



Analysis of loads for G+6 residential building using Staad pro (v8i)

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Abstract - In order to compete in the ever growing competent market it is very important for a structural engineer to save time. As a sequel to this an attempt is made to analyze and design a multistoried building by using a software package Staad pro. For analyzing a multi storied building one has to consider all the possible loadings and see that the structure is safe against all possible loading conditions. There are several methods for analysis of different frames like kani's method, cantilever method, portal method, and Matrix method. The present project deals with the analysis of a multi storied residential building of G+6 consisting of 5 apartments in each floor. The dead load & live loads are applied and the design for beams, columns, footing is obtained.

Keywords—Structural loads, Residential building, Staad pro

I. INTRODUCTION

Nowadays the house building is major work of the social progress of the county. Daily new techniques are being developed for the construction of houses economically, quickly and fulfilling the requirements of the community engineers and architects do the design work, planning and layout, etc., of the buildings. Draughtsman are responsible for doing the drawing works of building as for the direction of engineers and architects. The draughtsman must know his job and should be able to follow the instruction of the engineer and should be able to draw the required drawing of the building, site plans and layout plans etc., as for the requirements. A building frame consists of number of bays and storey. A multi-storey, multi-paneled frame is a complicated statically intermediate structure. A design of R.C building of G+6 storey frame work is taken up. The building in plan (40*28) consists of columns built monolithically forming a network. The size of building is 40x28m. It is residential complex. The design is made using software on structural analysis design (Staad-pro). The building subjected to both the vertical loads as well as horizontal loads. The vertical load consists of dead load of structural components such as beams, columns, slabs etc. and live loads. The horizontal load consists of the wind forces thus building is designed for dead load, live load and wind load as per IS 875. The building is designed as two dimensional vertical frame and analyzed for the maximum and minimum bending moments and shear forces by trial and error methods as per IS456-2000. The help is taken by software available in institute and the computations of loads, moments and shear forces and obtained from this software.

II. LITERATURE REVIEW

Sudhir K Jain: Reviewed the new code of IS 1893 (part-1): 2002 which Contains a discussion on clauses that are confusing and need classifications. The topographical and editorial errors are pointed out. Suggestions are also included for next revision of code.

The Following observations are made from this paper.

- The seismic zone map now contains only four zones as compared to the five zones earlier, and relative values of zone factors are different.
- The Design spectrum shape depends on the type of soil and foundation soil factor has been dropped.
- The minimum design force based in empirical fundamental period of the building even if the dynamic analysis gives a very high value of natural period and thus low seismic force.
- Most India buildings are soft storey buildings as per code definitions simply because the ground storey height is usually different from that in the upper storey.
- In the load combination the load factor 0.90 for gravity load, 1.5 for earthquake load is used in R.C. structures.

V.Varalakshmi: The design and analysis of multistoried G+5 building at Kukatpally, Hyderabad, India. The Study includes design and analysis of columns, beams, footings and slabs by using well known civil engineering software named as STAAD.PRO. Test on safe bearing capacity of soil was obtained.

III. OBJECTIVE OF THE STUDY

- 1) To analyze loads for G+6 residential building by manually and by use of software
- 2) To design G+6 residential building using software

IV. METHODS OF ANALYSIS

Method of analysis of statistically indeterminate portal frames:

- Method of flexibility coefficients.
- Slope displacements methods (iterative methods)
- Moment distribution method
- Kani's method
- Cantilever method
- Portal method
- Matrix method

❖ Method of flexibility coefficient:

The method of analysis is comprises reducing the hyper static structure to a determinate structure form by Removing the redundant support (or) introducing adequate cuts (or) hinges.

Limitations:

It is not applicable for degree of redundancy > 3

❖ Slope displacement equations:

It is advantageous when kinematic indeterminacy < static indeterminacy. This procedure was first formulated by axle bender in 1914 based on the applications of compatibility and equilibrium conditions. The method derives its name from the fact that support slopes and displacements are explicitly computed. Set up simultaneous equations is formed the solution of these parameters and the joint moment in each element or computed from these values.

Limitations:

A solution of simultaneous equations makes methods tedious for manual computations. This method is not recommended for frames larger than two bays and two storeys.

❖ Iterative methods:

These methods involves distributing the known fixed end moments of the structural member to adjacent members at the joints in order satisfy the conditions of compatibility.

Limitations of hardy cross method:

It presents some difficulties when applied to rigid frame especially when the frame is susceptible to side sway. The method cannot be applied to structures with intermediate hinges.

