



# Analysis and Design of Multistoreyed Residential Building by using STAAD.PRO

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## ABSTRACT

*The design of the G+6 multi-storied building starts with the planning of the residential building both for individual house and total layout of the building. The building has an overall area of 530 sq.m with four houses in each floor. Each house an area of 121 sq.m. Ground floor is used for parking with a capacity of 30 cars. Total building is designed in AutoCAD and analyzed by STAAD Pro. REVIT Architecture software is used for 3D diagrams and renderings. After being analyzed by STAAD Pro the results are verified by manual design using code books IS 456-2000 and SP-16.*

*STAAD Pro is the new advancement in structural engineering. This software is used for analysis and design of concrete, steel, timber and aluminum. The model is been created and analyzed under various load condition such as dead load, live load, and some combination. As a result of analysis, shear force, bending moment and support reaction are evaluated. Based on analyzed result, the structure is designed manually and cross referenced with the software results.*

**Keywords:** G+6 multi-storied building, residential building, IS 456-2000 and SP-16, analysis and design of concrete, steel shear force, bending moment and support reaction

## 1. INTRODUCTION

Designing and analyzing of G+6 multi storied residential building using analyzing software STAAD Pro. Structural analysis is the backbone of civil engineering. During recent years, there has been a growing emphasis on using computer aided software's and tools to analyze the structures. These developments are most welcome, as they relieve the engineer of the often-lengthy calculations and procedures required to be followed while large or complicated structures are analyzed using classical methods. But not all the time

such detailed analysis is necessary to be performed. Now-a-days, high rise buildings and multistory buildings are common in metropolitan cities. These multistoried buildings have large number of Joints which are free to move and it is very difficult and time consuming when it analyzed manually. Hence the computer method for analysis is used using the modern analyzing software STAADPro.

Imposed loads are the weights of occupants, furniture, machinery, weight of snow and Dead loads are

self-weight of slab and weight of flooring slabs from floors and roofs of building. Generally, they are assumed to carry uniformly distributed loads. In most cases, slabs are analyzed for flexure only. Usually, slabs are horizontal except in the case of staircase and ramps for stored car parks. Beams and walls support slabs. The various types of slab provided are the following,

Structural concrete beam elements are designed to support a given system of external loads such as walls and slabs of roof and floor systems. The cross-sectional dimensions are generally assumed based on serviceability requirements. The width is fixed based on thickness of walls and housing of reinforcements and the depth is selected to control deflection within safe permissible limits.

A column is generally a compression member supporting beams and slabs in a structural system and having an effective length exceeding three times the lateral dimension. Load carrying capacity of a column is depending upon the longitudinal steel and cross-sectional size of the column.

### 1.1 OBJECTIVE

- 1 To analyze the multi-storey residential building consists of 6 floors using STAAD Pro.
- 2 To obtain the results of Maximum shear force and Maximum bending Moment for beams, Maximum axial force for columns.
- 3 To design the critical structural members of beam, column, slab, footing and staircase using IS 456-2000 & SP-16.

### 2. GENERAL DETAILS OF THE PROJECT

1. Type of Building - G+6 residential building
2. Number of storey - 6 storeys
3. Types of foundation - Sloped foundation
4. Height of building - 22m from G.L
5. Total gross area of the building - 530 sq.m
6. Column Size - 300X600 & 600X300 mm
7. Beam Size – 230X300 & 300X350 mm
- 8.

