Seismic Analysis of RC Frame – A Parametric Study

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***Abstract*— The analysis of high rise building is quite complicated in view of large number of redundants involve. There are different methods by which a frame of multistory can be analysed, and the design of such frame is affected more by lateral loads than by gravity forces. Present study deals with the analysis of multistoried building (upto14 story) subjected to earthquake force. A complete parametric study is carried out for this frame. Effect of column stiffness, effect of number of bays, and building height etc. is studied. This building is assumed to be located in Mumbai. The earthquake load analysis is carried out using software namely SAP2000.**

Keywords—Seismic Analysis, Stiffness, RC frame

I. INTRODUCTION

Due to spiraling rise in cost of land, tall structures are being constructed in present day. These multistorey high structures require a small size of costly land and provide required floor area. The analysis of high rise building is quite complicated in view of large number of redundants involve. There are different methods by which a frame of multistory can be analysed, and the design of such frame is affected more by lateral loads than by gravity forces. Tall buildings are generally those buildings whose lateral dimension are less than or comparable to height of structure. The response of such type of structure to lateral loading becomes critical since stability of structure against lateral loading governs the design. For a structural designer a multistory building can be defined as one whose structural system must be modified to make it sufficiently economical to resist lateral forces due to wind or earthquake within prescribed criteria for strength, drift and comfort of the occupant.

II. STUDY OF BUILDING FRAME

Parameters studied are pertaining to 14 storey building frame

A. sizes of column are varied as
0.3 x 0.3, 0.3 x 0.4, 0.3 x 0.6, 0.3 x 0.7, 0.3 x 0.8, 0.3 x 1.0, 0.3 x 1.2, 0.3 x 1.4

B. No. of bays considered are
Single, Two bay, Three bay

The 14th storey single bay, two bays and three bays are also studied with and without diaphragm as shown in fig. 2.1

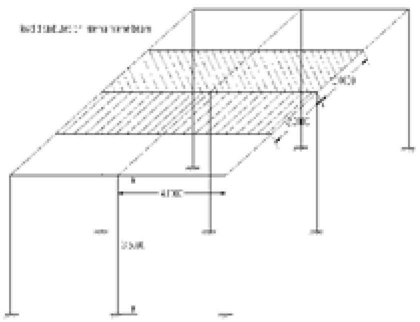

Fig 2.1 Intermediate frame considered for the analysis

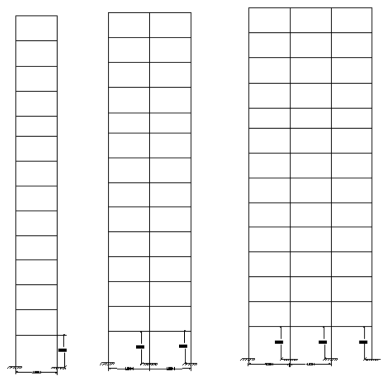

Fig 2.2 Frame model considered for the analysis

III. EFFECT OF COLUMN STIFFNESS

A. Single bay frame (without diaphragm):

Column moment: With the increase in stiffness of column the moment in column increases continuously from negative value towards positive value. If each model of different column stiffness considered separately the column moment decreases from bottom floor column towards top floor column up to certain floor and then again increases toward negative value. As shown in fig 2.3

Beam moment: With the increases in stiffness of column the moment in beam decreases continuously. If each model of different column stiffness considered separately the beam moment increases from bottom floor beam towards top floor beam up to certain floor and then again decreases continuously. As shown in fig 2.4

