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REVIEW PAPER ON SEISMIC ANALYSIS OF RCC FRAME STRUCTURES WITH FLOATING COLUMNS

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ABSTRACT

The purpose of the study of seismic response of a building is to design and build a structure in which the damage to the structure and its structure component by earth quake is minimized. The paper aims towards the review of study of dynamic structural behaviour of simple configuration and complex configuration multi storey building with floating column conducted by various authors in the past. The analysis is done on building models having different numbers of storey of RCC with simple and complex floor plan with floating columns. Finite element base software namely ETABS, Staad pro v8i, for the analysis which can easily determine the parameter such as lateral forces, bending moment, shear force, axial force, storey shear, storey drift, base shear. Time history method or response spectrum method is used for the dynamic analysis for simple and complex building configuration. With different level of forces along the height of the building, non-linear dynamic analysis or inelastic time history analysis is the best method to describe the actual behaviour of the building. Dynamic action is caused on building by both wind and earthquakes. Torsional effect on the complex shapes will undergo unacceptable structural seismic behaviour.

Keywords*: *floating columns,Staadpro,dynamic effect, finite element analysis, torsion, seismic design.

I. INTRODUCTION

In earthquake design the building has to go through regular motion at its base, which leads to inertia force in the building that consecutively causes stresses. For earthquake resistant design the normal building should be able to resist minor, moderate, sever shaking. In the circumstances of the building, simple shape configuration building transfer the earthquake force in the direct path to the base while in complex shape building the load transferring path is indirect which leads to generation of stresses at the corners. During the violent shaking of earth the cantilever portion experience whiplash effect. Building tends to swing in the direction in which are more flexible and have larger rendering time period. Natural periods are controlled by mass and stiffness specification of the building. The elementary mode of oscillation is the rendering natural modes ofoscillation that also are the pure translational mode shapes and not from corner to corner or torsional oscillation. According to Indian seismic code 5% damping for all natural modes of oscillation for reinforced concrete building and 2% for steel structure is used. Building with large projections are not structurally accepted because they offer stresses are re-entrant corners. Stresses on columnon lower storey cause structural damage of building with floating columns during earthquake shaking. In soft storey building stiffness is lower as compared to upper

storey, so it is more suitable touse structural wall element in RCC building endure the strong earthquake shaking. Architects and structural engineers tackle earthquake design building with greater precision.

II. LITERATURE REVIEW

Nikhil Bandwal et al[8],2014 has studied the architectural complexities and various irregularities like floating columns at various level and location are analysed. The main focus of this paper is on the behaviour of such buildings during earthquake. Earthquake load in this building is considered according to IS 1893(Part 1) :2002. The critical position of internal floating columns , external floating columns of G+6 building is analysed. With the help of significant graph , the various parameters like displacement , moments and forces on columns and beams at various floor levels are compared and correlated to each other. Staad pro software is used for the design and analysis of the building. The author concluded that the torsional effect was experienced at the ground level.

Rohilla et al [4],2015 , In this paper need of floating columns in highly populated areas is understood, the behaviour and advantages of floating columns are discussed. Although the floating columns are not suitable for the earthquake active areas because it doesn't provide path to the earthquake forces to carried down in the ground. Building of G+5 and G+7 for zone 2 and 5 having irregular architecture is analysed for this paper. The shape and size of beams and columns is also analysed for the complex architecture. Etabs software is used to evaluate the parameters like storey drift, storey displacement and storey shear. Author concluded that floating column should be avoided in high rise building specially in earthquake zone 5 because it leads to storey displacement. And increasing in the size of beam and columns can improve the strength of building having floating columns.

Hardikbhensdadia conducted the study on the effect of floating column and soft storey in different earthquake zone by the help of seismic analysis. Performance level of building of design capacity carried out up to failure so the push over analysis is adopted which also helps in determination of collapse load and ductility capacity of the structure. SAP software analysis package is used to analyse three RC framed structured with G+4 , G+9 , G+15 storey. Base force and displacement of RC bare frame structure is also compared. TShe author concluded that the pushover analysis is the accurate and efficient method of analysis and the displacement of all models are less for lower zone and it goes on increase for higher zone.

Patil et al [4],2015 , In this paper the RC building G+5 storey is considered for seismic analysis. Three different models , normal structure, shear wall and masonry infill walls are analysed and compared. Method used for the analysis are equivalent static method , response spectrum method and time history method. Etabs software is used for the analysing the parameters. The conclusion of this paper, multi-storey building with shear wall performance best in earthquake among the three models.

