International Journal of Research (IJR)
p-ISSN: 2348-6848
e-ISSN: 2348-795X
Vol. 8 Issue 5
May 2020

Design and Analysis Of Multistoried Building G+12 By Using STAAD Pro

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ABSTRACT

In every aspect of human civilization, we needed structures to live in or to get what we need. But it is not only building structures but to build efficient structures so that it can fulfill the main purpose for what it was made for. Here comes the role of civil engineering and more precisely the role of analysis of structure. There are many classical methods to solve design problem, and with time new software's also coming into play. Here in this project work based on software named "STAAD. Pro" has been used. The main aim of structural engineer is to design the structures for a safe technology in the computing field, the structural engineer can dare to tackle much more large and complex structure subjected to various type of loading condition. Earlier the loads acting on the structure are considered as static, but strictly speaking, with the exception of the self-weight (dead load) no structure load is static one. Now a days large number of application software's are available in the civil engineering field. All these software's are developed as the basis of advanced. In the present work, an attempt has been made to study the efficiency of certain civil engineering application software's. In this project we work with residential building with G+12 and analysis was done with software called STAAD Pro.

Keywords: STAAD. Pro, Auto CADD, Multistoried Building, Residential

INTRODUCTION

In every aspect of human civilization we needed structures to live in or to get what we need. But it is not only building structures but to build efficient structures so that it can fulfil the main purpose for what it was made for. Here comes the role of civil engineering and more precisely the role of analysis of structure. There are many classical methods to solve design problem, and with time new software's also coming into play. Here in this project work based on software named STAAD pro has been used. Few standard problems also have been solved to show how STAAD pro can be used in different cases. These typical problems have been solved using basic concept of loading, analysis, condition as per IS code. These basic techniques may be found useful for further analysis of problems.

This project aims for relearning of concept of structural design with the help of computer aids. Briefly we have gone through following points through out of the project work. Understanding of design and detailing concept. Main objective i.e. learning of STAAD.Pro software package. Learning of analysis and design methodology which can be very useful in the field. Understanding of earthquake resistance design concept. Approach for professional practice in the field of structural engineering

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STATEMENT OF PROJECT:

Salient features:

Utility of building :	MULTISTORIED BUILDING
No of stories :	G+12
Shape of the building :	11 APARTMENTS
No of staircases :	11
Type of construction :	R.C.C framed structure
Types of walls :	Brick wall

Geometric details:

Ground floor:	3m
Floor to floor height:	3m.
Height of plinth :	0.6m

Materials:

Concrete grade:	M40
All steel grades:	Fe415 grade
Bearing capacity of soil:	300KN/M2

ANALYSIS

Method of analysis of statistically indeterminate portal frames:

1. Method of flexibility coefficients.
2. Slope displacement methods (iterative methods)
3. Moment distribution method
4. Kane's method
5. cantilever method
6. Portal method
7. Matrix method
8. STAAD Pro

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 of iterations either by over sight of by intention does not lead to error in final end moments.

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 a 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

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namely horizontal and vertical loading. The analysis carried out separately for these two cases.

Horizontal cases:

The behavior of a structure subjected to horizontal forces depends upon its heights to width ratio among their factor. It is necessary to differentiate between low rise and high rise frames in this case.

Low rise structures:

Height < width

It is characterized predominately by shear deformation.

High rise buildings

Height > width

It is dominated by bending action

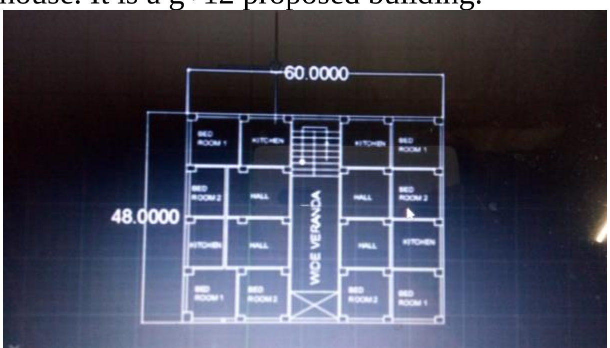
Matrix analysis of frames:

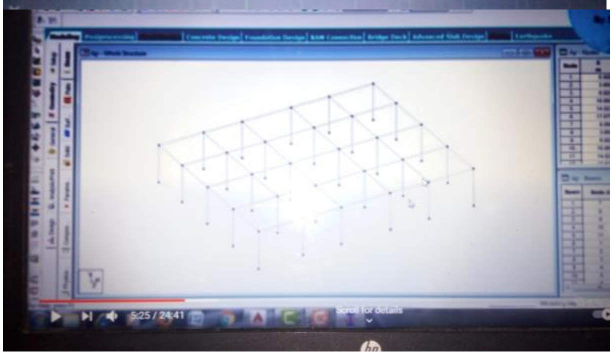
The individual elements of frames are oriented in different directions unlike those of continues beams so their analysis is more complex, never the less the rudimentary flexibility and stiffness methods are applied to frames. stiffness method is more useful because its adaptability to computer programming. stiffness method is used when degree of redundancy is greater than degree of freedom. However, stiffness method is used when degree of freedom is greater than degree of redundancy especially for computers.

