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PARAMATRIC STUDY OF BUILDING SUBJECTED TO SEISMIC POUNDING EFFECT – REVIEW PAPER

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Abstract: *in INDIA multistory building construction become nearer and nearer because shortage of land to build good residential building. Where human live there good life with their family. This less gap between two buildings faced more problems in construction and also problem accurse after construction because of earthquake. While earthquake effect on high rise multistory building faced pounding effect occur on adjusted buildings.*

Keywords: *Pounding Force, Earthquake, Time History Analysis, Link Force, ETABS, Adjusted Buildings*

I. INTRODUCTION

A. GENERAL

Pounding means building collided with each other while earthquake occur because of less distance of separation. By this seismic pounding building will damage partially or fully collapse. Seismic pounding will generate by both building different mode shape, different weight distribution & center of gravity of building is different. Pounding effect was at storey level or at middle of column. By building deflection seismic pounding occur. For control deflection in building assign shear wall, bracing & dampers in building.

In IS 4326 "EARTHQUAKE RESISTANCE DESIGN AND CONSTRUCTION OF BUILDINGS CODE OF PRACTICE" gives distance of separation of two adjusted building. This given GAP distance are given below in Table no 1,

Table 1 Seismic Pounding GAP for different structures

Sr No.	Type of Construction	Gap Width/Storey, in mm for design seismic coefficient ah= 0.1
1	Box system or frames with shear walls	15.0
2	Moment resistant reinforced concrete frame	20.0
3	Moment resistant steel frame	30.0

B. TIME HISTORY ANALYSIS

This technique is known as to be most sophisticated and accurate technique for dynamic analysis of building. In this study time history analysis are performed by considering the past earthquake vibration data, which can be find on some website for analysis. For time history analysis in ETABS software assign steps and time interval for analysis. Steps and time interval set a time for analysis in second. Mostly step is 1000 and time interval is 0.01 second which is analysis time is 10 second.

II. LITERATURE REVIEW

A. SEISMIC POUNDING BEHAVIOR OF MULTI-STORY BUILDINGS IN SERIES CONSIDERING THE EFFECT OF INFILL PANELS: ENGINEERING STRUCTURE 144, JAN 2017, PG. NO: 139-150

(Elwardany, Seleemah and Jankowski 2017)

ElwardanyHytham et al studied on effect of pounding effect on series considering buildings by infill panel. In this paper 3 models in ADINA software (1): Bare frame, (2): Fully In-filled frames, (3): Open first storey. Buildings are G+2 and G+1 storey buildings.

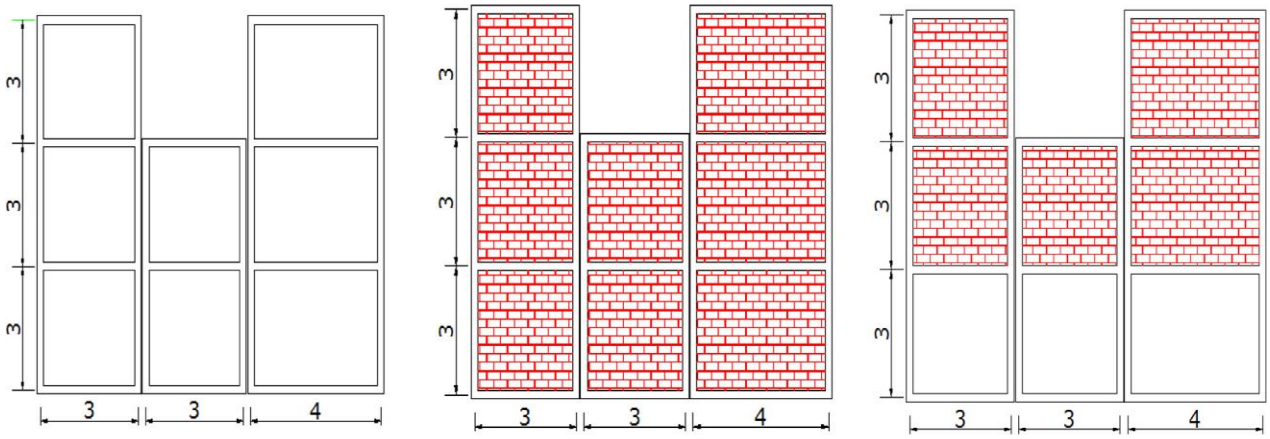

Figure A-1 Building under study

In this three cases gap was change from 30 mm to large separation gap. 30 mm gape study for pounding effect and large separation for no pounding effect and compare all case for study analysis result. Analysis by Northridge earthquake with PGA = 8.64 m/s^2

