



Estimation and Evaluation of G+3 Residential Building

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Abstract: Any construction project to begin with starts with the Layout of the building or structure followed by Design and Analysis of the structure which is succeeded by cost estimation and planning for the said project. This project involves the layout, design, analysis, planning and cost estimation of a G+3 residential building located in Bhiwandi. The layout of the proposed G+3 residential building is based on a plot of size 18X15M. Previously the plot was being used as a commercial complex, but according to the new plan it will be used as a multi-storied residential building. The ground floor of the building will be used as parking while the remaining 3 floors will be divided into 6 apartments each having an area of 2BHK & 1BHK 60.97sqm & 48.25sqm. Each apartment is of 2BHK and 1BHK configuration.

Keywords: Beam, Columns, Design, Analysis, Structure, Wind load, Shear force, bending moment and Axial force.

I.

INTRODUCTION

Estimation is defined as we can estimate the cost before we construct quantities of finished items of work and its expenses likely to be incurred for its construction. . The principle object of gauge is to know the necessary amount of material, work and cost before genuine execution. It causes a designer to design the development work, for speedy and appropriate development with required quality. It is accurate estimation in which, each item of work (Earth work, cement concrete etc.) Is worked out separately. The measurements like length, width, and profundity/stature are precisely taken from the concerned drawings (plans, areas, heights) of the proposed project. All the comparative things of works are gathered at one spot to aggregate the complete substance. The primary viewpoints considered for the Estimation of amounts are earthwork in unearthing and inlaying, solid work in establishment and in R.C.C constructions like pillars, segments, chunks, flights of stairs and so forth, steel fortification in shafts, segments and other R.C.C designs and brickwork in superstructure. The calculation of amounts was completed dependent on the drawings of different primary components, for example, the each floor plan, footings and segments format, radiates design, flights of stairs design, balance determinations and section particulars, which have additionally been given in this report. These details provide an idea for requirement of quantities for a particular project and also the likely expenditure which would be needed to be arranged.

II. OBJECTIVE

The objectives of the project are mentioned below:

- Draft the Layout of the proposed building using AutoCAD
- Analyses and Design the building on STAAD Pro V8i3.
- 3D modeling using Rivet.
- Calculate the approximate cost of the building.

III. LITERATURE REVIEW

Ashis Debashis Behera 2012

This report studied the comparison between two 30storeyed buildings having the same layout and dimensions but with two different load combinations DL+LL+Seismic Load DL+LL+Wind LoadThe analysis and design for both the models were done using STAAD Pro. The results showed that the building with seismic load combination required more reinforcement than the building with the wind load combination.

Azidah Ziden, Fatariah Zakaria & Ahmad Nizam Othman (Universiti SainsMalaysia, Penang, Malaysia) 2012

This study shows how AutoCAD can be an effective tool in increasing the performance of students of various levels. It helps in proper visualisation of the project to be undertaken and thus help students in learning Engineering Design better. The study also shows how AutoCAD increases the efficiency of the student/designer.

Bandipati Anup et al., (2016)

This paper deals with evaluate and plan a multi-storeyed building [G + 2 (3- dimensional frame)] adopting STAAD Pro. The technique used in STAAD Pro is limit state technique. Initially they have created 2-D frames and cross checked with physical calculations. The exact result should be proved. We tested and created a G + 2 storey building [2-D Frame] instantly for all feasible load combinations. The work has been finished with some more multi-storeyed 2-Dimensional and 3- Dimensional frames beneath various load combinations.

Case Studies. Bedabrata Bhattacharjee & A.S.V. Nagender 2007(NIT Rourkela)

They used STAAD pro for the analysis and design of a G+21 multi storeyed building. The dead loadsacting on the slab were calculated manually while live load, seismic load and wind load havebeen entered by following respective IS Codes. The design was done using limit state of design according to IS 456:2000.

IV. METHODOLOGY

1. Preparation of Building Layout using AutoCAD

The design for the proposed building was prepared and approved by an architect. The layout was then prepared using AutoCAD. The different layouts were prepared and then later discussed with the architect for error correction.

2. Cost Estimation using Microsoft Excel

The total steel and concrete requirement is determined by STAAD Pro reducing a lot of calculation. Remaining calculation left to be done is the calculation of walls, cement plaster, doors and windows, earthwork and foundation.

3. Analysis and Design using STAAD Pro

When the design of the building was approved by the architect the design was transferred from AutoCAD to STAAD Pro using a DXF file format. When the layout was transferred, multiple stories were created using the Translational Repeat Tool in Staad Pro. After this member properties were assigned. Next the load cases were generated and applied to the structure. Once the loads were applied the structure was analysed and corrections were made to the structure for the various errors that were generated while the structure was being analysed. After the analysis, we started designing the structure by entering the DESIGN tab in STAAD Pro. All the design parameters were entered and load cases selected. This completes the design of the beam, columns and slabs. For designing the foundation STAAD foundation program is opened and the structure along with the load cases is transferred. Once this is done the soil conditions and the type of foundation is entered. After this the program analyses and designs the foundation.