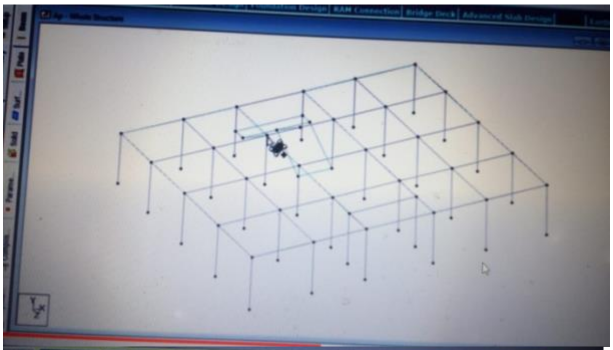
PLAN AND LOADINGS

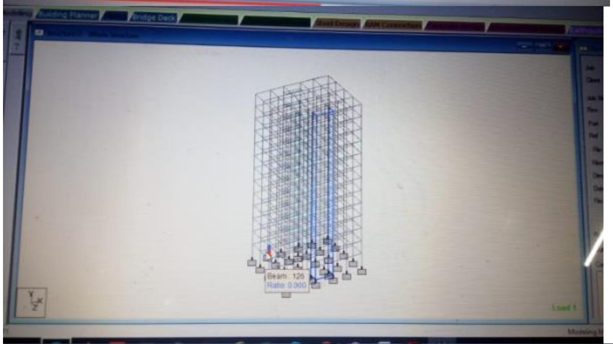
PLAN:

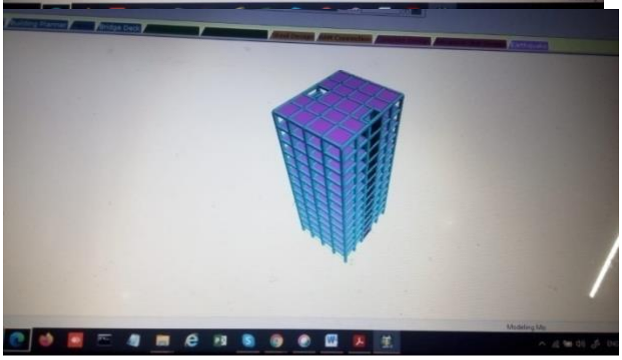
The auto cad plotting no.1 represents the plan of a g+12 building. The plan clearly shows that it is a combination of four apartments. We can observe there is a combination between each and every apartments. In each block the entire floor consists of a double-bed room house which occupies entire floor of a block. It represents a rich locality with huge areas for each house. It is a g+12 proposed building.









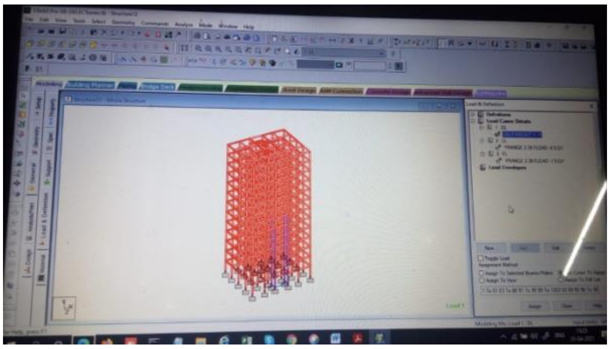


Design loads for residential buildings :

Since building codes tend to vary in their treatment of design loads the designer should, as a matter of due diligence, identify variances from both local accepted practice and the applicable code relative to design loads as presented in this guide, even though the variances may be considered technically sound. Complete design of a home typically requires the evaluation of several different types of materials. Some material specifications use the allowable stress design (ASD) approach while others use load and resistance factor design (LRFD).

- **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 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 skeletan structure looks red in color as shown in the figure.



<u>Example for calculation of dead load</u>

<u>Dead load calculation:</u>

Weight=Volume x Density

Self weight floor finish=0.12*25+1=3kn/m^2

The above example shows a sample calculation of dead load.