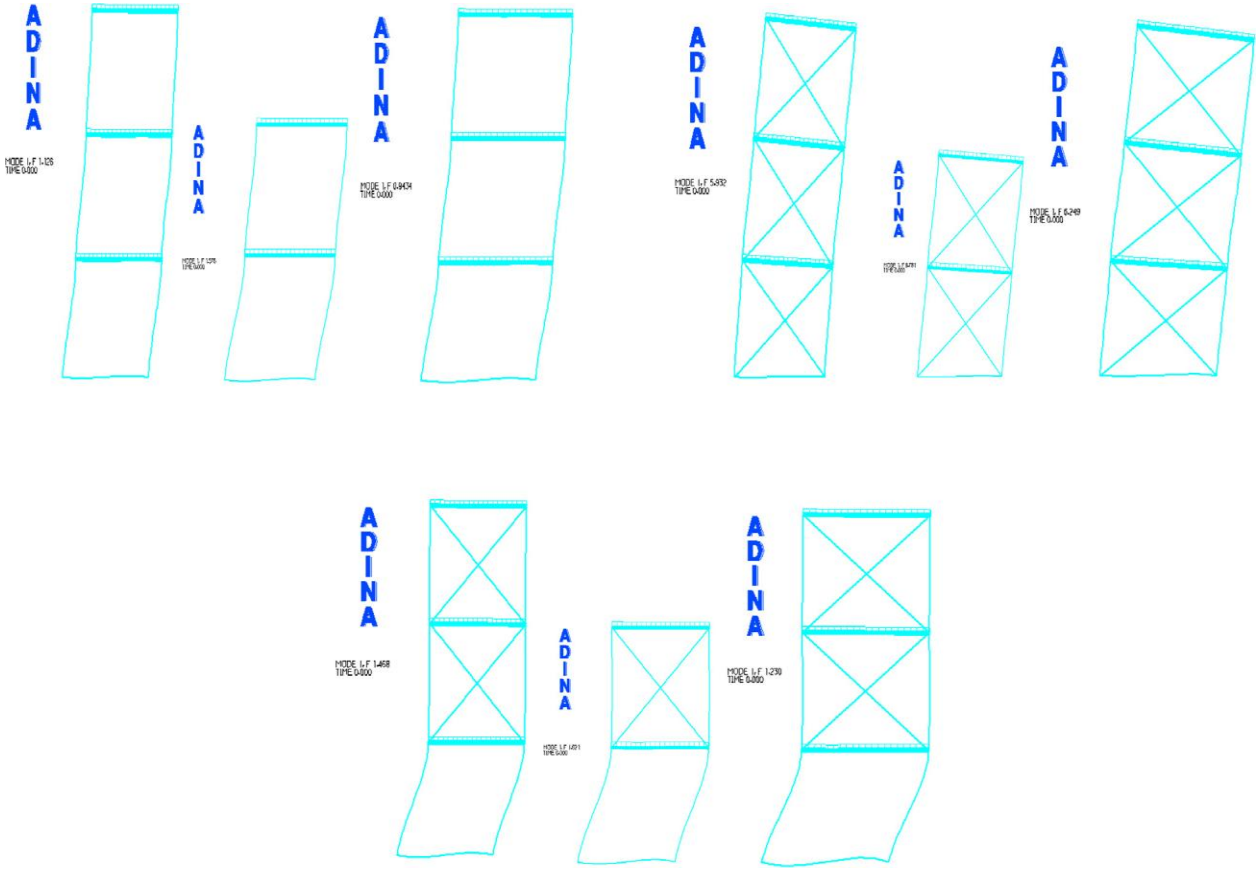

Figure A-2 First mode shapes for different cases

In-filled wall stiffness was more compare to bare frame structure. Open first storey building was displacing more compare to in-filled wall. In-filled wall structure displace less compare to bare frame structure.

