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# Seismic Analysis of Reinforced Concrete Building for Dynamic Characteristics of Ground Motion

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***Abstract:*** ***Earthquake is the result of sudden abortions in the Earth's crust that generate seismic waves. Ground shaking and rupture are major effects generated by earthquakes. To take precautions to damage life and damage the structures due to ground motion, it is important to understand the characteristics of motion of the ground.***
***Current review report deals with the frequency content of ground speed on reinforced concrete (RC) buildings. Linear time history analysis have to be perform in the structural analysis and design (STAAD Pro) software. The proposed review is to study the reaction of low, middle, and high-rise reinforced concrete buildings under low, intermediate and high-frequency content in ground motions. Regularly three-dimensional two, six and twenty-storey RC buildings have low, intermediate and high frequency content with six ground speeds, in which the same period and peak ground acceleration (PGA) will be consider. In response to story displacement, story velocity, story acceleration and ground shear in the base shear, the response of the buildings shall be studied. For each type of building, the responses of each ground motion will studied and compared.***
***Keywords: Reinforced concrete building, ground motion, peak ground acceleration, frequency content, column beam joint ratio, time history analysis.***

## I. INTRODUCTION

Stress stored in waves of earthquake is the result of the rapid release of energy which produces seismic waves. Structures are weak to sustain ground motion and harm the structures. To take precautions to damage the structures due to ground motion, it is important to know the characteristics of the motion of the ground. The most important dynamic features of earthquake are peak ground acceleration (PGA), frequency content and duration. These characteristics play major role in studying the behavior of structures under the motion of earthquake prone area.
Severe earthquakes rarely occur. Although it is technically conceivable for designing and constructing structures for the events of this earthquake, it is considered to be the most non-economic and unnecessary to do this. Seismic design is done with the hope that there will be some destruction as a result of the fierce earthquake, and on this basis a seismic design philosophy has been created through the years.
The purpose of seismic design is to constraint the damage to a suitable percent in a structure. The structure prepared in this manner should have the ability to resist the slightest level of earthquake without damage, which has to face the middle level, earthquake without structural damage, however, the possibility of some non-structural damage, and without collapse, has to face important levels of ground speed, yet with some structural and addition non-structural damage. In the upcoming work, two, six and twenty-storey regular RC buildings are subjected to six landed aspects of low, intermediate and high frequency content. Buildings will be prepared in three dimensions and the linear time history analysis has to done using structural analysis and design (STAAD Pro) software.

## II. LITERATURE REVIEW

In the review of literature, the features of the motion of the ground, which play important roles in seismic analysis of the structures, were explained. Then the behavior of RC buildings under seismic load is represented. There are some research related to seismic behavior of structures under frequency material.No research work is done on seismic behaviour of RC buildings under low, intermediate, and high-frequency content ground motions considering column beam joint ratio.
Rathje, et al. (1998)[1] Studied three simplified frequency materials, which are average duration (Tm), major period (Tp), and smooth spectral period (Tp). He calculated the frequency parameters for 306 speed records from twenty earthquakes. They used the data to develop a model to describe the distances of the site's reliability, magnitude and frequency content parameters. Evaluation of model coefficient and standard error conditions is done through nonlinear regression analysis. Their results show that the prediction of the traditional Tp parameter is the most uncertain and the earlier correlation was suggested that Tp's prediction is incredible with their current data set. In addition, the best frequency content characterization parameter is Tm.

