



## ANALYSIS AND DESIGN OF COMMERCIAL G+4 BUILDING

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**ABSTRACT** - Any building structure that has been used by the industry to store raw materials, or to manufacture products of the industry is called an industrial building. Industrial buildings can be classified as Normal type industrial buildings and Special type industrial buildings. Normal types of industrial building include shed type buildings with simple roof structures on open frames. These buildings are used for workshop, warehouses etc. These buildings require large and clear areas unobstructed by the columns. Multi storied Industrial/commercial building is selected and is well analysed and designed. The project was undertaken for M/s NKR Group of Constructions Pvt Ltd, It is a Ground+4 storied building, The analysis and designing was according to the standard. Specification to the possible extend. The analysis of structure was done using the software package STAAD PRO.V8i. All the structural components were designed manually. The detailing of reinforcement was done in AutoCAD 2013. The use of the software offers saving in time it takes value on safer side than manual work

**Key Words:** Staad Pro, Loads Combinations, structural Components, Raw Materials, Manual Works, Reinforcement, etc.

### 1.INTRODUCTION

Design is not merely a computational analysis; creativity must also be incorporated. Art is skill acquired as the result of knowledge and practice. Design of structures as thought course stands to consist of guessing the size of members required in a given Structure and analyzing them in order to check the resulting stressed and deflection against limits set out in codes of practice. Structural Design can be perceived as the art of placing material in three dimensional space so that a defined purpose is fulfilled in the most efficient possible manner Industrial training is an important element in the development of the practical and professional skills required by an

engineer. The goal of industrial training is to attain exposure on practical fields of engineering. Through such exposure, one can gain better understanding of general engineering practice and a sense of common and potential problems.

#### 1.1. General of The Project

To get the most benefit from this project, it made as comprehensive as possible on most of the structural design fields. Industrial training consists of two parts. First part consists of Modelling, Analysis, Designing and Detailing of a multistoried reinforced concrete building. Second part involves the research of Execution of Project by carrying out Site visit.

#### 1.2. General Practice Followed in Design

Deductions in dead loads of walls due to opening need not be made. The analysis shall be carried out separately for the dead loads, live loads, temperature loads and seismic load and wind loads. Temperature loads cannot be ignored particularly when the buildings are long.

**TABLE 1.1: Factor K2 for various height**

Height (m)	K <sub>2</sub>
10	0.98
15	1.02
20	1.05



## 2.LITERATURE REVIEW

M. Suresh Kumar Reddy. et.al. had studied a Now this project deals with a study of analysis, design of a G+8, u – shaped commercial building. Analysis and the design of the selected structural elements is done. For the same structure the design is done using software STAAD.Pro and results for the selected structural elements. Loads coming on the structure were considered from designed in accordance with IS 456:2000. All the frames are analysed by using STAAD.Pro. In our project we designed the isolated foundation using STAAD FOUNDATION software. In this foundation design we showed the bottom reinforcement and top reinforcement details.

### 2.1Research Objectivises

The objective of this investigation is to assess a proposed "floating" concrete aerobics floor \designed to be a costeffective solution to the problem of transmitted floor vibrations due to rhythmic exercise in existing structures. Chapters 3 and 4 present the results of this as sessment. Three configurations of the test floor were tested in the laboratory. The vibration properties were determined based on a heel-drop excitation, and the transmitted forces were determined from jumping tests at various

frequencies for each test configuration. The acceleration and force traces were analyzed to determine the damping coefficient and natural frequencies utilizing Fast Fourier Transforms (FFTs). Analytical results were determined based on vibration theory for a Single Degree of Freedom (SDOF) system. In this report, the Analytical and experimental results are compared 10 and recommendations are given concerning the acceptability of the "floating" floor concept and possible applications.

### 2.2 Steps To Involved In And Analysis and Design

Develop R.C.C. plan at various floor levels. In the plan, structural detailing and orientation of columns, beam

layout, type of slab (along with its design live load) at various floor levels must be indicated. The imposed live load and other loads like wind, seismic and other miscellaneous loads (where applicable) must be determined as per IS: 875, for the proposed use of space, and seismic zone of the site of proposed building as per IS:1893.

Correct the provisionally assumed slab and beam sizes. With the help of beam size value correct the column section based on strong column weak beam design. For multistoried building, as far as practicable, same column size and concrete grade should be used for at least two stories to avoid very frequent change in column size and concrete mix to ensure the easy and quick construction process. Minimum grade of concrete to be adopted for structural members at all floors is M20 for Non Coastal Region and M30for Coastal Region. Feed the data of frame into the computer. The beam and column lay outs were fixed using Auto cad. Modeling was done using software STAAD Pro.V8i. Dead loads and Live loads as per IS codes and

their combinations were applied on the Space frame.