B. SEISMIC POUNDING OF MULTISTORIED BUILDINGS: INTERNATIONAL JOURNAL OF RESEARCH IN ENGINEERING AND TECHNOLOGY (IJRET), ISSN: 2319-1163, NOV-2013, PG. NO: 12-17 (Khaja and Vidyadhara 2013)

KhajaAfroz and H.S.Vidyadharastudied on effect of shear wall location on building stiffness. In this paper 5 models in ETABS software (1): 50 mm gap between building, (2): 75 mm gap between building, (3): 100 mm gap between building, (4): 50 mm gap with shear wall SW1, (5): 50 mm gap with shear wall SW2. Model G+12 and G+9 storey building for analysis. Plan and elevation of building are given below,

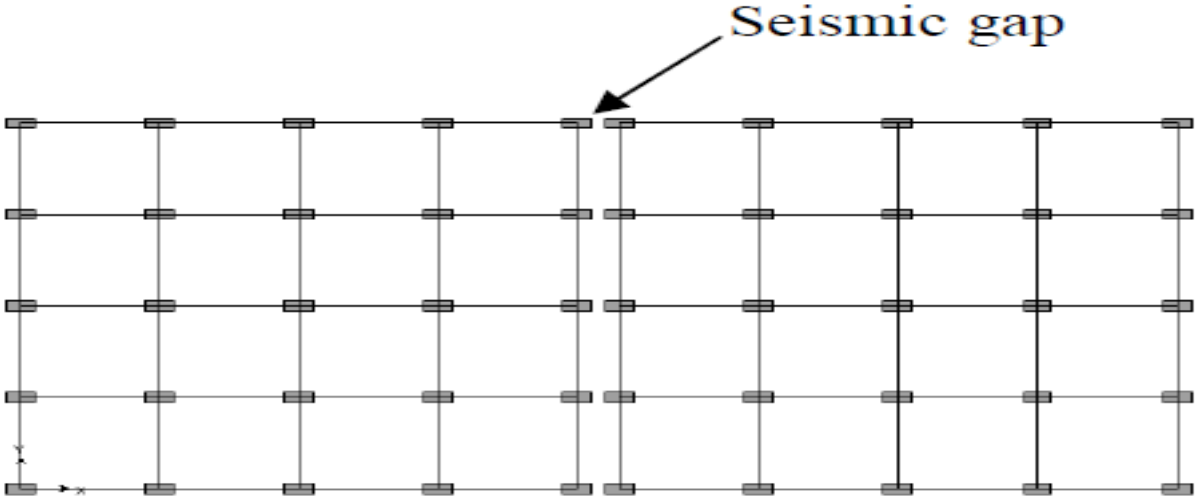

Figure B-1 Plan of Building

In this paper Analysis by El-Centro earthquake by SRSS method. Location of SW1 was outer side and location of SW2 was inner side.

In this paper they discuss separation gap between building more damage of building decrease. Shear wall location was also effect on pounding effect. Shear wall outer side very effective then inner side shear wall.

C. EFFECT OF GAP BETWEEN BUILDING ON SEISMIC POUNDING FORCE: INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN SCIENCE AND ENGINEERING (IJIRSE), VOLUME: 02, ISSUE: 06, JUNE- 2016 (Patil and Dr.Prof. Talikoti 2016)

PatilJagruti and Dr.Prof.Talikoti.R.Sstudied on separation gap between two adjacent buildings. In this paper building was G+13 and G+8 storey buildings with 50 mm, 80 mm, 110 mm, 140 mm, 170 mm, 200 mm, 230 mm, 260 mm separation gap and analysis by Imperial Valley earthquake.