Chin-Hsun (1990)[14] proposed a new stochastic model of excitement in which frequency is both time dependent. The proposed ground motion model can be effectively employed in simulation as well as reliability study of random vibrations and nonlinear structures. A single static non-static system and Monte Carlo simulations are found to respond without constant biaxial ground speeds or without damaged single-mass non-linear systems and three-story space frames.
Their results indicate that the time varying frequencies and ground frequencies are close to the structural natural frequency. Apart from this, biaxial and twist response in an asymmetrical structure can be remarkable.
Şafak & Frankel (1996)[7] studied the effects of motion characteristics of the ground on the response of the base-isolated structures. They presented the feedback of base structures in two models to show the effects of ground motion characteristics. He considered one and three-dimensional velocity model for six and seven-Storeyed base isolated buildings, which are subjected to ground motion. Their results indicate that the efficiency of base Isolators is very dependent on the frequency characteristics as well as the dimension of ground motion.
Mwafy & Elnashai (2001)[8] Studied static pushover vs. dynamic collapse analysis. He studied natural and artificial ground speed data on twelve RC buildings of different characteristics. Reactions of more than one hundred non-linear dynamic analyzes are used to create dynamic pushover envelopes and compare with pushover results with different load patterns, using a detailed 2D modeling approach for each of the twelve RC buildings. They established good relation between dynamic analysis and calculated ideal envelopes of stable pushover results for a certain class of structure.
Pankaj & Lin (2005)[10] modeled the material in seismic reaction analysis for the design of RC frame structures. He used two similar continuum plasticity material models to observe the effect of material modeling on the seismic reaction of RC frame structures. In one model, reinforced concrete has been formulated as an identical material by using an isotropic Drucker-Prager yield state. In Model Two, concrete and reinforcement have been freely included on the basis of the Drucker-Prager criteria; later on, the strain softening in tension consider. Their results indicate that response feedback from reaction history analysis (RHA) is quite different for both models.
Sarno(2013)[11] studied the effects of many earthquakes on inelastic structural response. Five stations are selected to point to a set of sites that come in contact with the different earthquakes of different dimensions and source-to-site distance. Three of the tenths of the records taken at these five places are selected for each venue, which reflects the leading and lagging states of powerful land movement. RC frame analysis is subject to the same set of ground motion used for the response of RC frame, not only verify that many earthquakes are comprehensive and need urgent studies, but rather the lack of conservatism in the protection of structures traditionally when subject to various earthquakes.
Cakir (2013)[3] Studies the evaluation of the effect of earthquake frequency content on the seismic behaviour of cantilever retaining wall associated with soil-structure interaction. They carried out a 3D backfill-structure-soil / foundation conversation event through the finite element method to analyze the dynamic behaviour of the cantilever that maintain the wall under various ground motions. They evaluated soil structure using the effects of earthquake frequency content as well as five separate ground motion and six different types of soil. He also did analytical formulation using the modal analysis technique to examine the finite element model verification, and he made a very good agreement between numerical and analytical results. In the end, they made the method comprehensive to examine the effects of parametric effects not only the frequency of earthquake, but also the interaction of soil / foundations and nonlinear time history analysis. Their results indicate that with the change in properties of soil, some displacements are made on tension reactions under lateral displacement and various ground speeds. He briefly said that the dynamic response of the Cantilever wall is susceptible to the frequency characteristics of earthquake records and the interaction of the soil structure.
Stefano & Pintucchi (2008)[12] Research on seismic behaviour of irregular buildings. He reviewed three areas of research. First, the impact of planning-irregularity using a single-story and multi-story building model Using base isolation and other types of equipment, there is an inactive control as an approach to reduce secondary effects. Third, concerns a vertical irregular structure and setback buildings. However, fewer papers are published in the last one, it reports on progress and progress in seismic behaviour of irregular buildings at high altitude to show a growing interest within the experts in the state-of-the-art research field.
Nayak and Biswal (2013)[4] studied the seismic behavior of partially filled rigid rectangular tanks, which had lower downstream blocks. They used six different ground speeds of low, intermediate and high frequency materials to check the dynamic behavior of the tank liquid-submerged block system. They established a Velocity capability-based Galerkin finite element model for analysis and the effect of submerged blocks on the impulsive and sensory response components of hydrodynamic behavior in the context of the base transverse moment, the base shear and the pressure distribution enumerated with both the tank and the block wall shown. The magnitude of related physical reactions are less than the peak impulsive response components of dynamic physical parameters, in all the grounded studies studied for exploration, regardless of their frequency content.

Apart from this, impulsive feedback is almost not dependent on the frequency content of ground speed and is dependent on PGA, which is a measure of the intensity of the earthquake. However, sensitized response is strongly affected by the frequency content of the soil stimulation. The effect of the down-mounted submerged blocks has a great impact on the overall mobility of the tank-liquid system, and such effects vary widely due to seismic motions of various frequency materials.

A S Patil (2013)[13] studied nonlinear dynamic analysis of Ten storied RCC building considering different seismic intensities is carried out and seismic responses of such building are studied. The building under consideration is modeled with the help of SAP2000-15 software. Five different time histories have been used considering seismic intensities V, VI, VII, VIII, IX and X on Modified Mercalli's Intensity scale (MMI) for establishment of relationship between seismic intensities and seismic responses. The results of the study shows similar variations pattern in Seismic responses such as base shear and storey displacements with intensities V to X. From the study it is recommended that analysis of multistoried RCC building using Time History method becomes necessary to ensure safety against earthquake force.