### 3. MODELING AND ANALYSIS OF THE BUILDING

Structural analysis, a part and parcel of any engineering project is the process of predicting the performance of a given structure under a prescribed loading condition. The performance characteristics commonly of concern in structural design.

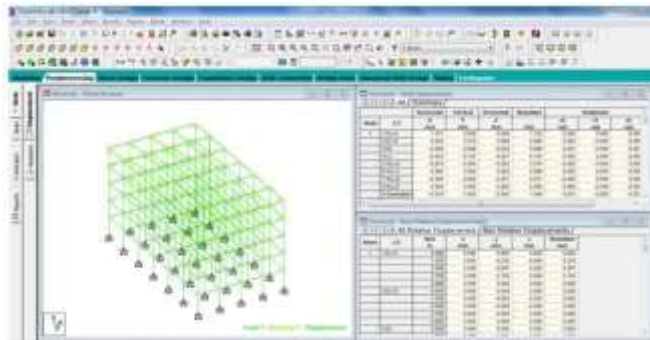
#### 3.1 Earthquake force

Earth quakes generate waves which move from the origin of its location with velocities depending on the in tensity and magnitude of the earth quake. The impact of earth quake structures depends on the stiffness of the structure, stiffness of the soil media, height and location of the expensive in order to maintain either serviceability and



safety if all types of forces would have acted on all structures at all times. Accordingly, the concept of characteristics loads has been accepted to ensure at least 95 percent of the cases, the characteristic loads used would be greater than the factually applied loads on the structure. However, the characteristic loads are to be calculated on the basis of average/mean load of some logical combination of loads mentioned.

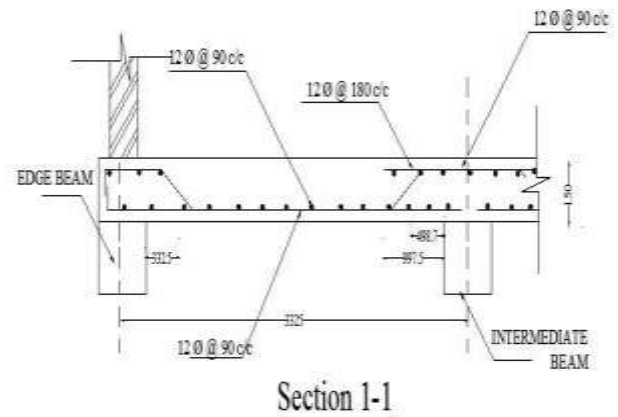
structure, etc. The earthquake forces are prescribed in IS 1893:2002, (Part-I). Seismic Analysis using was done by using STAAD. Pro. Then tire beam-column joint are made pinned and the program was run for 1.0 or 0.5 The live load shall be 0.25 times for loads up to 3kN/m<sup>2</sup> and



**Figure 3.2 Bending Moment Diagram**

**4. Design of slab**

Slabs are plate elements having the depth much smaller than other two dimensions. They usually carry a uniformly distributed loads from the floors and roof of the building. Design of reinforcement concrete was done using IS 456:2000 and SP16:1980. Slabs of thickness 150mm were used in the building and were designed a sone-way or two slab as the case may be. Grade of concrete M25 is assumed for slabs design.



**Figure 4.1 Reinforcement details of Two-way Slab**

**4.1 Check For Thickness of Tank wall**

The horizontal moment MH on the wall will be combined with the direct tension due to shear force on adjacent wall Similarly, vertical moment MV in the wall will be combined with the direct thrust due to weight pf roof slabs and wall itself, though the effect will be of minor importance.

**4.2 Design and analysis**

Industrial building design national code: SP:07-(2005) The purpose of structural design is to It would achieve an acceptable probability that the structure being designed will perform the function. for which it is designed and will safely withstand the influence that will act on it throughout its useful life. These forces are primarily the loads and the other forces to which it will be subjected. The effects due to temperature fluctuation, foundation settlements etc. should be also Considered.

**Conclusions**

All major aspects relating to the safety of structures, functionalities, and all relevant building codes were met successfully in designing and analyzing the G+4 multi storied building. Proper analysis with regards to the distribution of load, the selection of materials, and architectural designs are all adopted to enhance stay,



Hdurability, and efficiency of the build in and efficiency

of In addition, the software applied for modern structural analysis will be this employed to make this design the best suitable to the specifications requirements of the site while meeting the highest standards of engineering and construction.

Environmental and economic factors were also taken into consideration to ensure that the project is sustainable and cost-effective for the future occupants. Cost Detailed construction plans and analysis will ensure that the building will perform optimally throughout its lifespan,

offering a safe, efficient, and comfortable space for all users.

The project clearly shows how responsible planning and technical skills can produce a balanced, efficient, and safe multi-story structure well suited for urban environments.

## ACKNOWLEDGEMENT

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