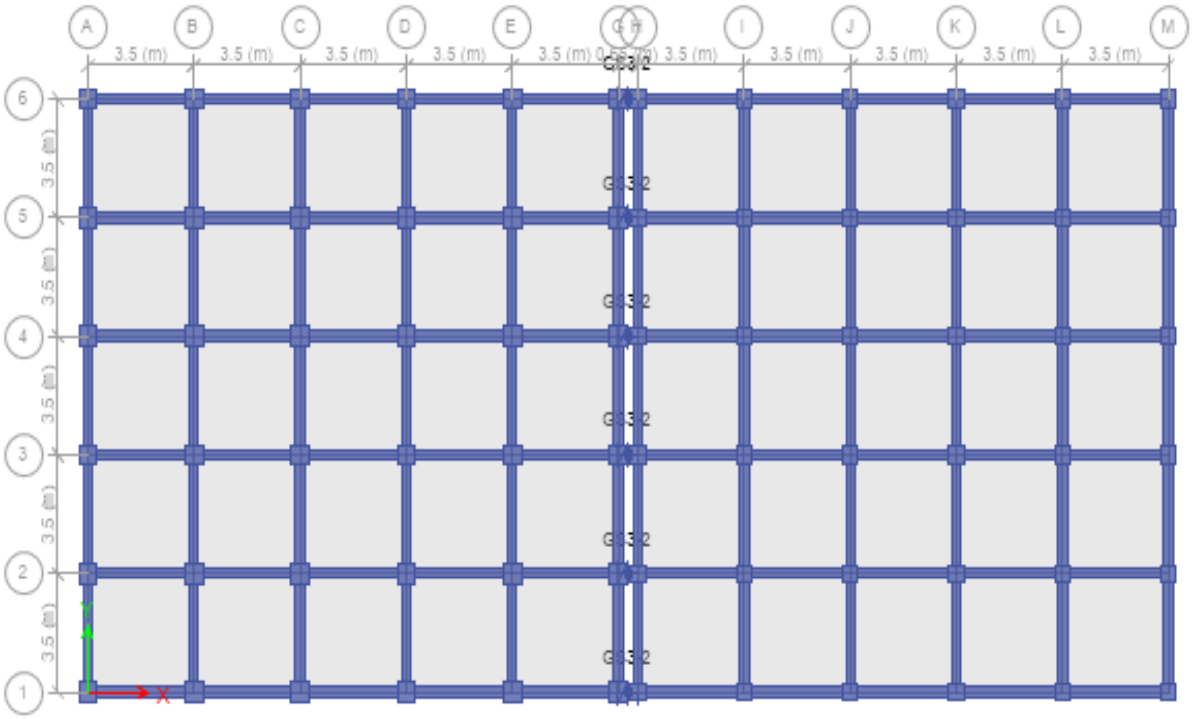

Figure C-1 Plan of Building

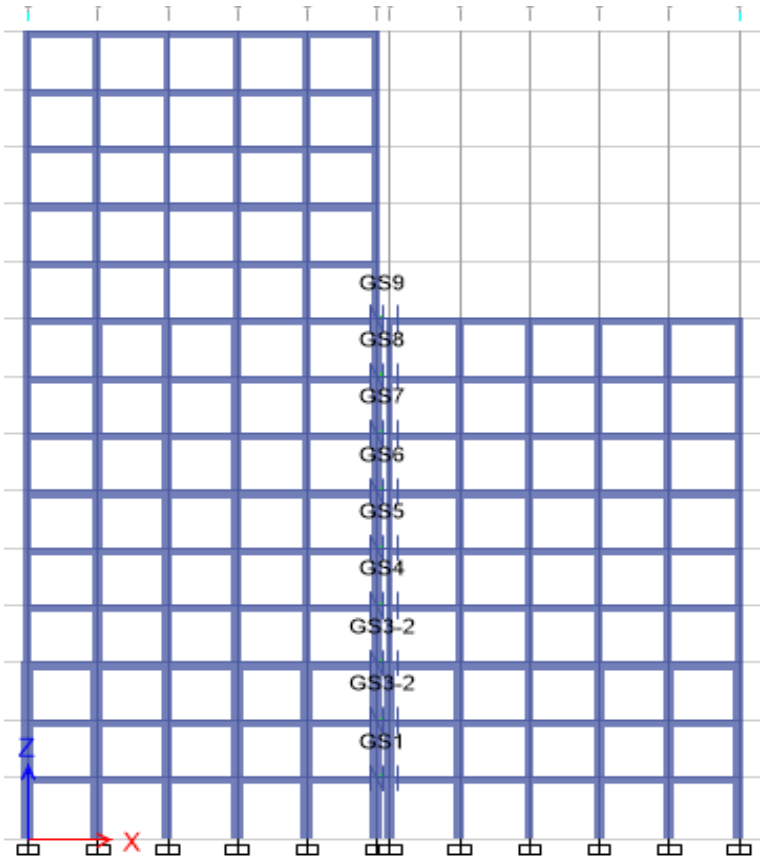

Figure C-2 Elevation of Building

After analysis results are given below,

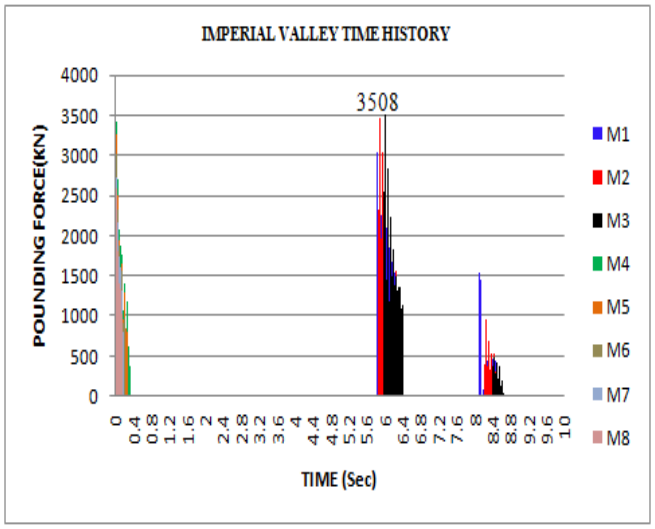

Figure C-4 variation of maximum impact force

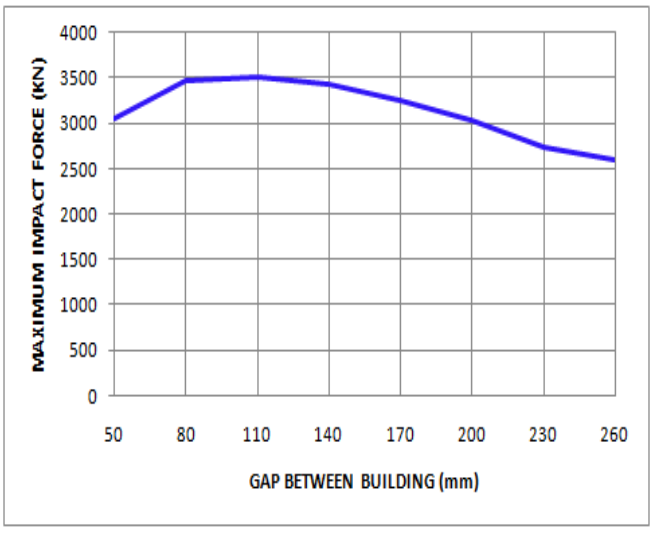

Figure C-3 Time history of pounding force at Roof level

The gap between the buildings plays import role as far as pounding concern. Primarily the maximum impact force increases as gap increases and then after it goes on decreasing. Maximum pounding force at 110 mm separation gap between two buildings.

D. ANALYSIS OF SEISMIC POUNDING BETWEEN ADJACENT BUILDINGS: INTERNATIONAL RESEARCH JOURNAL OF ENGINEERING AND TECHNOLOGY (IRJET), ISSN: 2395-0056, VOLUME: 04, ISSUE: 05, MAY-2017(Karamadi and Togarsi 2017)

KaramadiAsharani B and TogarsiRajanistudied different floor level effect on pounding. In this research paper model a G+10 and G+15 storey buildings with 50 mm separation gap with different floor level 3 m and 3.5 m floor height. This research paper study the seismic pounding does on affect the base shear and storey force.

E. EFFECT OF SEISMIC POUNDING BETWEEN REINFORCES CONCRETE BUILDINGS: INTERNATIONAL JOURNAL OF LATEST TREADS IN ENGINEERING AND TECHNOLOGY (IJTET), ISSN: 2278-621X, VOLUME: 07, ISSUE: 02, JULY 2016(Arpitha and Umadevi n.d.)

