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Seismic Response Comparison G + 12 Building by Using Old and New Code

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Abstract: *Recommendations provided by seismic codes help the designer to improve the behaviour of structures so that they may withstand the earthquake effects without significant loss. Therefore, the seismic code needs revision from time to time. IS: 1893-2002 has been revised in year 2002 after the gap of 18 years (IS:1893-1984). Now this is again revised as IS: 1893 2016. The building designed as per the earlier version of the code may be checked for recommendations made by the revised code. Such comparison is to be carried out to establish whether existing buildings designed by earlier version are safe for revised recommendations also. Buildings known to possess structural deficiency should be retrofitted to withstand expected design earthquake vibrations.*

Keywords :- *Retrofitting, Revision of code, Earthquake effect, Vibration, Structural behaviour, Seismic code.*

I. Introduction

Recommendations provided by seismic codes help the designer to improve the behaviour of structures so that they may withstand the earthquake effects without significant loss. Seismic codes are unique to a particular region or country. They take into account the local seismology, accepted level of seismic risk, properties of available materials, methods used in construction and building typologies. Further, they are indicative of the level of progress a country has made in the field of earthquake engineering and property. Most of the recommendations of IS codes are based on observation during past earthquakes as well as experimental and analytical studies made by scientists, engineers and seismologists. In India, the first seismic code namely IS: 1893 (Criteria for earthquake resistant design of structures) was published in 1962. As due to Analysis of performance of structures during past seismic events and Efforts put by researchers, considerable advancement have been made over the years in earthquake resistant design of structures, and seismic design requirements in building codes have steadily improved. Therefore, the seismic code needs revision from time to time. IS: 1893-2002 has been revised in year 2002 after the gap of 18 years (IS:1893-1984). Now this is again revised as IS: 1893-2016. The building designed as per the earlier version of the code may be checked for recommendations made by the revised code. Such comparison is to be carried out to establish whether existing buildings designed by earlier version are safe for revised recommendations also. Buildings known to possess structural deficiency should be retrofitted to withstand expected design earthquake vibrations. Tall structures and buildings are now adopted in India. Many major cities near to the coastal area comes under the live seismic zone, it creates problem for high rise multi-storey buildings. Analysis of such a complex structure are too hectic & time consuming. It is tried since long time to find the solution to this problem. Wind & seismic analysis of the structures can be done by the advance software STAAD Pro, SAP or ETABS. Structural Analysis and design are predominant in finding out significant threats to integrity and stability of a structure. Multi storied structures, when designed, are made to fulfil basic aspects and serviceability. Since Robustness of structure depends on loads imposed, it is critical. Software's are developed such as STAAD PRO, ETABS & SAFE, and SAP to solve typical problems with ease of use. The design results using software's can be obtained and compared. The building performance under seismic depends critically on its overall shape, size and geometry. Earthquake resistant design of buildings depends upon providing the building with strength, stiffness and inelastic deformation capacity. The building slenderness ratio and the building core size are the key drivers for the efficient structural design.

II. Litrature Review

A. A. Kale, S. A. Rasal, 2017. Author considered four shapes of same area multistorey model and model is analyzed using ETABS under the guideline of IS-875-Part3 & IS1893-2002-Part1. The behavior of 15, 30 & 45 storey building has been studied. Parameters like Story displacement, Story drift, Base shear, Overturning moments, Acceleration and Time period are calculated. Conclusion includes building shape results author concluded that which section is convenient & either seismic or wind effect is critical.

N.Veerababu, B Anil Kumar, 2016, In this study an endeavor has been made to produce reaction spectra utilizing site particular soil parameters for a few destinations in seismic zone V, i.e. Arunachal Pradesh and Meghalaya and the produced reaction spectra is utilized to break down a few structures utilizing business programming STAAD Pro. The impact of soil properties, its sorts and the profundity of soil in the reaction range is talked about. The reaction range is obtained in which the physical properties and time history

information of a tremor i.e. North-East seismic tremor of September 10, 1986 which had the greatness of 5.2 is considered. At long last examinations have been made in the middle of the structure outlined by taking IS 1893:2002 reaction spectra under thought with the structure planned by considering the created reaction spectra for different sorts of soil for the seismic zone as far as twisting minute, shear powers and fortification.

