



## ANALYSIS AND DESIGN OF MULTI STORYED BUILDING BY USING STAAD-PRO

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### ABSTRACT

*The principle objective of this project is to analyses and design a multi-storied building (3 dimensional frame)] using STAAD Pro. The design involves load calculations manually and analyzing the whole structure by STAAD Pro. The design methods used in STAAD-Pro analysis are Limit State Design conforming to Indian Standard Code of Practice. STAAD. Pro features a state-of-the-art user interface, visualization tools, powerful analysis and design engines with advanced finite element and dynamic analysis capabilities. From model generation, analysis and design to visualization and result verification, STAAD. Pro is the professional's choice. Initially we started with the analysis of simple 2 dimensional frames and manually checked the accuracy of the software with our results. The results proved to be very accurate. We analyzed and designed a G + 5 story building [2-D Frame] initially for all possible load combinations [dead, live, wind and seismic loads].*

*STAAD. Pro has a very interactive user interface which allows the users to draw the frame and input the load values and dimensions. Then according to the specified criteria assigned it analyses the structure and designs the members with reinforcement details for RCC frames. We continued with our work with some more multi-storied 2-D and 3-D frames under various load combinations. Our final work was the proper analysis and design of a G + 5 3-D RCC frame under various load combinations.*

### INTRODUCTION

Due to the concentration and increase of population into urban cities there is a need to accommodate the influx in the urban cities.

However, due to rapid increase of land cost, and limited availability of land the trend is to build high rise building. The advantages of high rise buildings include but not limited to high ratio rentable floor space per unit area of land. These high rise buildings are sky scrapers are built not just for economy of space they are considered icons of a city's economic power and the city's identity.

Various types of structural system have been used to facilitate the demand of high rise structures. Thousands of high rise buildings are being built all over the world with steel as well as reinforced concrete. Many of the high rise buildings are designed with structural components consisting of various systems such as flat slab, flat plate system, and shear wall core with or without perimeter beams. High rise buildings are used for densely populated areas where mix uses high rise buildings including commercial and uses because the systems have various advantages.

Our main aim to complete an Analysis and design of multi-stored building by using STAAD.PRO against all possible loading conditions and to full fill the function for which they have built. Safety requirements must be met so that the structure is able to serve its purpose with the maintain cost. Detailed planning of the structure usually comes from several studies made by town

planners, investors, users, architects and other engineers. On that, a structural engineer has the main influence on the overall structural design and an architect is involved in aesthetic details. For the design of the structure, the dead load, live loads, seismic and wind load are considered. The analysis and design for the structure done by using software package STAAD.PRO. In this project multistoried construction, we have adopted Finite Element Method of analysis and design the structure. The design is in confirmation with IS456-2000. the analysis of one frame is worked out manually and simultaneously it has been checked using STAAD.PRO Therefore an attempt has been made to present the multistoried building for purpose in the busy city of Hyderabad. The complex consisting of five stores. The structure is design based on the theory of Finite Element Method which provides adequate strength, serviceability and durability besides economy.

### **PLANNING OF MULTISTORY BUILDING**

Building is defined as any structure for whatsoever purpose and of whatsoever materials constructed and every part there of whether used as human habitation or not and includes Foundation, Plinth walls, Floors, Chimneys, Plumbing and building services, fixed platforms, Verandah, balcony. Cornice (or projection), signs and outdoor display structures. Broadly speaking, building consist of three parts, namely

- (i) Foundation
- (ii) Plinth Area
- (iii) Superstructure.

General Principles of site selection:-

Site selection has an important bearing on planning and designing of buildings. Generally, therefore an architect has either to make a choice of suitable site or to plan his building structure to suit the available site. Natural defects of a site will involve considerable expenditure on construction and maintenance of the building.

1. A site which comes within the limits of an area where the by-laws of the local authority enforce restrictions regarding proportions of plots to build up, vacant spaces to be left in front and sides, heights of buildings etc. should be preferred.
2. The site should be situated on an elevated place and also leveled on with uniform slopes from one end to the other so as to provide good and quick drainage of rain water.
3. The soil surface of the site should be good enough to provide economical foundations for the intended building without causing any problem. Generally for most satisfactory instructions, the site should have rock, sand or firm soil below 60 to 120cm. layer of light or even black cotton soil.
4. The situation of the site should be such as to ensure unobstructed natural light and air.
5. The site should have a good land scope but away from quarries, kilns, factories etc.
6. A site should be abandoned under adverse circumstances such as
  - (a) Un healthy, noisy or crowded localities

- (b) Immediate neighborhood of rivers carrying heavy floods, badly maintained drains, and Nullahs;
- (c) Reclaimed soil of water-logged areas, subject to subsidence or settlement; and
- (d) Industrial having smoke and obnoxious odors.

