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ANALYSIS AND DESIGN OF G+1 RESIDENTIAL BUILDING USING STAAD PRO

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Abstract:-As a result, demonstrating efficiency in design work is one of the aspects that forms a substance of competitiveness of a structural engineer. Evolving from this the aim of the report is to provide an analysis and design procedure for a single-family residential building using the computer software STAAD.Pro. To analyze the residential building, the designer has to consider all possible types of loadings and ensures that the structure is safe under all possible loading scenarios. There are several methods for analysis of different frames including Kani's method, cantilever method, portal method, and Matrix method.

The present project deals with the analysis of a residential building of G+1. Dead and Live loads are applied and the design for beams, columns, slab is obtained using STAAD.Pro. Its new features surpassed its predecessors and compotators with its data sharing capabilities with other major software like AutoCAD.

***Key Words*:** STAAD.Pro V8i, AutoCAD

1.INTRODUCTION

In accomplishing the task of urbanization G + 1 residential structures building is one of the essential activities, which requires to accomplish the stability of the respective structure, economy and standards of design. In contemporary civil engineering the design and analyses of the structure is greatly assisted by computer programs such as STAAD Pro. STAAD Pro is a development of a structural engineer's mind who wants to use computers in modeling, analyzing and designing structures since it is one of the most advanced and productive structural analysis software.

This project is related concretely with G+1 (Ground plus one-storied), which is commonly used for the diagnosis and design of a multi-dimensional evaluation of residential buildings in urban and semi-urban, areas. The main aim is to strengthen the structure in such a way that it is able to take the stabilizing various set of the constituents, majorly the dead load, the live load, the wind load and the seismic load as per the specified building codes such as the IS 456:2000 for construction of reinforced concrete structures and IS 1893:2016 for design seismic analysis of future structures.

1.1 STEEL REINFORCEMENT:

Steel bars are principally utilized in the tension region of members of concrete due to the reason that concrete is weak in tension and also in compression members to improve the load bearing value.

I couldn't help but notice the huge cracks on the steel bars especially on some flexor members with tensions in concrete. There was immeasurable tensile stress placed on these members since the steel was utilized as reinforcement.

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2.LITERATURE SURVEY

1.Varalakshmi. V (2014)

This project focused on the design of the various components of a G+5 storey residential building which included foundation, column, beam and slab. The loads, namely dead load and live load, were calculated in accordance with 15 870(Part 1 11) and HYSD bars, namely Fe415, www used in accordance with IS-1986 and 15-1985. According to them, the safety of a RCC structure is the given the detail of the structural design, the quality of drafting of the reinforcement detail of the frame to make the elements stable and ductile and the quality of the entire architectural and structural systems.

2. S. Harish and L. Ramaprasad Reddy (2017)

In this paper, it is today the center of our interest in the whole structure administration from the top down the lower part of the building the basic requirements of foundation of different varieties of columns different types of beans. The design. of storage building is taken as the different methods limit state and working stresses method based upon on the experimental results. Planning and designing are also used in various software like Auto Cad. In this instance studied learned about particular thing is design in right track for calculation.

3. R.D. Deshpande (2017)

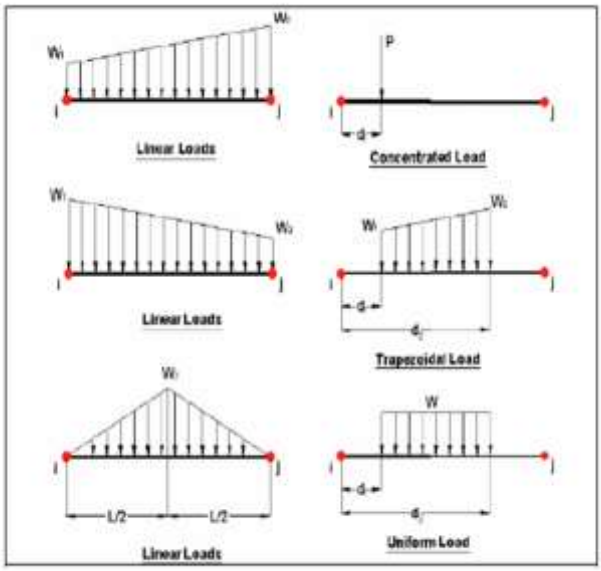
The objectives of this project seeks to understand the functioning of the various parts in the construction of the multi – storied building. Planning of multi – storied building has been done for G+2 building.

3. ANALYSIS OF STRUCTURE

3.1 LOADS

Moving Load Generator:

This feature makes it possible to define moving loads on the members of a structure. The moving load system(s) is/are in the form of concentrated loads at fixed specified distances in both directions on a plane which is to be defined by the user. The given number of primary load cases will be created by the program and taken into account in the analysis The given number of primary load cases will be created by the program and taken into account in the analysis.



Seismic Load Generator:

The STAAD seismic load generator uses the equivalent lateral load analysis method. It is assumed that the lateral loads will act along the X and Z direction and Y direction will be

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under the gravity loads. Hence, for a building model, Y axis will be perpendicular to the floors and will point upward (all the Y joint co-ordinates are positive).