Nutiyal et al[4] 2014 has studied the outcome of a floating column under earthquake for various soil condition. For the analysis process two models are considered having four storey and six storey building with special moment resting frame. Author did the variation in the positioning of floating columns, some were lifted from first floor, some from second floor and some from third floor. Staad pro software is used for the seismic spectrum analysis of all building models. For the medium soil, base shear value for medium soil are found higher than that of hard soil for both the models.

Mundada et al[4] 2014 has studied the architectural drawing and structural framing drawing of existing residential building G+7. Using the staad pro software equivalent static analysis is carried out on the three models, building withfloating columns, building without floating columns, building with floating column with struts. The author concluded that the possibility of failure with floating column is more than the floating column with strut and deflection is much larger in case of floating column than the deflection in floating column with struts.

Malaviya et al[4] 2014 has studied the aftermath on the cost analysis of structures design on staad pro. A 15m X 20m G+1 symmetrical structure building with floating column and without floating columns is considered for the study based on modelling analysis, design and estimation of the building the author concluded that the weight of concrete and steel is more in the case of building with floating columns than the building without floating columns and with the change of positioning of floating column, the quantity steel and concrete is also changed.

Sabari et al[4] 2014 has done the time history analysis of RCC frame structure of different stiffness. considering the building frame base fixed, the author has created artificial stimulation of earthquake similar to bhuj earthquake ground motion with the help of FEM Package SAP 2000. The various parameters like base shear, roof displacement, axial force, storey drift were considered. By changing the column size dynamic analysis is carried out and concluded that with increase in column size, the maximum deflection and inter storey drift are reduced.

Srikanth et al[4] 2014 has performed the whole work consist of four models i.e., models, FC (floating column is provided in particular floor, location),FC+4(floating column is provided by rising height by 4m), FC+HL(floating column is provided by applying heavy load), FC+4+HL(floating column is provided by rising the storey height by 4m). The design methodology employs the fully combined process that allow modelling, analysing, designing. The author concluded that complex building will undergo whiplash effect under earthquake shaking. The models experience less displacement value for lower zone and goes on increase for higher zone.

III. SUMMARY OF RESEARCH NEEDS

The present study models is limited upto the height of 40m special resisting moment frames building with simple configuration for medium soil condition having parameters bending moment , shear force , storey drift , storey shear, axial forces. Whereas in complex configuration building lot of scrutiny yet to be done. The unsymmetrical models which will show the irregular pattern due lack of data. The building with complex configuration with floating column should be monitor for roof deflection. Future investigation should be concerted on the modes shape which reflect the actual structural behaviour of the building.

REFERRENCES

[1]. Nikhil Bandwal, AnantPande, VaishaliMendhe, AmurtaYadav “To study the seismic behaviour of RC building with floating columns.” Vol .03,Issue.08. May- 2014.

[2]. IshaRohilla, S.M Gupta,BabitaSaini "Seismic response of multi-storey irregular building with floating column." Vol.4 Issue03 March 2015, PP 506-518.

[3]. Hardik, Sidharth Shah "Push over analysis of RC frame structure with floating column and soft storey in different earth quake zone." Vol.04 Issue 04 April 2015, PP 114-121.

[4]. UmeshP.Patil, Shaivanand s Hallur. "Seismic Analysis of G+5 framed structure with and without using floating columns using ETABS- 2013 software." PP 1482-1489.

[5]. PrernaNautiyal, SaleemAkhtar and GeetaBatham, "Seismic Response Evaluation of RC frame building with floating column considering different soil condition". Vol4 Feb 2014,PP 132-138.

[6]. A P Mundad , S.W Sawdatkar "Comparative seismic analysis of multi-storey building with floating column and without floating column" Vol .04 Issue 05 Oct 2015 , pp 3395-3400

[7]. Malaviya , Saurav " Comparative study of effect of floating column on the cost analysis of a structure designed on staad pro" vol .05 Issue05 May- 2015

[8]. Agarwalpankaj , Shrinkhande Manish (2009) , " Eathquake resistant design of structure " PHI learning private limited , New Delhi

[9]. Srikanth ,Yogeendra "seismic response of complex building with floating column " vol.02 Issue 04. 2014.

[10]. T . Raja Shekhar , " study of behaviour of seismic analysis of mulitstoried building with and without floating column".