❖ Kani's method:

This method over comes some of the disadvantages of hardy cross method. Kani's approach is similar to H.C.M to that extent it also involves repeated distribution of moments at successive joints in frames and continuous beams. However there is a major difference in distribution process of two methods. H.C.M distributes only the total joint moment at any stage of iteration. The most significant feature of kani's method is that process of iteration is self-corrective. Any error at any stage of iterations corrected in subsequent steps consequently skipping a few steps error at any stage of iteration is corrected in subsequent consequently skipping a few steps of iterations either by oversight or by intention does not lead to error in final end moments.

Advantages:

It is used for side way of frames.

Limitations:

The rotational of columns of any storey should be function a single rotation value of same storey. The beams of storey should not undergo rotation when the column undergoes translation. That is the column should be parallel. Frames with intermediate hinges cannot be analysis.

❖ Approximate method:

Approximate analysis of hyper static structure provides a simple means of obtaining a quick Solution for preliminary design. It makes some simplifying assumptions regarding Structural behavior so to obtain a rapid solution to complex structures. The usual process comprises reducing the given indeterminate configuration to determine structural system by introducing adequate no of hinges. It is possible to sketch the deflected profile of the structure for the given loading and hence by locate the print inflection. Since each point of inflection corresponds to the location of zero moment in the structures. The inflection points can be visualized as hinges for the purpose of analysis. The solution of structures is sundered simple once the inflection points are located. The loading cases are arising in multistoried frames namely horizontal and vertical loading.

V. PLAN AND ELEVATION

The auto cad drawing represents the plan of a g+6 building. The plan clearly shows that it is a combination of five apartments. We can observe there is a combination between each and every apartments. The Apartments are located at Ahmadabad which is surrounded by many apartments. In each block the entire floor consists of a three bed room house which occupies entire floor of block. It represents a rich locality with huge areas for each house.

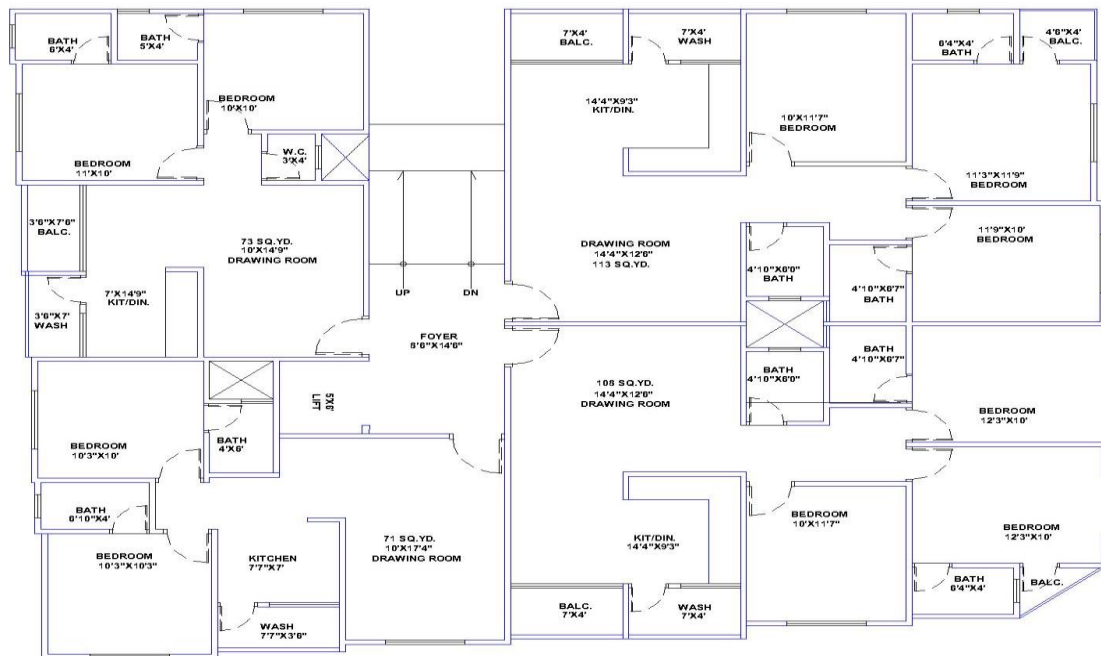


Figure 1 Architectural Floor Plan

The plan shows the details of dimensions of each and every room and the type of room and orientation of the different rooms like bed room, bathroom, kitchen, hall etc... All the five apartments have similar room arrangement. The entire plan area is about 1100 sq.m. There is some space left around the building for parking of cars. The plan gives details of arrangement of various furniture like sofa etc. The plan also gives the details of location of stair cases in different blocks. We have 2 stair cases for each block and designing of stair case is shown in AutoCAD plot no.3. In the middle we have a small construction which consists of four lifts and those who want to fly through lift can use this facility and we know for a building with more than g+4 floors should compulsory have lift and the charges for the facilities is collected by all the members.