## III. OBJECTIVE AND SCOPE

To study the response of low, mid, and high-rise regular three-dimensional RC buildings with a beam column joint ratio under low, intermediate, and high-frequency content ground motions in terms of story displacement, story velocity, story acceleration and base shear preforming linear time-history analysis using STAAD Pro software.

From the three dynamic characteristics of ground motion, which are PGA, duration, and frequency content, keeping PGA and duration constant and changing only the frequency content to see how low, mid, and high-rise reinforced concrete buildings behave under low, intermediate, and high-frequency content ground motions.

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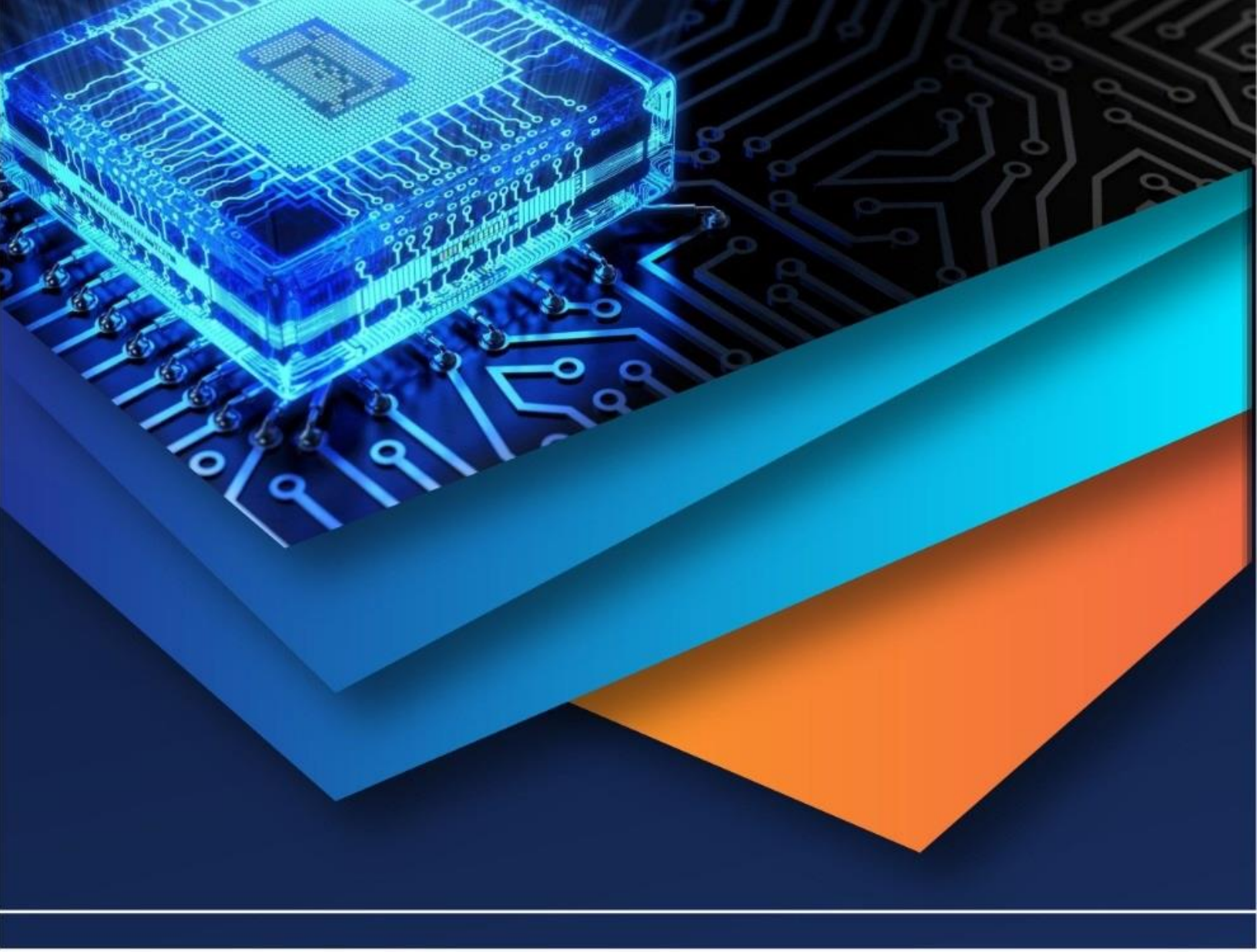

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