The factors affecting the orientation of a building are:

1. Climatic factors solar radiation and wind directions.
  2. Local topography
  3. Pleasure of a view
  4. Requirements of privacy
  5. Reduction of noise
- Of the above, climatic factors are more important than all the other factors. For this it is essential to know the following:
1. Sun's path and its relative position with respect to the locality.
  2. The direction of prevalent wind.
  3. Intensity and direction of rain.

## STRUCTURAL ANALYSIS

The procedure of structural analysis is simple in concept but complex. In detail. It involves the analysis of a proposed structure to show that its resistance or strength will meet or exceed a reasonable expectation. This expectation is usually expressed by a specified load or the demand and an acceptable margin of safety that constitutes a performance goal for a structure. The performance goals structural design is multifaceted. Foremost, a structure must perform its intended function safely over its useful life. The concept of useful life implies consideration of durability and

established the basis for considering the cumulative exposure to time varying risks (i.e. corrosive environments, that performance is inextricably linked to cost, owners, builders, and designer must consider economic limit to the primary goal of safety and durability. In the view of the above discussion, structural designer may appear to have little control over the fundamental goals of structural design except to comply with or exceed the minimum limits established by law. While this is generally true, a designer can still do much to optimize the design through alternative means and methods that can for more efficient analysis techniques, creative design detailing, and the use of innovative construction materials and methods. In summary the goal of structural design are defined by law and reflect the collective interpretation of general public welfare by those involved in the development and local adoption of building code. It is advantageous when kinematic indeterminacy < static indeterminacy. Alex Bender first formulated this procedure in 1914 based on the applications of compatibility and equilibrium of compatibility and equilibrium conditions. This method derives its name from the facts that supports and displacements are explicitly computed. Set up simultaneous equation is formed from the solution of these parameters and the joint moment in each or computed from these values.

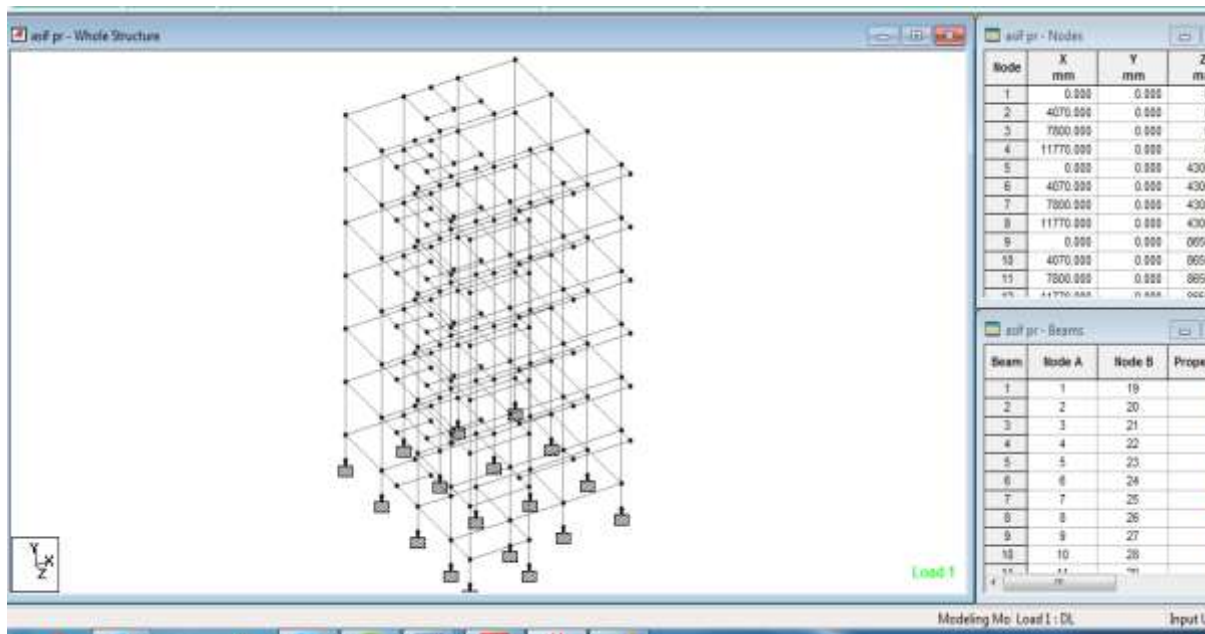
A structure can be defined as a body, which can resist the applied loads without appreciable deformations. Civil engineering structures are created to serve some specific like, Human habitation, transportation,

bridges, storage etc. in safe and economical way. A structure is assembling of individual elements like pinned elements (truss elements), beam elements, column, and shear wall slab able or arch. Structural engineering is concerned with the planning, designing and the construction of structures. Structural analysis involves the determination of the forces and displacements of the structures or components of a structure that make up the structural system. The main object of reinforced concrete design is to achieve a structure that will result in a safe economical solution.