Arpitha K and Umadevi R were studied on different model of buildings with setback. In this paper they model different model with same building height and different building height, with same floor level and with different floor level and with 5 m setback at right hand side building. They model G+8 and G+5 storey building with 80 mm separation gap and model was analysis by El-Centro earthquake vibration data. In analysis they study displacement, acceleration and impact force for all 6 cases. In setback pounding force are more compare to other cases.

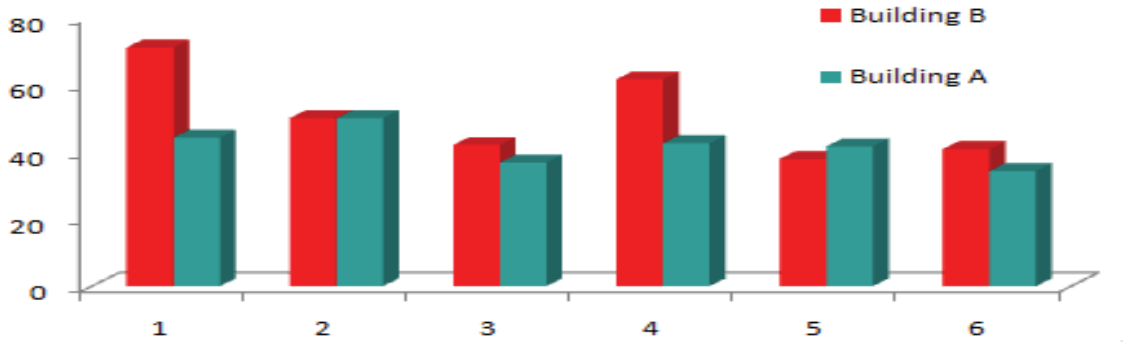

Figure E-1 Displacement of building A and B

F. SEISMIC POUNDING EFFECT IN BUILDING: INTERNATIONAL JOURNAL OF ADVANCEMENT IN ENGINEERING TECHNOLOGY MANAGEMENT AND APPLIED SCIENCE (IJAETMA), ISSN: 2349-3224, VOLUME: 01, ISSUE: 02, JULY-2014 (Tapashetti, S and Swamy 2014)

TapashettiAmrutaSadanand et al, was studied on different equipment for control displacement of building. This paper they use proper safe separation gap to control pounding and this model they compare with RC shear wall, steel cross bracings, RC shear wall and steel cross bracings combine system, dampers, RC shear wall and dampers combine system, Steel cross bracings and dampers combine system. In this paper model a G+6 and G+ 8 storey building in different file. Model both building in Sap2000 software and analysis in sap2000. In this paper analysis result only displacement of both buildings.

