ANALYSIS AND DESIGN OF A (G + 6) MULTI STOREY RESIDENTIAL BUILDING USING STAAD PRO

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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 analyse and design a Multi-storeyed building by using a software package staad pro. For analysing 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 storeyed 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. STAAD Pro with its new features surpassed its predecessors and compotators with its data sharing capabilities with other major software like AutoCAD, and MS Excel. We conclude that staad pro is a very powerful tool which can save much time and is very accurate in Designs. Thus it is concluded that staad pro package is suitable for the design of a multi-storeyed building.

INTRODUCTION

Building construction is the engineering deals with the construction of building such as residential houses. In a simple building can be define as an enclose space by walls with roof, food, cloth and the basic needs of human beings. In the early ancient times humans lived in caves, over trees or under trees, to protect themselves from wild animals, rain, sun, etc. as the times passed as humans being started living in huts made of timber branches. The shelters of those old have been developed nowadays into beautiful houses. Rich people live in sophisticated condition houses.

Buildings are the important indicator of social progress of the county. Every human has desire to own comfortable homes on an average generally one spends his two-third life times in the houses. The security civic sense of the responsibility. These are the few reasons which are responsible that the person do utmost effort and spend hard earned saving in owning houses.

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 is 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. The number of columns is 85. 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 **IS 456-2000**. The help is taken by software available in institute and the computations of loads, moments and shear forces and obtained from this software.

LITERATURE REVIEW

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 comported. 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 too bays and two storeys.

Iterative methods:

These methods involve distributing the known fixed and 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 continues 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 over sight of 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.

PLAN AND ELEVATION

The auto cad plotting no.1 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 apartment.

The Apartments are located at gachibouli which is surrounded by many apartments.

In each block the entire floor consists of a three bed room house which occupies entire floor of a block. It represents a rich locality with huge areas for each house.

It is a g+6 proposed building, So for 5 blocks we have 5*6=30 flats.

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. At that junction we have a club for our enjoyment and charges are collected by all the building occupants every month.

So these represent the plan of our building and detailed explanation of remaining parts like elevations and designing is carried in the next sections.

Elevation:

AutoCAD plot no.2 represents the proposed elevation of building. It shows the elevation of a g+6 building representing the front view which gives the overview of a building block.
The figure represents the site picture of our structure which are taken at the site .the building is actually under constructions and all the analysis and design work is completed before the beginning of the project.
Each floor consists of height 3m which is taken as per GHMC rules for residential buildings.
The building is not designed for increasing the number of floors in future.so the number of floors is fixed for future also for this building due to unavailability of the permissions of respective authorities.
Also special materials like fly ash and self-compacted concrete were also used in order

to reduce the dead load and increase life of the structure and also improve economy. But these materials were not considered while designing in staad to reduce the complexity and necessary corrections are made for considering the economy and safety of the structure as it is a very huge building with 30 apartments.

The construction is going to complete in the month of June 2012 and ready for the occupancy.

This is regarding the plan and details of the site and next section deals with the design part of the building under various loads for which the building is designed.

The above figure represents the center line diagram of our building in staad pro. Each support represents the location of different columns in the structure. This structure is used in enerating the entire structure using a tool called transitional repeat and link steps. After using the tool the structure that is created can be analyzed in staad pro under various loading cases.

Below figure represents the skeletal structure of the building which is used to carry out the analysis of our building.

All the loadings are acted on this skeletal structure to carry out the analysis of our building. This is not the actual structure but just represents the outline of the building in staad pro. A mesh is automatically created for the analysis of these building.

