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Seismic Analysis and Design of G+4 Structure with Modified Provision: A Review

Kunal S. Bhut[1], Prof. Vishal Gajghate[2]
[1]*M.Tech (Structural Engineering), Department of Civil Engineering, GHRCE, Nagpur*
[2]*Assistant Professor, Department of Civil Engineering, GHRCE, Nagpur*

Absrtact: ***In order to struggle in the ever growing skilled market it is very essential for a structural engineer to save time. as a development to this challenge is made to analyze and design a Multistoried structure by using a software package staad.pro. For analyzing a multi storied structure one has to believe all the possible loadings and see that the structure is secure against all possible loading conditions. There are numerous methods for analysis of different frames like kani's method, cantilever method, portal method, matrix method. The current project deals with the analysis of a multi storied residential structure of G+4 consisting of 5 apartments in each floor. The dead load &live loads are useful and the design for beams, columns, footing is obtained STAAD Pro with its new features surpass its predecessors, and compotators with its data sharing capability with other major software like AutoCAD, and MS Excel. We terminate that staad.pro is a very powerful tool which can save much time and is very perfect in Designs. Thus it is determined that staad.pro package is proper for the design of a multistoried structure.***
To design a structure, it is separated into two categories -by using manual method and software based method. Due to progression in technology, humans are developing software for designing of structures to make the progression easier and accumulate time. It is true that design with software is simple and time reduction and mostly the results are correct. As STAAD Pro is the present leading design software in the marketplace, many structural designing company use this software for their project design purpose. So, this article normally deals with the analysis of the results obtain from the design of a structure when it is designed using STAAD Pro Software. The software method of analysis is used for a G+4 Residential building located in Zone-II. The scope behind presenting this work is to learn how relevant Indian Standard codes are used for design of various structure elements such as beams, columns, slabs, and foundation and stair case with STAAD Pro package when seismic loads are acting on the structure. Earthquakes that occurred in past guide to the complete collapse of the building as structures are not fine designed and constructed without sufficient strength. To ensure safety against seismic forces of building, there is need to study the seismic analysis to design earthquake opposed to structures. The current work deal with the analysis of a residential structure of G+4 in which the dead load and live loads are apply and the structural design scope for beams, columns, footing is obtaining. Beams and columns shall be designed as per IS 456:2000, IS 875 (part1), IS1893:2002 and IS1893:2016
Keywords: Code Comparison between IS 1893:2002 and IS 1893:2016, G+4 Building Structure, Seismic Analysis of Structure, Pushover Analysis, Ductile Detailing

I. INTRODUCTION

Currently, Construction of high rise structure is a basic need because of shortage of land. Conventional method of manual design of high rise structure is time overriding as well as risk of human errors. So it is required to use some computer based software which gives more precise results and reduce the time. STAAD-PRO is the structural software is currently accepted by structural engineers which can solve emblematic problem like static analysis, wind analysis, seismic analysis using a variety of load combination to confirms various codes such as IS 456:2000, 1893:2002, IS 875:1987 etc

The method for analysis and design of a given structure will depend on the type of building, its complexity, the number of storey etc. First the architectural drawings of the structure are study, structural system is finalizing and sizes of structural members are sure and brought to the knowledge of the worried architect. The method for structural design will absorb some steps which will depend on the type of structure and also its intricacy and the time available for structural design. Often, the work is necessary to start soon, so the steps in design are to be approved in such a way the foundation drawings can be taken up in hand within a logical period of time

A structure shall be considered as irregular as per is IS code, if it lacks regularity and has discontinuity in geometry, mass or load resist elements. These irregularities may cause problem in stability of force flow and stress concentration. A building should possess four main attributes, mainly have simple and regular configuration, sufficient lateral strength, stiffness and ductility. Structural

analysis is mainly anxious with finding out the behavior of a structure when subjected to some action. The dynamic loads consist of wind, waves, traffic, earthquakes, and blasts. To carry out well in an earth, quake a building should possess four main attribute namely simple and normal configuration and sufficient lateral Strength, stiffness and ductility. Current earthquake codes define structural pattern as either regular or irregular in terms of size and shape of the building, agreement of the structural and non-structural elements within the structure, sharing of mass in the building etc. A building shall be considered as uneven for the purposes of this standard, if at least one of the conditions is appropriate as per IS 1893:2002 or IS 1893:2016.

II. OBJECTIVES

A. To study IS1893-2002 and IS1893-2016 for the different introduce in new code.
B. To remark the improvements and differences in results using new design code IS1893 – 2016.
C. To study pushover analysis.
D. To compare seismic analysis between IS1893-2002 and IS1893-2016.
E. To study practical design of G+4 structure.

III. LITERATURRE REVIEW

A. A.A. Kale, S.A. Rasal,
In this paper the four different shapes of same area multistory model is generated & tested by the ETABS under the guideline of IS-875-Part3 & IS1893-2002-Part1. The behavior of 15, 30 & 45 storey structure has been studied. The Dynamic effects also get by Response spectrum method. All the parameter like Story displacement, Story drift, Base shear, overturning moments, Acceleration and Time period are deliberate. After compare all structure shapes results completed that which section is convenient & either seismic or wind effect is critical.