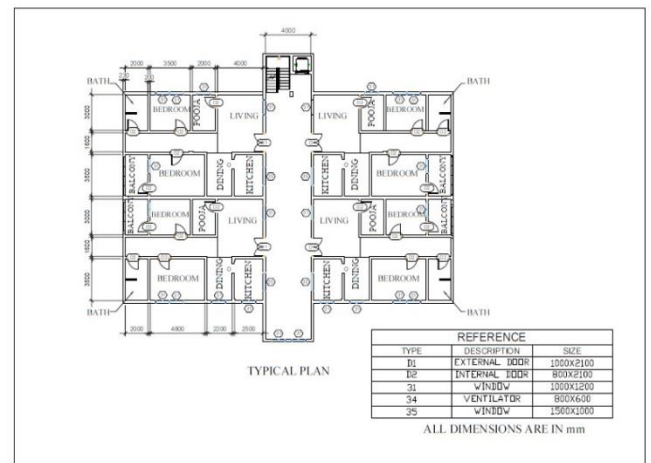
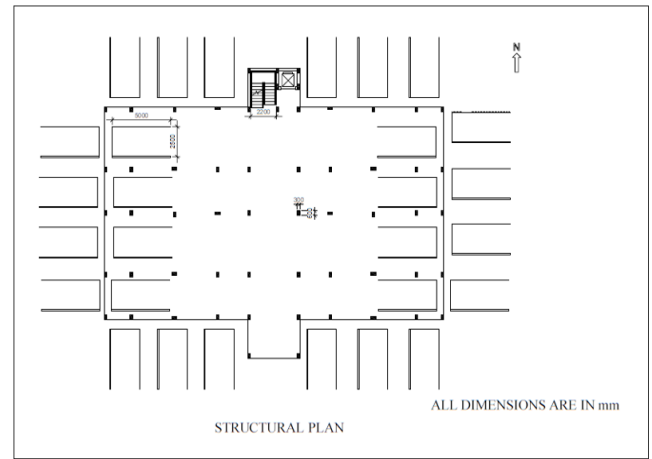
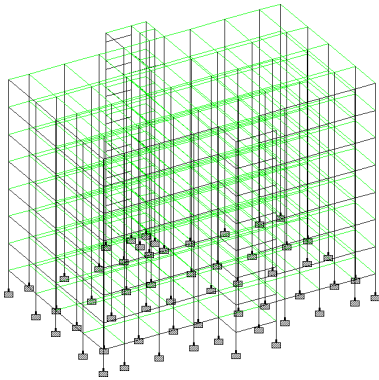


Figure 1: Building Plan

Figure 5: member Properties

### 3. DESIGN AND ANALYSIS



The frames were identified from the building and the corresponding loads were calculated using IS 875 (part-1), (part-2). The analysis of frames for the vertical forces was carried by STAAD Pro Software.