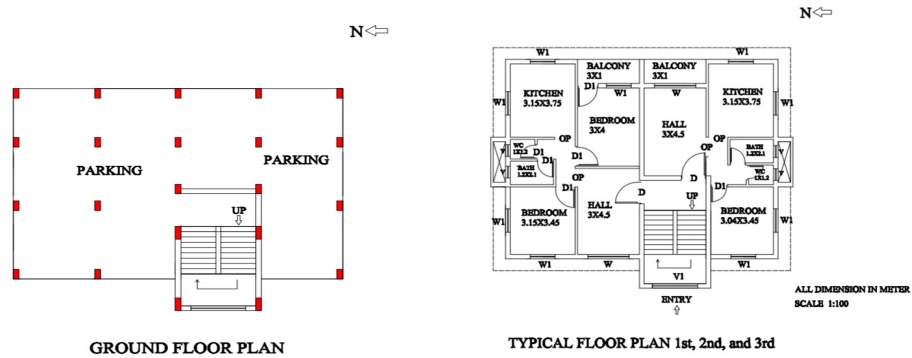
4. Elevation of building by using Revit

Plan in Revit involves working with real objects, like walls, foundations, columns, roofs, etc. that forms the engineering intuition, engineering thinking. Automatic generation of plans, facades, sections, specifications as derivatives represent a single model building and automatic update with the 3D model makes it possible to prevent errors in plan.

V. PLANNING AND ESTIMATION

1. The Plan is done in the AutoCAD

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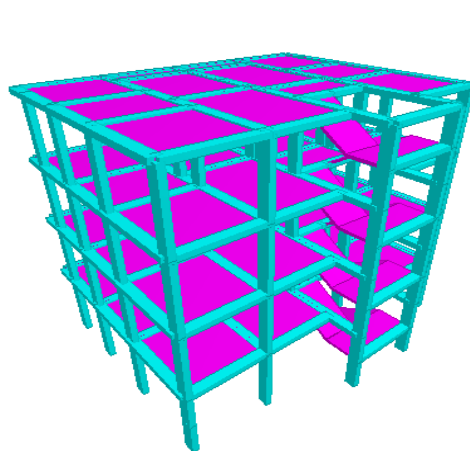


2. The Estimation is done in the Microsoft Excel

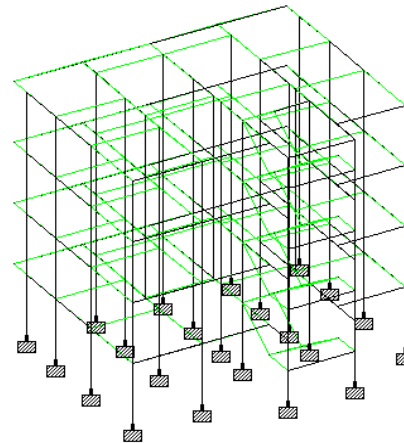
Item no.	Description of item	No.	Length m	Breadth m	Height m	Quantity	Units
Sub Head 1 Earthwork							
1	Surface Dressing to an av. Depth of 12mm	1	38	15		270	sq.m
2 Earthwork in Excavation in Foundation							
	F1.2	18	1.5	1.2	2	64.8	
	column 2	4	1.6	1.2	2	15.36	
						Total	80.16
3	Earthwork in Filling by earth in foundation trench						16.032
	1/5th of excavation						cum
4 RCC							
	1:4:8 PCC for Foundation						
		18	1.5	1.2	0.1	3.24	
		4	1.6	1.2	0.1	0.768	
						Total	4.008
							cum
5 Concrete for Column Footing							
	A1, Rectangular	18	1.2	1	0.25	5.4	
	A2, Trapezoidal	4	1.4	1	0.25	1.4	
	V-0/6/41-44/A2/3	18			0.456	8.208	
		4			0.495	1.98	

vi. ANALYSIS DESIGN OF STRUCTURAL ELEMENTS

The modeling analysis is done in the STAAD PRO



3D Modeling in STAAD PRO



Skelton structure of building

VII.

CONCLUSION

I. Structural frame works are modeled in STAAD and analyzed.

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- II. Load combinations as per Indian Standards and guidelines are followed to ensure the safety of Building in both Ultimate state and serviceability state.
- III. Structural components are designed for max bending & shear which further warrants the well-being of Structure.
- IV. Detailing is presented using Auto CAD for clarity.
- V. Analyzing and detailing software aids time wastage and also adds in accuracy of results.
- VI. Estimation of Building using Microsoft Excel.

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