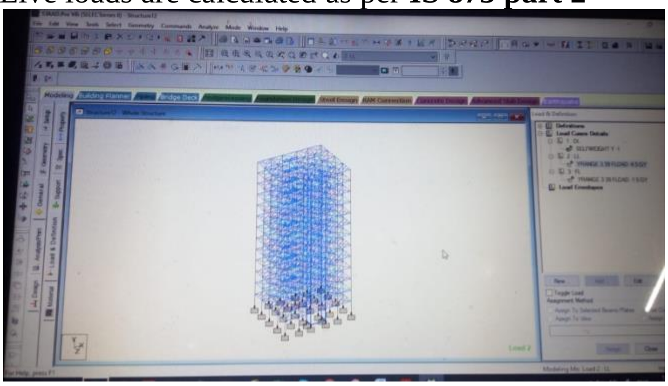
- **<u>Live Loads:</u>**

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 on 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 appears as 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**



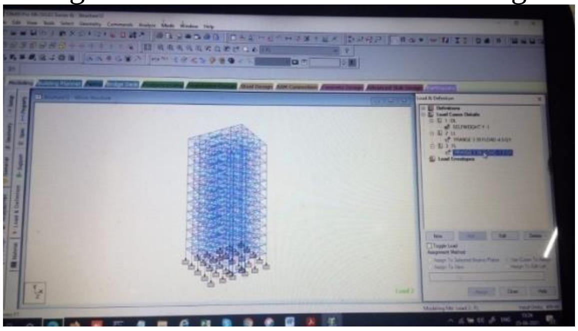
<u>Diagram of live load</u>

- **<u>Floor load:</u>**

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/mm2**

-ve sign indicates that floor load is acting downwards.



SFD and BMD:

The shear force diagram (SFD) and bending moment diagram(BMD) of a beam shows the variation of shear force and bending moment along the length of the beam.

These diagrams are extremely useful while designing the beams for various applications.

a shear force F, which is defined as the algebraic sum of all vertical forces either to the left or to the right hand side of a section.

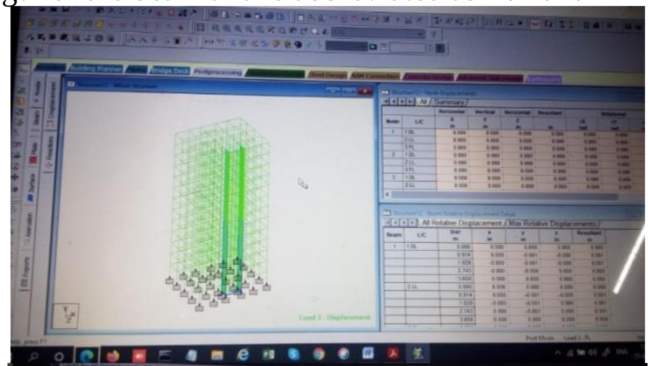
a bending moment M, which is defined as the algebraic sum of the moments of all vertical forces either to the left or to the right of a section

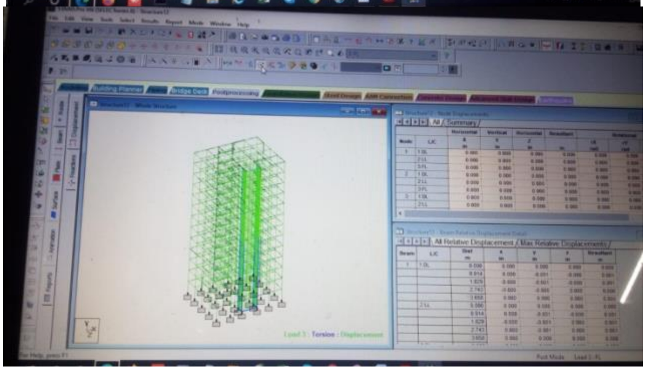
SFD(Shear force diagram)

A shear force diagram is the graphical representation of the variation of shear force along the length of the beam and is abbreviated as S.F.D.

BMD(Bending moment diagram)

A bending moment diagram is the graphical representation of the variation of he bending moment along the length of the beam and is abbreviated as B.M.D.