VI. LOAD CALCULATION

Loads are a primary consideration in any building design because they define the nature and magnitude of hazards are external forces that a building must resist to provide a reasonable performance(i.e., safety and serviceability)throughout the structure's useful life. The anticipated loads are influenced by a building's intended use (occupancy and function), configuration (size and shape) and location (climate and site conditions).Ultimately, the type and magnitude of design loads affect critical decisions such as material collection, construction details and architectural configuration. Thus, to optimize the value (i.e., performance versus economy) of the finished product, it is essential to apply design loads realistically. While the buildings considered in this guide are primarily single-family detached and attached dwellings, the principles and concepts related to building loads also apply to other similar types of construction, such as low-rise apartment buildings.

Dead Loads:

Dead loads consist of the permanent construction material loads compressing the roof, floor, wall, and foundation systems, including claddings, finishes and fixed equipment. Dead load is the total load of all of the components of the components of the building that generally do not change over time, such as the steel columns, concrete floors, bricks, roofing material etc. In staad pro assignment of dead load is automatically done by giving the property of the member. In load case we have option called self-weight which automatically calculates weights using the properties of material i.e., density and after assignment of dead load the skeletal structure looks red in color as shown in the figure.

Live Loads:

Live loads are produced by the use and occupancy of a building. Loads include those from human occupants, furnishings, no fixed equipment, storage, and construction and maintenance activities. As required to adequately define the loading condition, loads are presented in terms of uniform area loads, concentrated loads, and uniform line loads. The uniform and concentrated live loads should not be applied simultaneously n a structural evaluation. Concentrated loads should be applied to a small area or surface consistent with the application and should be located or directed to give the maximum load effect possible in endues conditions. For example the stair load of 300 pounds should be applied to the center of the stair tread between supports.

In staad we assign live load in terms of U.D.L .we has to create a load case for live load and select all the beams to carry such load. After the assignment of the live load the structure appearsas shown below.

For our structure live load is taken as 25 N/mm for design.

Live loads are calculated as per IS 875 part 2.