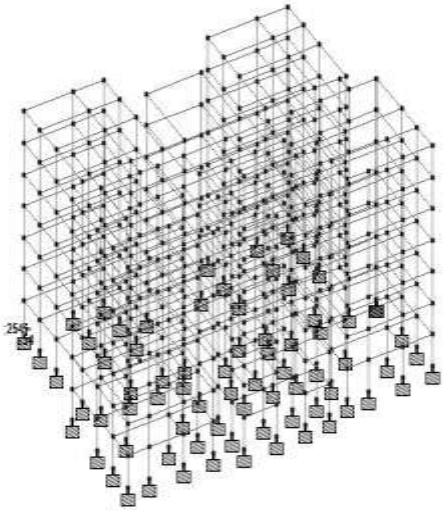

Fig: Skeletal structure of the building

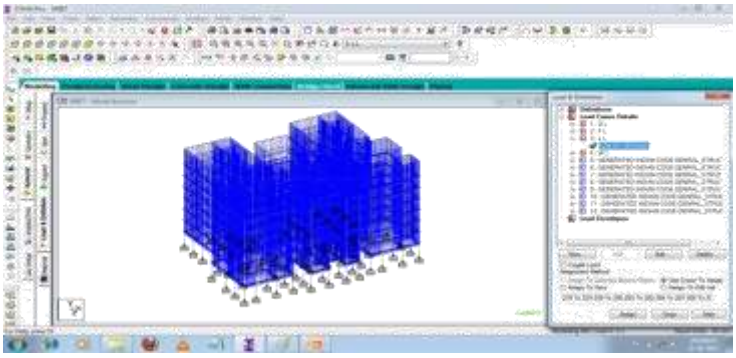

Fig: Diagram of live load

Estimation:

Total volume of concrete = 661.74 CU.METER

BAR Dia (mm)	Weight (in staad)
8	142796.00
10	340.00
12	289856.00
16	1675.47
Total=605667.50	

Bending Moment:

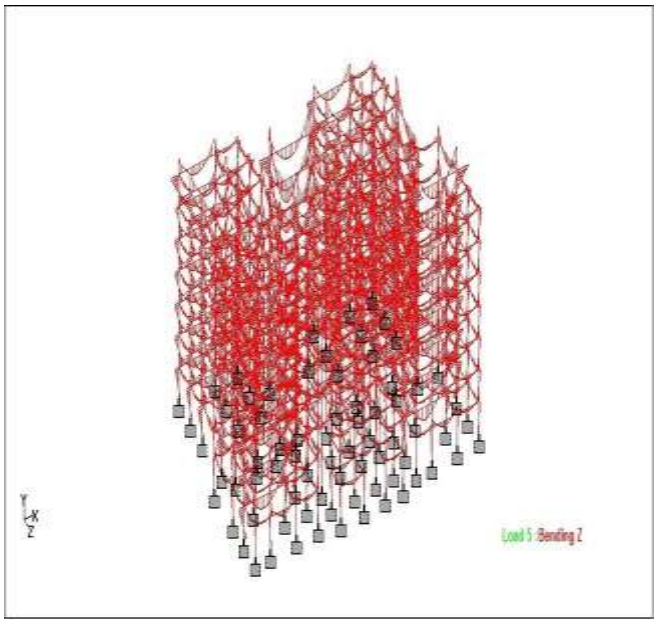

Fig: a showing bending moments of all the beams

Shear:

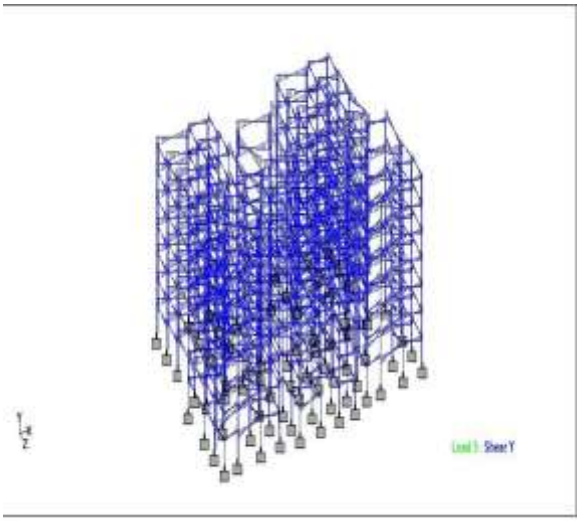

Fig : b Showing Shear Force of all the beams

CONCLUSIONS:

1. Designing using Software's like Staad reduces lot of time in design work.
2. Details of each and every member can be obtained using staad pro.
3. All the List of failed beams can be obtained and also Better Section is given by the software. 4. Accuracy is improved by using software.

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Code Books

1. IS 456-2000 code book for design of beams, columns and slabs 2.SP-16 for design of columns.