

# Planning, Design Analysis in Staad.Pro and Detailed Estimation with Valuation of a Residential Building (G+2)

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**Abstract-** The construction of residential buildings requires proper planning, structural safety, and cost efficiency. This study presents the planning, structural analysis, estimation, and valuation of a Ground plus Two (G+2) residential building. The building is designed to ensure efficient space utilization, proper ventilation, and user comfort. Structural analysis is carried out using STAAD.Pro to evaluate the behavior of the building under different loading conditions such as dead load and live load. The software-based approach provides accurate results for bending moments, shear forces, and deflections. Based on the analysis, structural members are designed to ensure safety and stability. A detailed estimation is performed to calculate the quantity of materials and overall cost of construction. Finally, valuation of the building is carried out considering construction cost and depreciation. The study demonstrates that integrating planning, analysis, and estimation results in an economical and structurally sound residential building.

**Keywords:** Residential Building, STAAD.Pro, Structural Analysis, Estimation, Valuation, G+2 Building.

## I. INTRODUCTION

Residential construction is a fundamental aspect of civil engineering that focuses on providing safe, durable, and comfortable living spaces. With increasing population and urbanization, the demand for well-planned housing has increased significantly. Modern buildings are designed not only for shelter but also for functionality, aesthetics, and economic efficiency.

A G+2 residential building is commonly adopted due to its efficient land utilization and convenience. Proper planning ensures better arrangement of rooms, ventilation, and lighting. Structural analysis is necessary to ensure that the building can withstand various loads safely.

In this study, STAAD.Pro software is used for structural analysis, which improves accuracy and reduces manual errors. The project also includes estimation and valuation to understand the economic feasibility of the building.

## II. BUILDING PLANNING AND DETAILS

Planning is an important step in construction that ensures proper utilization of available space. The

building layout includes essential components such as living room, bedrooms, kitchen, bathrooms, and staircase.

### Plot Selection

- Good location with basic facilities
- Proper drainage system
- Accessibility to roads
- Suitable soil condition

### Building Specifications

- Type: Residential building
- Structure: RCC framed
- Floors: Ground + 2 floors
- Total area: Approx. 4200 sq.ft

### Materials Used

- Cement
- Fine aggregate (sand)
- Coarse aggregate
- Steel reinforcement
- Bricks

### Loading Considerations

- Dead load (self-weight)
- Live load (occupants & furniture)
- Wind and seismic loads

### III. METHODOLOGY

The project is carried out systematically to ensure accuracy and efficiency.

#### Procedure

- Data collection
- Planning of building
- Load calculation
- Structural modeling in STAAD.Pro
- Structural analysis
- Design of members
- Estimation
- Valuation

#### Structural Modeling

The building is modeled in STAAD.Pro by defining nodes, beams, and columns. Material properties and section properties are assigned.

#### Load Application

- Dead load: Self-weight and wall load
- Live load: As per IS standards

#### Analysis

The structure is analyzed to determine:

- Bending moment
- Shear force
- Deflection

### IV. RESULTS AND DISCUSSION

The results obtained from STAAD.Pro analysis help in understanding the structural behavior of the building.

#### Bending Moment

The bending moment diagram shows variation of internal forces in beams under different loads.

#### Shear Force

Shear force results indicate the load transfer along structural members.

#### Deflection

Deflection values are within permissible limits, ensuring safety.

#### Structural Performance

The building is found to be stable and safe under applied loads.

### V. ESTIMATION AND VALUATION

#### Estimation

Estimation includes calculation of:

- Concrete quantity
- Brickwork
- Plastering
- Flooring
- Painting

#### Cost Analysis

- Cost per sq.ft: ₹1800 – ₹2200
- Total cost: ₹75 – ₹90 Lakhs

#### Valuation

Valuation is based on:

- Construction cost
- Depreciation
- Present market value

### VI. CONCLUSION

This study presents a complete approach for planning, analysis, estimation, and valuation of a G+2 residential building. Proper planning ensures efficient space utilization and comfort. Structural analysis using STAAD.Pro provides accurate results and ensures safety.

The estimation process helps in determining material quantities and cost, making the project economical. The valuation gives an idea of the building's present worth. Overall, the integration of planning, analysis, and cost evaluation leads to a safe, durable, and economical residential building.

### REFERENCES

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