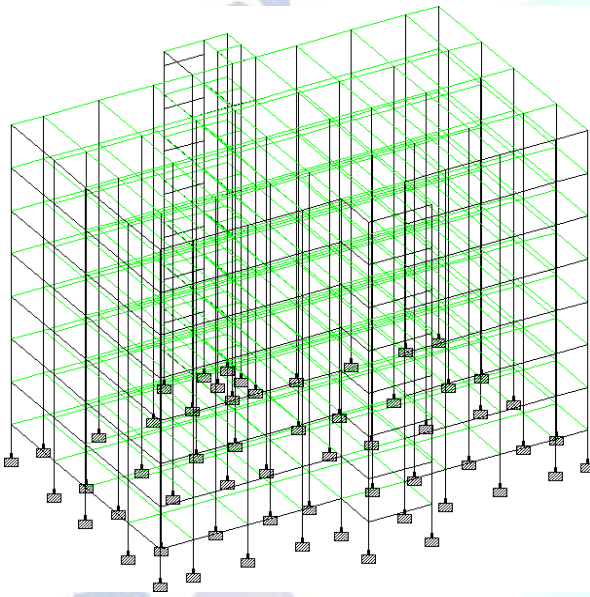


Figure 3: Framed structure

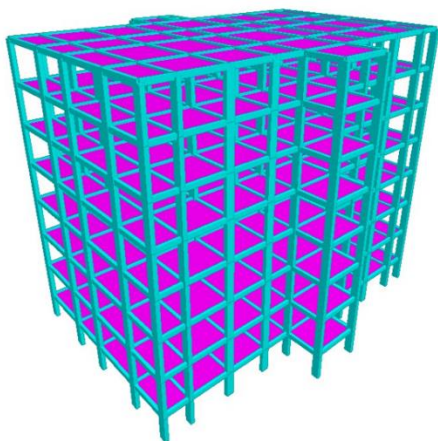


Figure 4: 3D modelling

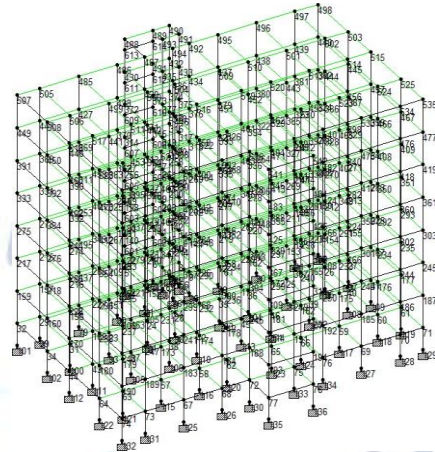


Figure 5: Node of the structures

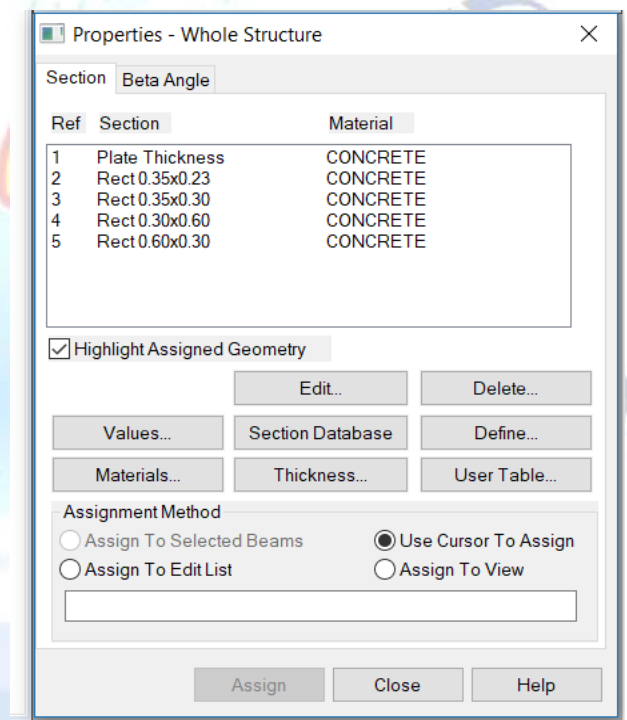


Figure 6: Properties of members

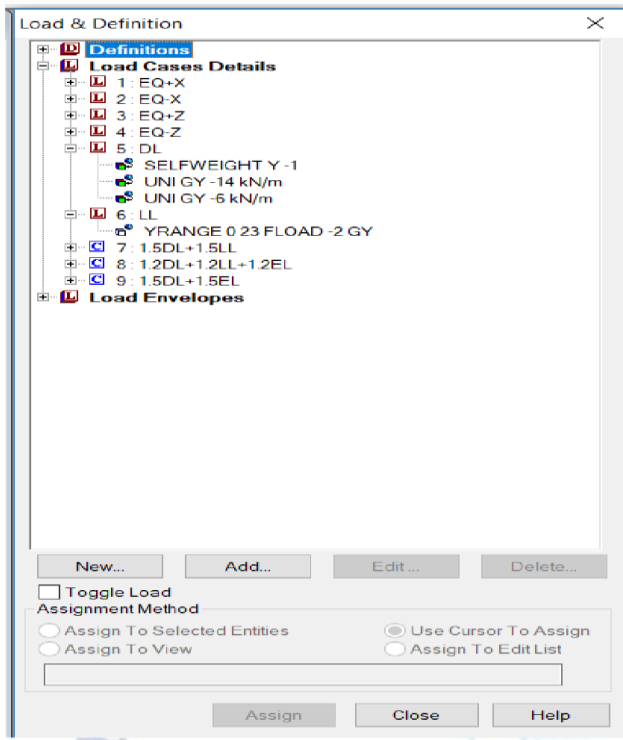


Figure 7: loadfs and definations

Cracking of concrete should not adversely affect the appearance or durability of the structure; the acceptable limits of cracking would vary with the type of structure and environment. Where specific attention is required limit the designed crack width to a particular value, crack width calculation may be done using formula given in Annex F (IS:456-2000).