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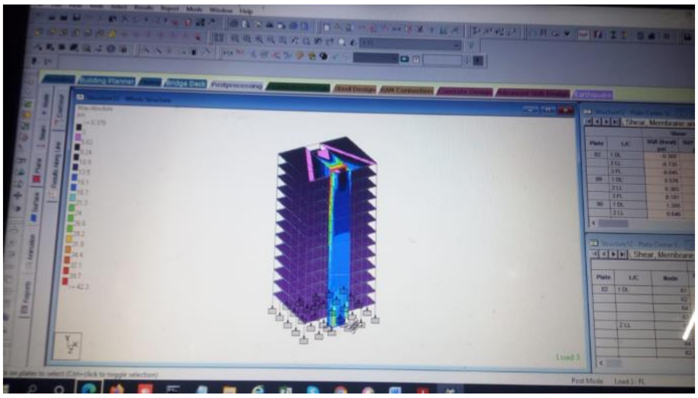

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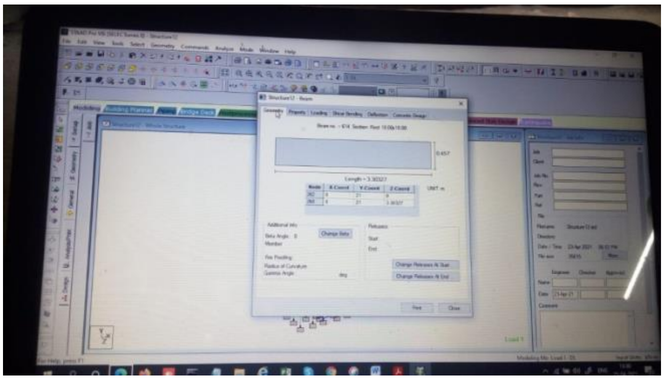

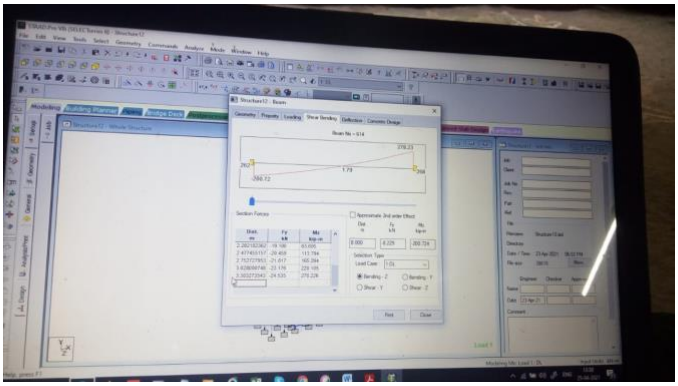

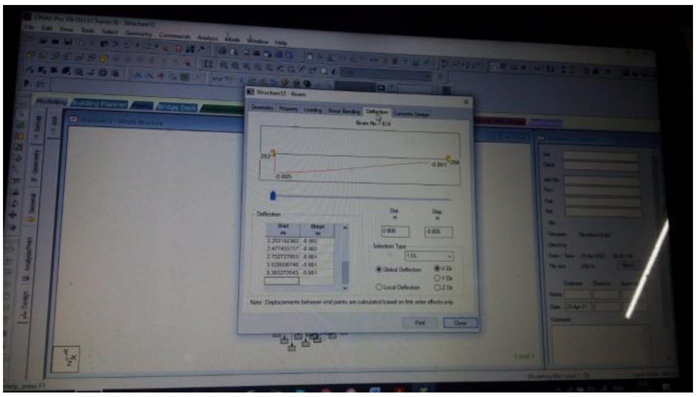

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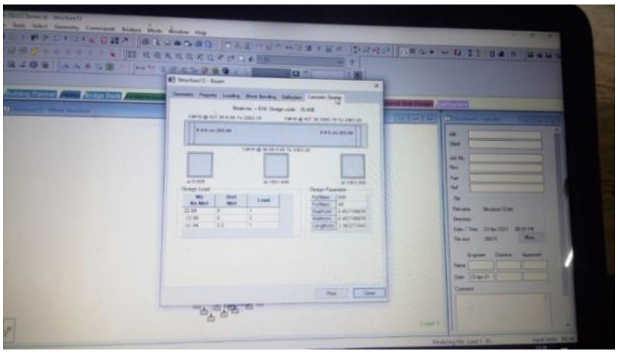