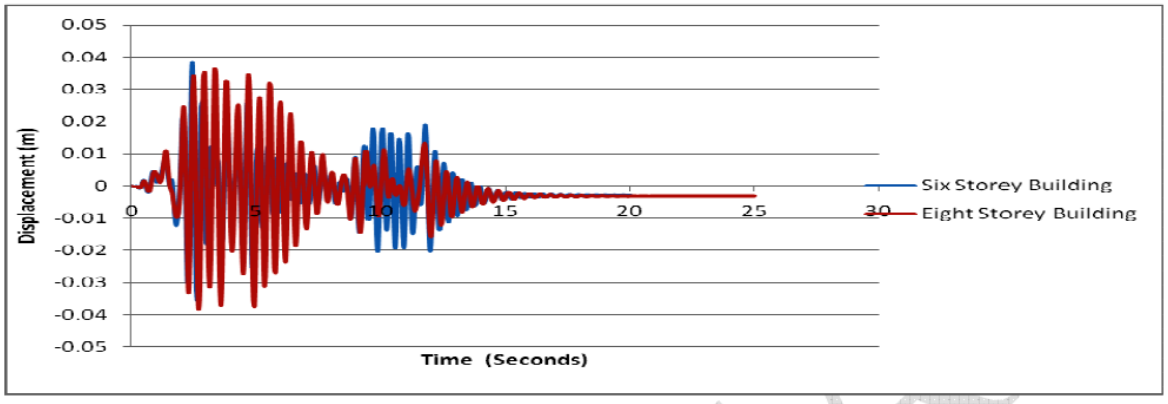

Figure F-1 Displacement Vs. time graph for RC shear wall

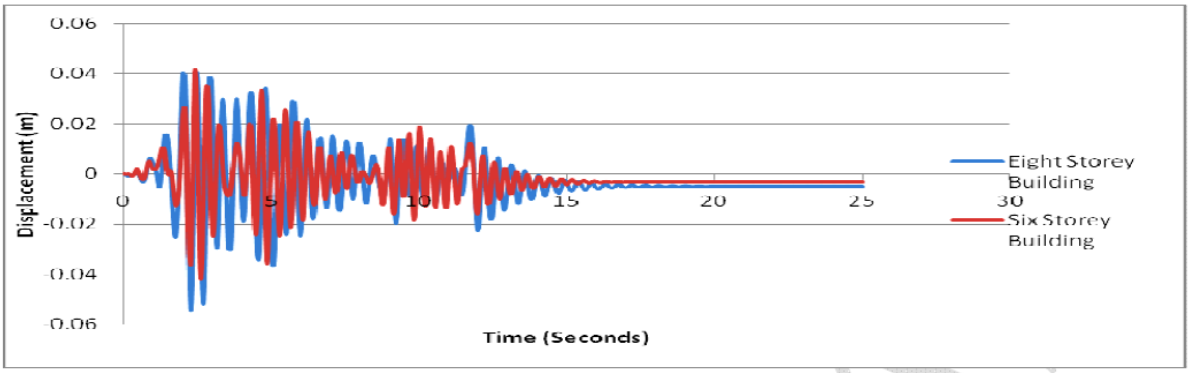

Figure F-2 Displacement Vs. Time graph for Steel cross Bracings

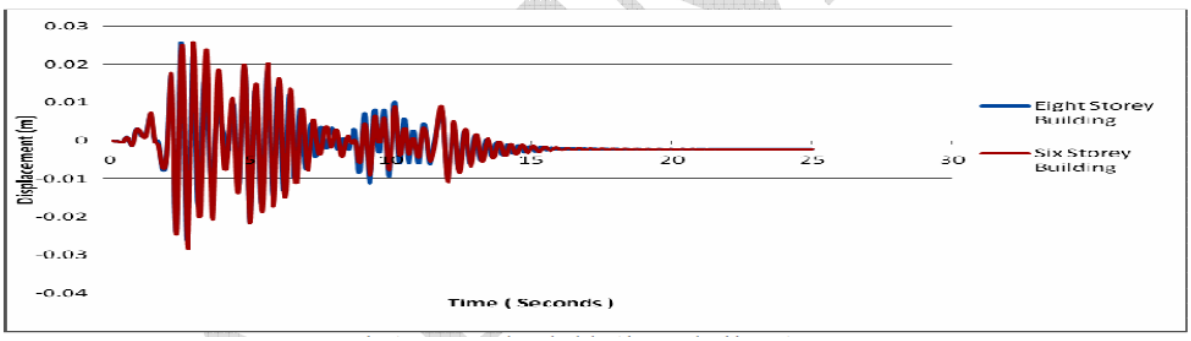

Figure F-3 Displacement Vs. Time Graph for Dampers

Stiffness of building can be increase by provide RC Shear wall, Steel cross bracing, Dampers. Old buildings have to follow privations against pounding. All the additional stiffness must be fixed to increase stiffness

G. PARAMETRIC STUDY ON SEISMIC POUNDING EFFECT IN BUILDING SYSTEM: INTERNATIONAL RESEARCH JOURNAL OF ENGINEERING AND TECHNOLOGY (IRJET), ISSN: 2395-0056, VOLUME: 03, ISSUE: 08, AUG 2016, PG. NO: 420-427 **(Sathish and Mr. Vasantha 2016)**

Satish T.B and Mr. Vasantha.Dwere studied on building pounding effect by sloppy ground with different geometry of buildings. In this paper they model G+12 and G+8 storey building with different building materials and different structure size. In this paper they analysis building by seismic zone II and Zone V.