B. K VenuManikanta, Dr. DumpaVenkateswarlu,
The most important intention of this study is to carry out a complete analysis on recreation tools ETABS and STAAD PRO, which have been use for analysis and design of rectangular drawing with vertical regular and rectangular Plan with Vertical geometrically irregular multi-storey building. This study is focused on bring out reward of using ETABS over current practices of STAAD PRO versions to light. It was pragmatic that ETABS is more user friendly, precise, compatible for analyzing design results and many more advantages to be discussed in this study over STAADPRO. Pros and cons of using this software's also mentioned in this study.

C. Sanjay Kumar Sadh, Dr. Umesh Pendharkar,
The behavior of a structure during earthquakes depends seriously on its overall shape, size and geometry. Earthquake unwilling design of buildings depends upon provided that the building with strength, stiffness and inelastic deformation capacity which are great sufficient to endure a given level of earthquake-generated force. This is generally skillful through the variety of a suitable building pattern and the careful detailing of structural members. pattern is critical to good seismic performance of buildings. The imperative aspect affecting seismic configuration of buildings is overall geometry, structural systems, and load paths. The structure slenderness ratio and the structure core size are the key drivers for the proficient structural design. This paper focuses on the result of both Vertical Aspect Ratio (H/B ratio i.e. Slenderness Ratio) and Horizontal or Plan Aspect Ratio (L/B ratio), where H is the total Height of the structure frame, B is the Base width and L is the Length of the structure frame with different Plan Configurations on the Seismic Analysis of Multistoried Regular R.C.C. building. The test structures are kept regular in elevation and in plan. Here, height and the base dimension of the buildings are assorted according to the Aspect Ratios. The values of Aspect Ratios are so assigned that it provides different configurations for Low, Medium and High-rise structure models.
In the present study, four structure models having different Horizontal Aspect ratios viz. 1, 4, 6 & 8 ranging from 12m.to 96m.length of different Vertical Aspect ratios (slenderness ratios) viz. 1, 4, 6 & 8 of varying 4, 16, 24 & 32 storey have been considered and their influence on the behavior of the RCC Multistoried buildings is demonstrated, using the parameters for the design as per the IS-1893- 2002-Part-1 for the seismic zone- 3. In this method total 16 structure models are analyzing for dissimilar load combinations by Linear Flexible Dynamic Analysis (Response Spectrum investigation)

D. Gauri G. Kakpure, Ashok R. Mundhada
This paper presents a review of the previous work done on multistoried buildings vis-à-vis earthquake analysis. It focuses on static and dynamic analysis of building. This paper presents a review of the relationship of static and dynamic analysis multistoried structure. Design parameter such as Displacement, bending moment, Base shear, Storey drift, Torsion, Axial Force were the focus of the study.

E. Mr. S. Mahesh, Mr. Dr. B .Panduranga Rao

In this paper a residential of G+11 multi-story building is studied for earth quake and wind load using ETABS and STAAS PRO V8i .Assume that material property is linear static and dynamic analysis are perform. These analyses are carried out by considering different seismic zones and for each zone the behavior is assessed by taking three different types of soils namely Hard, Medium and Soft. Different response like story drift, displacements base shear is plotted for different zones and different types of soils

F. Prashanth. P, Anshuman. S, Pandey. R.K, Arpan Herbert

This project primarily deals with the relative analysis of the results achieved from design of a steady and a plan uneven (as per IS 1893) multi storey structure structure when designed using STAAD.Pro and ETABS software's separately. These results will also be compared with manual calculations of a sample beam and column of the similar structure designed as per IS 456.

From the design consequences of beams, it may terminate that ETABS gave lesser area of required steel as compare to STAAD PRO. It is found out from earlier studies on judgment of STAAD results with manual calculations that STAAD.Pro gives conservative design results which is again proved in this study by comparing the results of STAAD.Pro, ETABS and Manual calculations (refer below table). Form the design consequences of column; since the required steel for the column forces in this exacting problem is less than the minimum steel limit of column (i.e., 0.8%), the amount of steel designed by both the software is equivalent. So judgment of results for this case is not possible.

G. S.K. Ahirwar, S.K. Jain and M. M. Pande

This paper presents the seismic load assessment for multistory building as per IS: 1893-1984 and IS: 1893-2002 commendations. Four multistory RC framed building range from three storied to nine storied are measured and analyzed. The procedure gives a set of five individual analysis sequence for each structure and the results are used to evaluate the seismic reaction viz. storey shear and base shear compute as for each the two version of seismic code. The seismic forces, compute by IS: 1893-2002 are establish to be considerably higher, the difference varies with structure properties. It is completed that such study needs to be carried out for self-structure to forecast seismic susceptibility of RC framed building that were designed using prior code and due to revision in the codal necessities may have render risky.

IV. CONCLUSION

It is conclude that the minimum value of IO, LS, CP Point is obtained in the Structure with stiffness irregularity curve. It is also conclude that the maximum value of IO, LS, CP Point is obtained in the Structure with vertical irregularity (curtailed column) curve. From the study of above structures it is conclude that maximum strength is obtained to the structure with stiffness irregularity, while minimum strength is obtained to the Structure with vertical irregularity (curtailed column) After pushover analysis is complete, pushover curve is obtained. In this study both capacity and demand curves are intersected in between immediate occupancy and life safety zone. Such that building is subjected to moderate damage when subjected to pushover loads in Seismic Zone V.

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