## WORKING PROCEDURE IN STAAD.Pro

### Input Generation

The GUI (or user) communicates with the STAAD analysis engine through the STD input file. That input file is a text file consisting of a series of commands which are executed sequentially. The commands contain either instructions or data pertaining to analysis and/or design. The STAAD input file can be created through a text editor or the GUI Modeling facility. In general, any text editor may be utilized to edit/create the STD input file. The GUI Modeling facility creates the input file through an interactive menu-driven graphics oriented procedure.



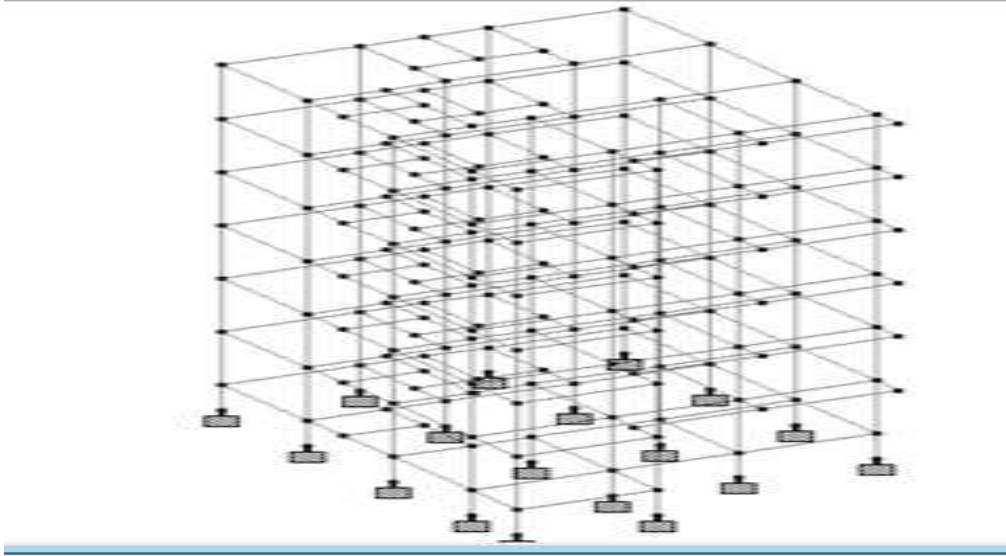
### Supports

Supports are specified as PINNED, FIXED, or FIXED with different releases (known as FIXED BUT). A pinned support has restraints against all translational movement and none against rotational movement. In other words, a pinned support will have

reactions for all forces but will resist no moments. A fixed support has restraints against all directions of movement. Translational and rotational springs can also be specified. The springs are represented in terms of their spring constants. A translational spring constant is defined as the

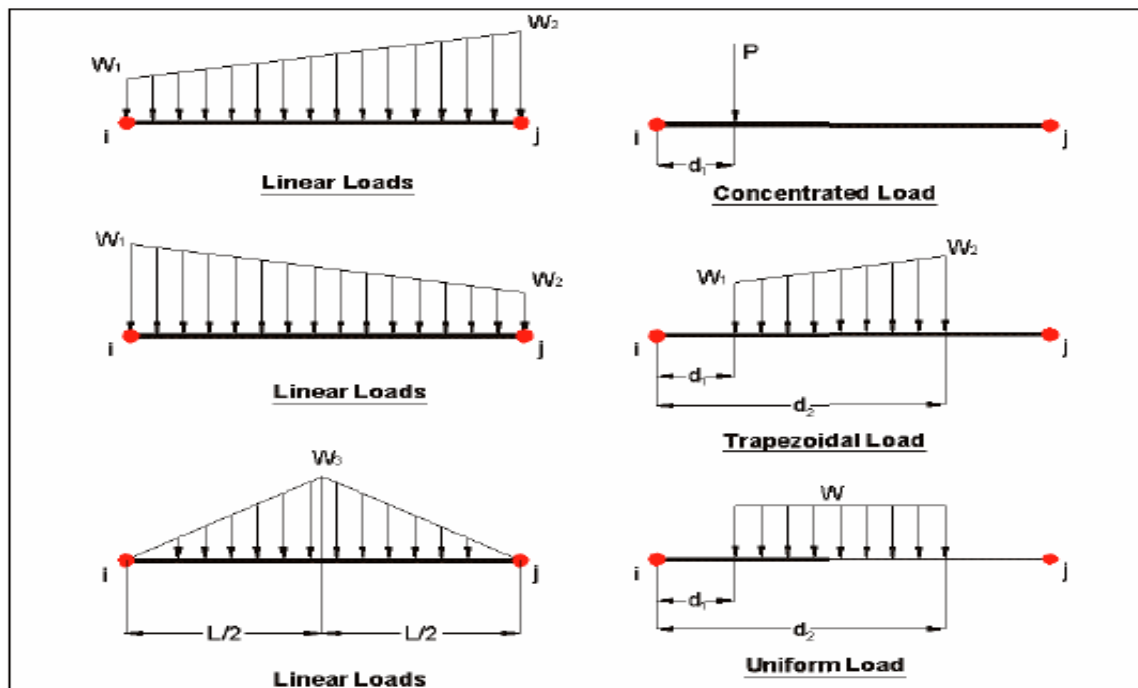
force to displace a support joint one length unit in the specified global direction. Similarly, a rotational spring constant is defined as the force to rotate the support