K Venu Manikanta, Dr. Dumpa Venkateswarlu, 2016. The main purpose of this study is to carry out a detailed analysis on simulation tools ETABS and STAAD PRO, which have been used for analysis and design of rectangular Plan with vertical regular and rectangular Plan with Vertical geometrically irregular multi-storey building. This study is focused on bringing out advantages of using ETABS over current practices of STAAD PRO versions to light. It was observed that ETABS is more user friendly, accurate, compatible for analyzing design results and many more advantages to be discussed in this study over STAADPRO.Pros and cons of using these software's are also be mentioned in this study.

Sanjay Kumar Sadh, Dr. Umesh Pendharkar, 2016. Authors focuses on the effect 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 building frame, B is the Base width and L is the Length of the building frame with different Plan Configurations on the Seismic Analysis of Multistoried Regular R.C.C. Buildings. In the present study, four building 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 storeys have been considered and their influence on the behaviour of the RCC Multistoreyed buildings is demonstrated, using the parameters for the design as per the IS-1893- 2002-Part-1 for the seismic zone- 3. In this way total 16 building models are analysed for different load combinations by Linear Elastic Static Analysis (Equivalent static force analysis) with the help of ETABS-2015 software and the results obtained on seismic response of buildings have been summarized.

Gauri G. Kakpure, Ashok R. Mundhada, 2016, Reinforced Concrete (RC) building frames are most common types of constructions in urban India. These are subjected to several types of forces during their lifetime, such as static forces due to dead and live loads and dynamic forces due to earthquake. 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 buildings. This paper presents a review of the comparison of static anddynamic analysis multistoried building. Design parameters such as Displacement, Bending moment, Base shear, Storey drift, Torsion, Axial Force were the focus of the study.

Pardeshi sameer, 2016, The current version of the IS: 1893-2002 requires that practically all multi storied buildings be analyzed as three-dimensional systems. Buildings may be considered as asymmetric in plan, in mass and stiffness along storey, of the buildings. Most of the hilly regions of India are highly seismic. In this study, 3D analytical model of G+15 storied buildings have been generated for symmetric and asymmetric building models and analyzed using structural analysis tool ETABS software. Mass and stiffness are two basic parameters to evaluate the dynamic response of a structural system. Multi-storied buildings are behaved differently depending upon the various parameters like mass-stiffness distribution, foundation types and soil conditions. 2001 Bhuj earthquake in Gujrat, India demonstrated the damage and collapse of the buildings due to the irregularities in structural stiffness and floor mass. This paper is concerned with the effects of various vertical irregularities on the seismic response of a structure. The objective of the research is to carry out Response spectrum analysis (RSA) of regular and irregular RC building frames and Time history Analysis (THA) of regular RC building frames and carry out the ductility based design using IS 13920 corresponding to response spectrum analysis. Comparison of the results of analysis of irregular structures with regular structure is done.

S.Mahesh, B.Panduranga Rao, 2014, The behaviour of G+11 multistory building of regular and irregular configuration under earth quake is complex and it varies of wind loads are assumed to act simultaneously with earth quake loads. In this paper a residential of G+11 multistory building is studied for earth quake and wind load using ETABS and STAAS PRO V8i .Assuming that material property is linear static and dynamic analysis are performed. These analysis are carried out by considering different seismic zones and for each zone the behaviour is assessed by taking three different types of soils namely Hard , Medium and Soft .Different response like story drift, displacements base shear are plotted for different zones and different types of soils.

III. Conclusion on Literature Review

1) The seismic design approach, in both the versions, is based on designing a strong and ductile structure, which can take care of the inertial forces generated by earthquake shaking. Unlike previous version of 1984, the latest 2002 version clearly reflects that design seismic force is much lower than what can be expected during strong shaking.
2) In IS:1893-1984 version, seismic coefficient method yields higher values of base shear relative to response spectrum and modal analysis method.
3) Seismic forces in upper storeys of buildings obtained by modal analysis method are significantly less.
4) Forces obtained as per IS:1893-2002 are significantly higher than that computed as per recommendations of IS:1893-1984.
5) Relative difference in the design seismic forces as per the two versions varies with the building properties and therefore existing buildings designed as per earlier code be analyzed on individual basis so as to assess the vulnerability for future shocks.

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