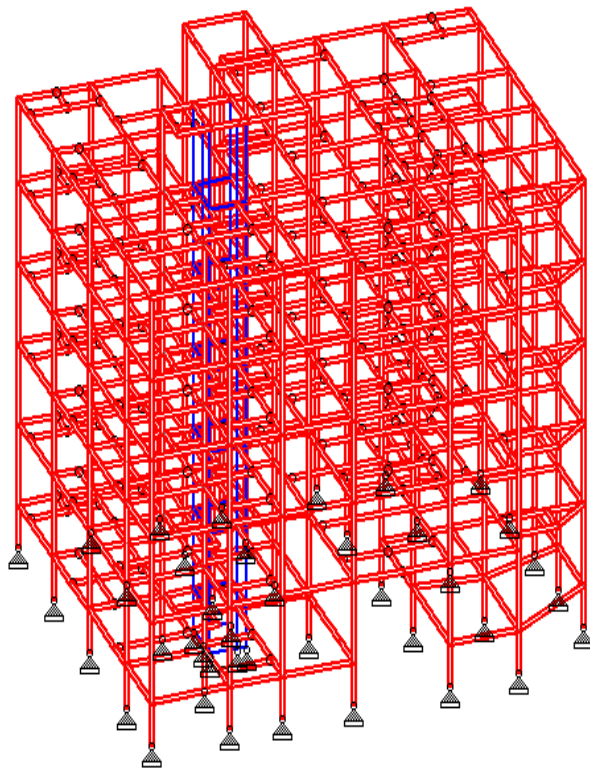


Figure 2 Dead Load acting on Frame Structure

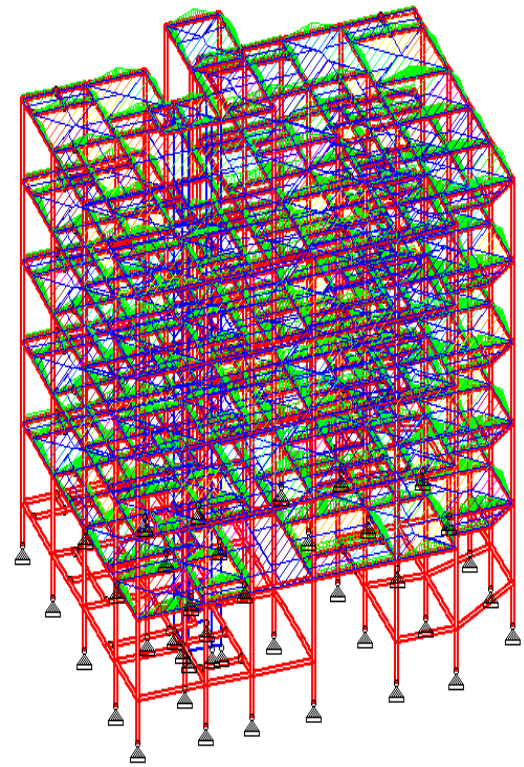


Figure 3 Live Load acting on Frame Structure

Floor load:

Floor load is calculated based on the load on the slabs. Assignment of floor load is done by creating a load case for floor load. After the assignment of floor load our structure looks as shown in the below figure.

The intensity of the floor load taken is: 0.0035 N/mm^2

-ve sign indicates that floor load is acting downwards.

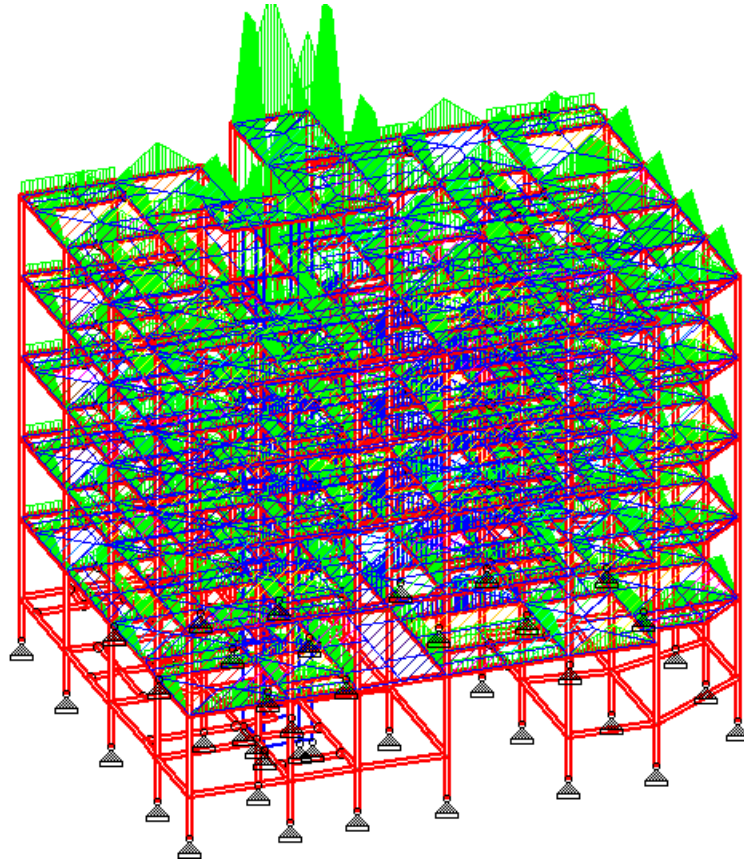


Figure 4 Floor Load acting on Frame Structure

Load combinations:

All the load cases are tested by taking load factors and analyzing the building in different load combination as per IS456 and analyzed the building for all the load combinations and results are taken and maximum load combination is selected for the design Load factors as per IS456-2000.

Live Load	Dead Load	Wind Load
1.5	1.5	0
1.2	1.2	1.2
0.9	0.9	0.9

When the building is designed for both wind and seismic loads maximum of both is taken. Because wind and seismic do not come at same time as per code. Structure is analyzed by taking all the above combinations.

VII. CONCLUSION

To calculate s.f.d and b.m.d of a complex loading beam it takes about an hour. So when it comes into the building with several members it will take a week. Staad pro is a very powerful tool which does this job in just an hour's Staad is a best alternative for high rise buildings. Now a day's most of the high rise buildings are designed by Staad which makes a

compulsion for a civil engineer to know about this software. This software can be used to carry rcc, steel, bridge, truss etc. according to various country codes.

VIII. REFERENCES

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