joint one degree around the specified global direction.

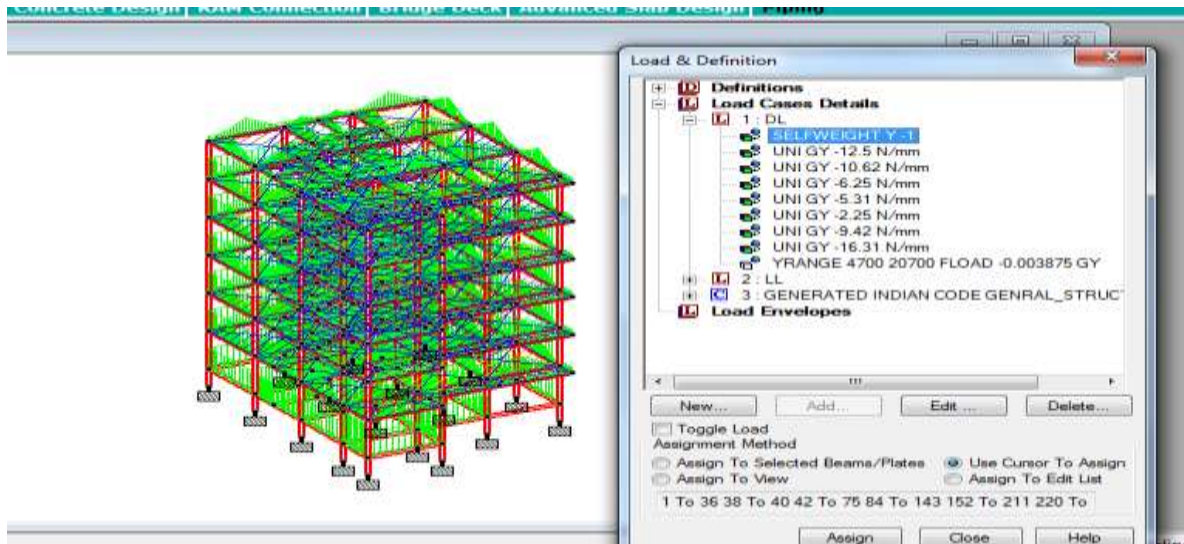


Member loads can be specified in the member coordinate system or the global coordinate system. Uniformly distributed member loads provided in the global

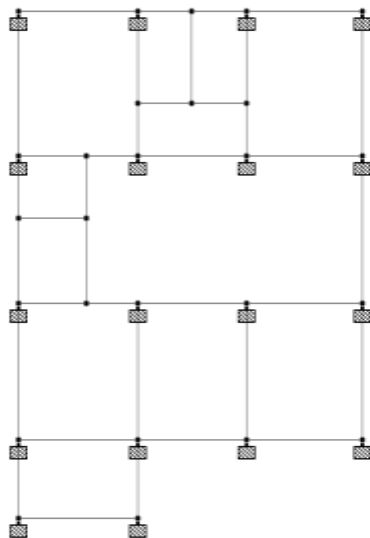
coordinate system may be specified to act along the full or projected member length.







## Analysis of G + 5 RCC Framed Building Using Staad. Pro



## CONCLUSIONS

STAAD Pro software has become more and more critical in the analysis of engineering and scientific problems. Much of the reason for this change from manual methods has been the advancement of computer techniques development by the research community and in particular universities. As technology and engineering adoptions are advertising new methodology of

interlinking and completing the industries via computer applications are created with a similar improvement in hardware capacities. This is turn facilities the implementations of more effective and professional engineering software. As the applications adventure in functionality, one can hope that they will be more affordable to promote their widespread usage amongst civil engineering at a global scale. Taking into account the technological advance, this project has been dealt with using the latest design software.

## REFERENCES

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- IS: 875(part – 3)- 1987 code of practice for design loads for building and structures.
- SP: 16 designs for reinforce concrete.
- Auto CAD & STAAD Pro
- Reinforcement concrete design by N.KRISHNA RAJU & R.N.PRANESH