The surface width of the crack should not, in general, exceed 0.3 mm in members where cracking is not harmful and does not have any serious adverse effect upon the preservation of reinforcing steel or upon the durability of the structures. For particularly aggressive environment, such as the severe category in Table 3 (IS:456-2000) the assessed surface width of cracks should not exceed

#### STAAD EDITOR:

STAAD SPACE  
START JOB INFORMATION  
ENGINEER DATE 20-02-23  
END JOB INFORMATION  
INPUT WIDTH 79  
UNIT METER KN

#### JOINT COORDINATES

2 2.215 0 0; 3 5.915 0 0; 4 8.545 0 0; 5 8.545 0 -3.23; 6 11.245 0 -3.23;  
7 12.805 0 -3.23; 8 12.805 0 -1.7; 9 12.805 0 0; 10 11.245 0 -1.7;  
11 11.245 0 0; 12 15.6 0 0; 13 19.3 0 0; 14 23 0 0; 15 25.215 0 0;  
23 2.215 0 5.015; 24 5.915 0 5.015; 25 19.3 0 5.015; 26 23 0 5.015;  
27 25.215 0 5.015; 28 8.545 0 5.015; 29 -1.485 0 0; 31 -1.485 0 5.015;  
32 -3.7 0 0; 34 -3.7 0 5.015; 35 12.805 0 5.015; 36 15.6 0 5.015;  
37 2.215 0 8.73; 38 5.915 0 8.73; 39 19.3 0 8.73; 40 23 0 8.73;  
41 25.215 0 8.73; 42 8.545 0 8.73; 43 -1.485 0 8.73; 44 -3.7 0 8.73;  
45 12.805 0 8.73; 46 15.6 0 8.73; 57 2.215 0 13.745; 58 5.915 0 13.745;  
59 19.3 0 13.745; 60 23 0 13.745; 61 25.215 0 13.745; 62 8.545 0 13.745;  
63 -1.485 0 13.745; 64 -3.7 0 13.745; 65 12.805 0 13.745; 66 15.6 0 13.745;  
67 2.215 0 17.46; 68 5.915 0 17.46; 69 19.3 0 17.46; 70 23 0 17.46;  
71 25.215 0 17.46; 72 8.545 0 17.46; 73 -1.485 0 17.46; 74 -3.7 0 17.46;  
75 12.805 0 17.46; 76 15.6 0 17.46; 77 8.545 0 20.69; 78 12.805 0 20.69;  
79 2.215 -2 0; 80 5.915 -2 0; 81 8.545 -2 0; 82 8.545 -2 -3.23;  
83 11.245 -2 -3.23; 84 12.805 -2 -3.23; 85 12.805 -2 -1.7; 86 12.805 -2 0;  
87 11.245 -2 -1.7; 88 11.245 -2 0; 89 15.6 -2 0; 90 19.3 -2 0; 91 23 -2 0;  
92 25.215 -2 0; 93 2.215 -2 5.015; 94 5.915 -2 5.015; 95 19.3 -2 5.015;  
96 23 -2 5.015; 97 25.215 -2 5.015; 98 8.545 -2 5.015; 99 -1.485 -2 0;  
100 -1.485 -2 5.015; 101 -3.7 -2 0; 102 -3.7 -2 5.015; 103 12.805 -2 5.015;  
104 15.6 -2 5.015; 105 2.215 -2 8.73; 106 5.915 -2 8.73; 107 19.3 -2 8.73;  
108 23 -2 8.73; 109 25.215 -2 8.73; 110 8.545 -2 8.73; 111 -1.485 -2 8.73;

#### 4. CONCLUSIONS

The sole purpose of a school building has been achieved to facilitate the students with all the facilities that were required to lead a proper life style and to become a good citizen of our Nation. It educates us with all the needed attributes in leading our life in a proper life style. Education does make a remarkable effect on one's personality. Getting educated and finally earning a professional degree prepares you to be a part and contribute in good organization, companies or institutions. Moreover, it was a great experience to be exposed to practically design such a building rather than just studying the theoretical matters that were printed in the book

#### Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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