Wind Load Generator:

The STAAD Wind Load generator is capable of performing the wind loads on the joints of a structure with the help of wind intensity and exposure factors as input by the user. It is possible to define different wind intensities for different zones of the structure within height. the Exposure structure. factors Every can joint be of used the to structure represent has openings an exposure factor which is the ratio of influence area on which the wind load acts.

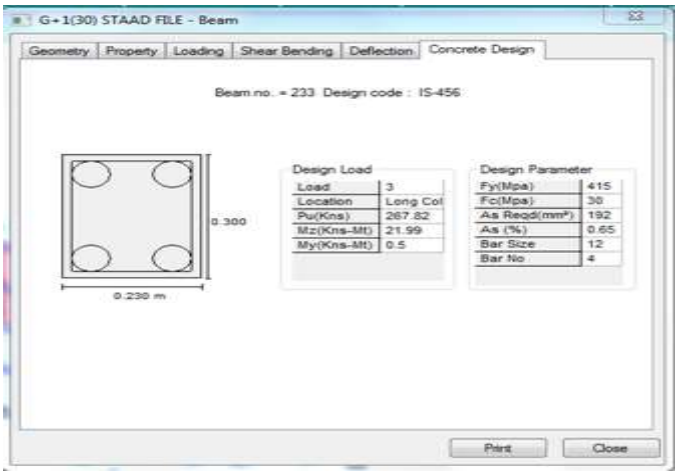
4.DESIGN OF STRUCTURE:

4.1 SLABS

A Slab is a common structural element of modern buildings. It is a covering provided over the four walls or beams of a room in order to enclose it. A slab may be a floor or a roof depending upon it location in the building. Slabs carry uniformly distributed loads primarily by flexure. Inclined slabs may be used as ramps for multi-storey car parks.

4.2. COLUMNS

A column in structural engineering is a vertical element that transmits, through compression, the weight of the structure above it to other structural elements below. In the context of wind or earthquake engineering, columns may be designed to resist lateral forces. A column or strut is a compression member, used primarily to support axial compressive loads and with a height at least three times its least lateral dimension.



4.3. FOOTINGS

Footings are the structural members that transfer loads from the building or individual column to the ground. If these loads are to be properly transmitted, foundations must be designed to prevent excessive settlement or rotation and to minimize differential settlement and to provide adequate safety against sliding and overturning.

4.4 STAIRCASE

A stair is a series of steps arranged in such a manner as to connect different floors of a building. Stairs are designed to provide an easy and quick access to different floors. The stairs should be thoughtfully located, carefully planned, tastefully designed, serving its purpose and at the same time being economical in construction.

Guidelines for fixing the dimensions of the component parts of stairs:

1.The rise should be between 150mmto180mm and tread between 220mmto250mm for

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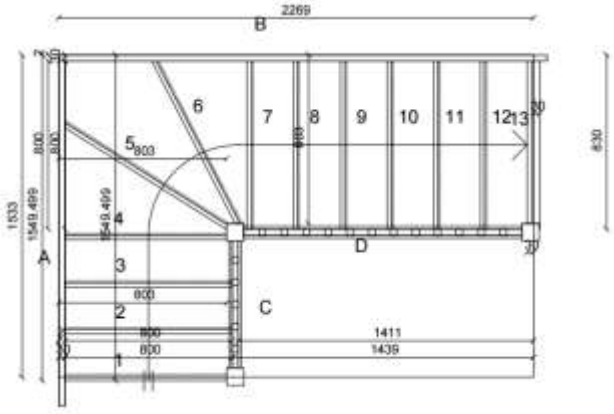
residential buildings. The riser should be between 120mm to 150mm.

2.The sum of the tread and twice the rise (T+2R) should be between 500mm to 650mm.
3.The width of the stairs should be between 0.8mto1m for residential buildings. The width of stairs should be between 1.8mto2m for public buildings.
4.The width of landing should not be less than width of stairs.
5.The number of steps in each flight should not be greater than 12.
6.The pitch of the stair way should not be greater than380.
7.The head room measured vertically above any step or be low mid-landing shall not be less than 2.1m.
8.Avoid wind as far as possible.



5.CONCLUSION

The analysis and design of the G+1 residential building are a sensitive balance between structural integrity, functionality, and cost efficiency. This documentation covers all the critical aspects of the design process to ensure that it complies with the relevant building codes and standards while taking into consideration practicality and aesthetics.

The design for the structure was made considering various load applications: safety and durability, performance of the dead load, live load, and all environmental forces such as wind and seismic activities. Finite element modeling and a manual approach were some of the

advanced analysis techniques employed to optimize the design in different structural components. For reinforced concrete, versatility, strength, and cost-effectiveness have been ensured for its use, such that it resists the expected stresses and withstands the service life span.

Architectural planning was ineluctable for the satisfaction of the functional needs of the building. The G + 1 layout will go a long way towards ensuring that space utilization is up to a maximum limit by accommodating the latest requirements of modern living-areas for living, dining, and sleeping, along with appropriate provisions for ventilation and lighting. It has aesthetic elements interwoven without compromising the building structure or functionality aspect.

Acknowledgment

I would like to thank all those who contributed to the successful completion of this project on the analysis and design of a G+1 residential building.

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