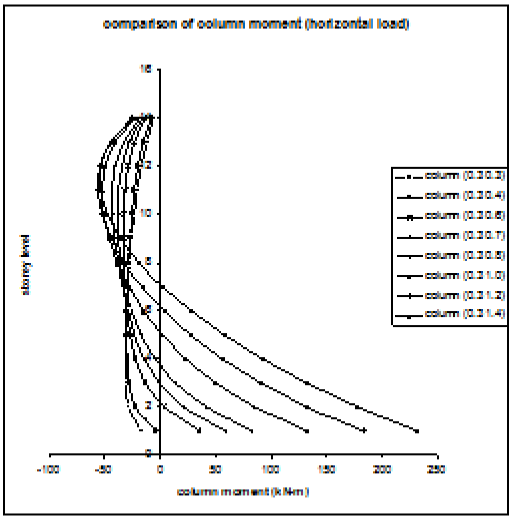

Fig.2.3 comparison of column moment

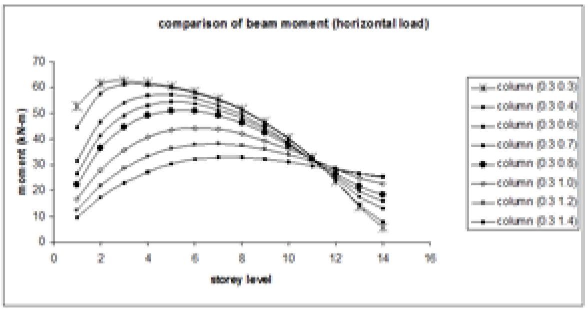

Fig.2.4 comparison of beam moment

B. Single bay frame (with diaphragm):

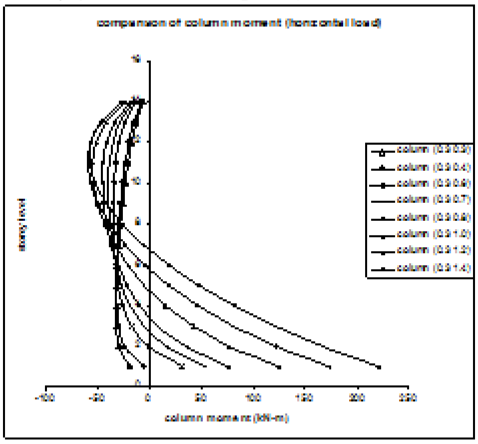

Fig 2.5 Comparison of column moment

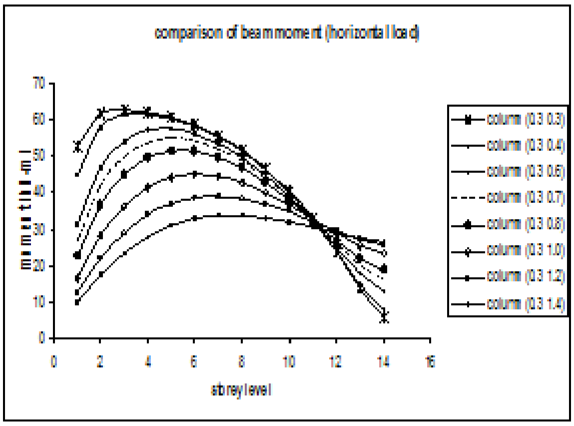

Fig.2.6 Comparison of beam moment

C. Two bay frame (without diaphragm):

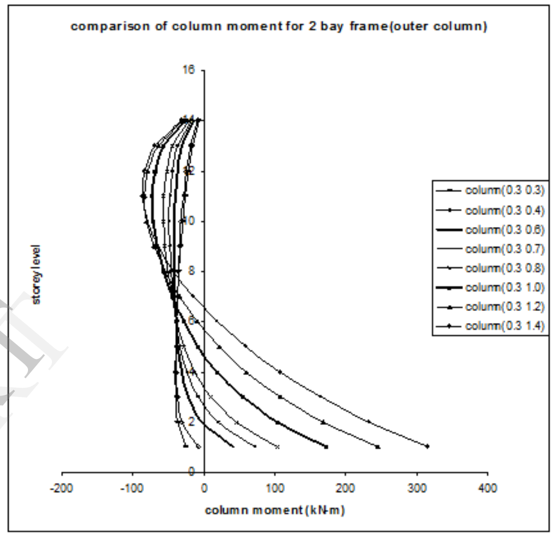

Fig.2.7 Comparison of column moment

D. Two bay frame (with diaphragm):

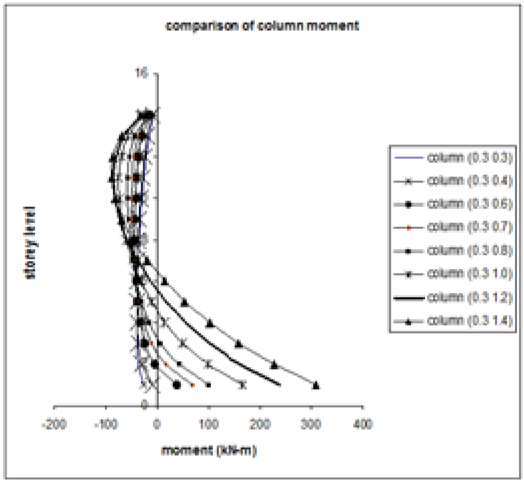

Fig.2.8 Comparison of column moment

E. Three bay frame:

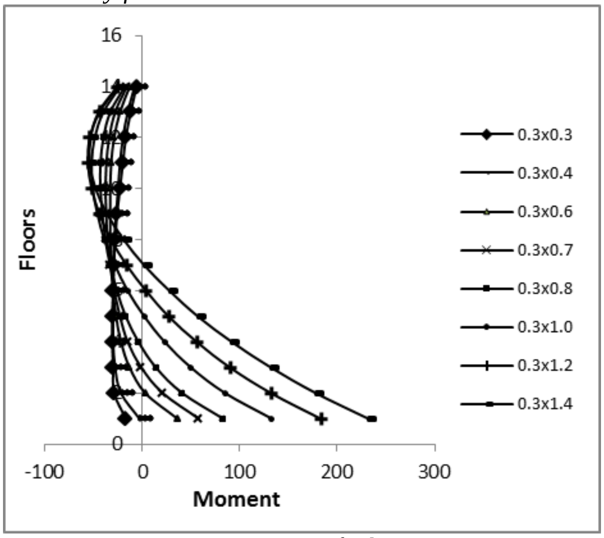

Fig.2.9 Comparison of column moment

IV. CONCLUSION

As the stiffness of column increases the moment in the same floor level beam decreases. However if 14 story frame is considered, the beam moment increases up to certain floor, in middle portion moment nearly constant and then again reduced up to top story.

As the stiffness of column increases the moment in same floor level column increases continuously from negative value towards positive value. However if 14 story frame is considered, the column moment decreases up to certain floor, then again increases up to top story.

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