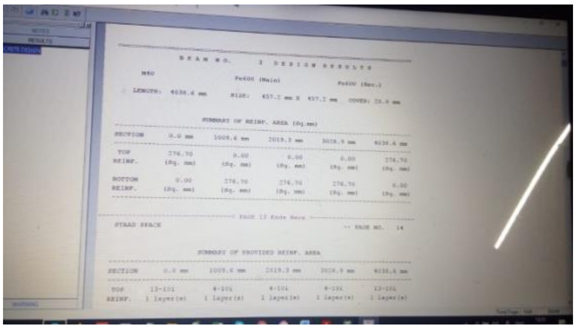

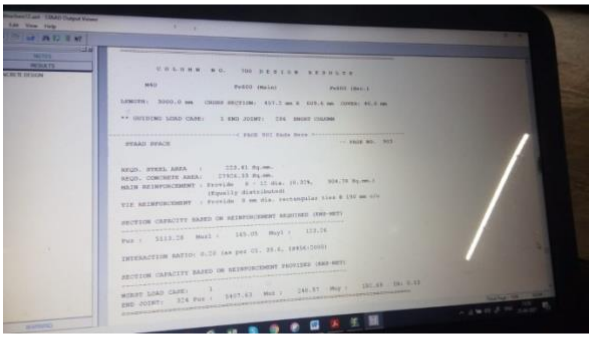

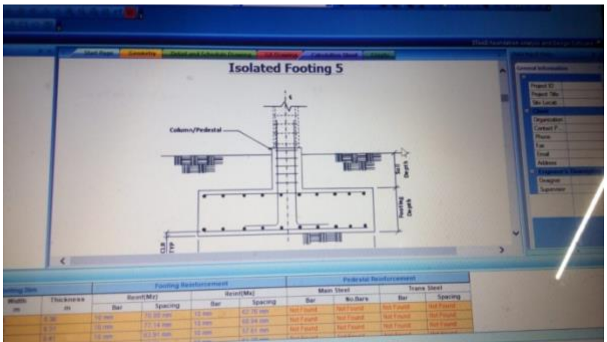

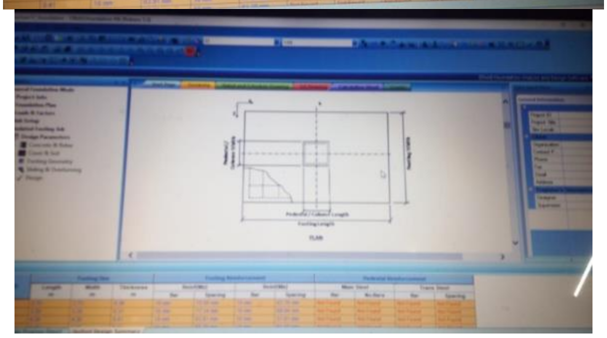

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MEMBERINCIDENCES

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p-ISSN: 2348-6848
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Vol. 8 Issue 5
May 2020

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PERFORMANALYSIS
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CONCLUSIONS

STAAD PRO has the capability to calculate the reinforcement needed for any concrete section. The program contains a number of parameters which are designed as per IS: 456(2000). Beams are designed for flexure, shear and torsion.

Design for Flexure:

Maximum sagging (creating tensile stress at the bottom face of the beam) and hogging (creating tensile stress at the top face) moments are calculated for all active load cases at each of the above mentioned sections. Each of these sections are designed to resist both of these critical sagging and hogging moments. Where ever the rectangular section is inadequate as singly reinforced section, doubly reinforced section is tried.

Design for Shear:

Shear reinforcement is calculated to resist both shear forces and torsional moments. Shear capacity calculation at different sections without the shear reinforcement is based on the actual tensile reinforcement provided by STAAD program. Two-legged stirrups are provided to take care of the balance shear forces acting on these sections.

Beam Design Output:

The default design output of the beam contains flexural and shear reinforcement provided along the length of the beam.

Column Design:

Columns are designed for axial forces and biaxial moments at the ends. All active load cases are tested to calculate reinforcement. The loading which yield maximum reinforcement is called the critical load. Column design is done for square section. Square columns are designed with reinforcement distributed on each side equally for the sections under biaxial moments and with reinforcement distributed equally in two faces for sections under uni-axial moment. All major criteria for selecting longitudinal and transverse reinforcement as stipulated by IS: 456 have been taken care of in the column design of STAAD.

REFERENCES:

1. ChandwaniVinay, AgrawalVinay, Gupta and Naveen Kumar (2012),"Role of Conceptual Design in High Rise Buildings.", Vol. 2, Issue 4, JulyAugust 2012, pp.556-560.
2. P C Varghese, Advanced Reinforced Concrete Design, Prentice-hall Of India,2005.
3. B.S Taranath, (1998), "Structural Analysis and Design of Tall Buildings". McGraw-Hill Book Company, 1988.
4. Bruno Palazzo, Luigi Petti (1999), "Combined control strategy: Base isolation and Tuned mass damping", *ISET, Journal of earthquake engineering*, **36**:121-137.
5. AparnaGhosh and BiswajitBasu (2007), "Alternative approach to optimal tuning parameter of liquid column damper for seismic applications", *ASCE, Journal of Structural Engineering*,**133**:1848-1852.
6. 18. IS 456: 2000, Plain And Reinforced Concrete Code of Practice, Indian Standards