| Sand | ₹ 3,901.30 |
| Aggregate | ₹ 186.58 |
| Steel | ₹ 54,020.00 |
| Shuttering | ₹ 89,591.93 |
| Over all cost | ₹ 1,75,981.27 |

Table: 8 Cost of Wall

| Materials | Cost |
|---|---|
| Cement | ₹ 21,171.92 |
| Sand | ₹ 17,523.40 |
| Brick | ₹ 1,17,381.00 |
| Total cost | ₹ 1,56,076.32 |
| Cost for one floor | ₹ 3,12,152.64 |

**Overall Cost of Building = ₹ 31,35,555**

## 4. RESULT AND DISCUSSION

Excel is a typical spreadsheet which is nowadays widely used in cost estimation and also sometimes for planning purposes. Excel has various inbuilt calculation tools which can be used for complex calculation. Apart from that one can also input one's own formula for special calculations. The user interface is very friendly and easy to use.

The total calculated area for the ground floor is 1874.5 Sq.ft and by using standard schedule rates of Tamilnadu state the estimated cost for the ground floor is Rs.31,35,555.38

- Total area =1874.5 Sq.ft
- Total cost = Rs. 31,35,555.38

## 5. CONCLUSIONS

This project involves designing a Ground floor residential building using AUTOCAD software and estimating its total cost. The building's layout, situated on 1900 sq.ft plotin Kannankattupalayam, Erode district, features 2BHK units. AUTOCAD software wasused for drafting, while Microsoft Excel was employed for cost estimation using the center line and long wall-short wall methods. The abstract estimate was calculated based on state of Tamilnadu standard schedule rates. The project highlights the importance of estimating and costing in construction, enabling bid preparation, cost control, and exploration of material options. Accurate estimation helps minimize conflicts and ensures successful project execution.

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