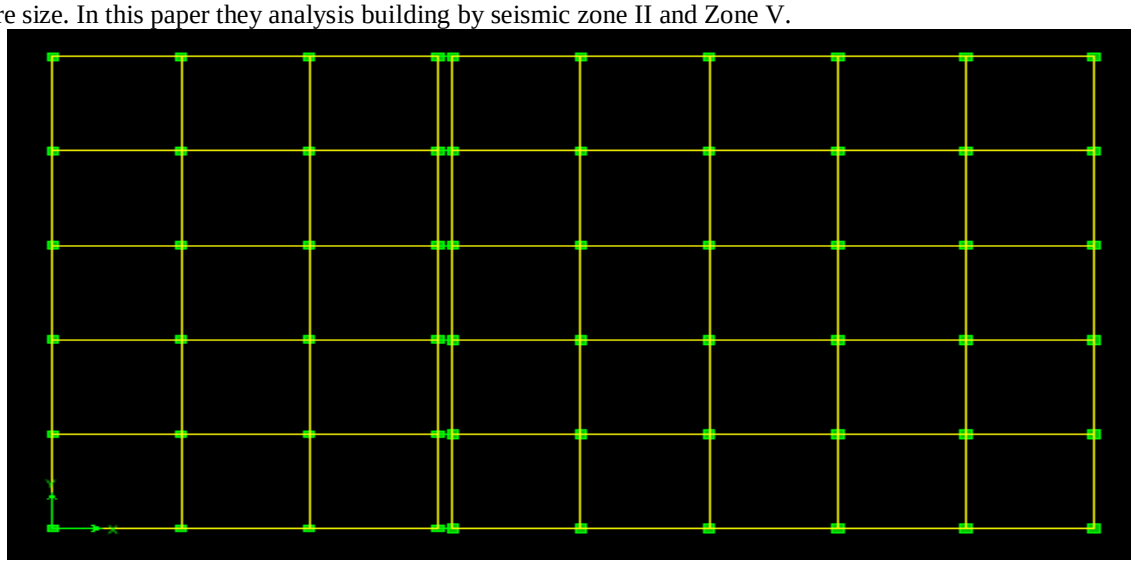

Figure G-1 Plan of Building

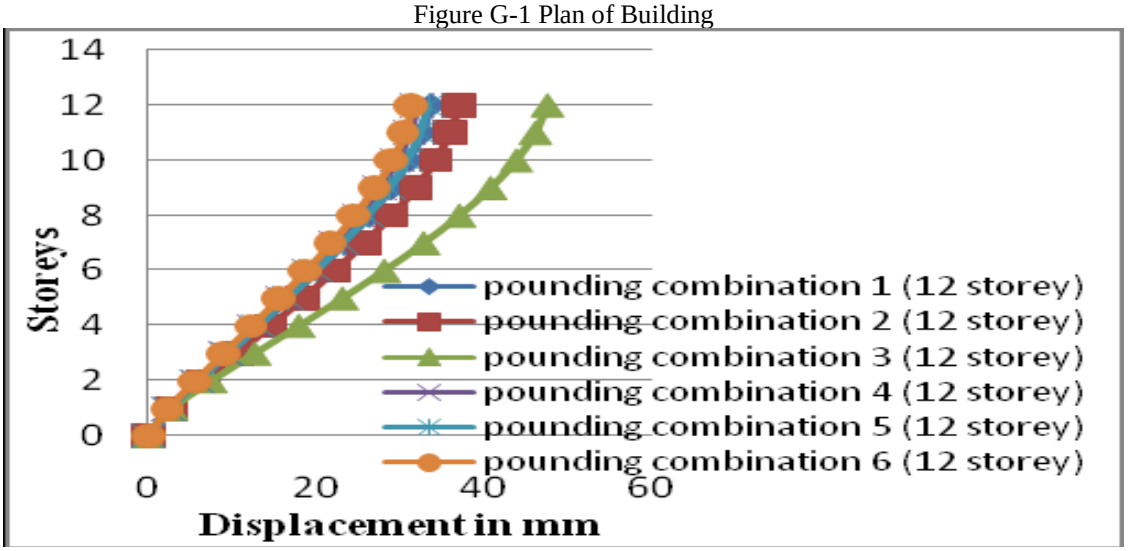

Figure G-2 Displacement of 12 story building at Zone II

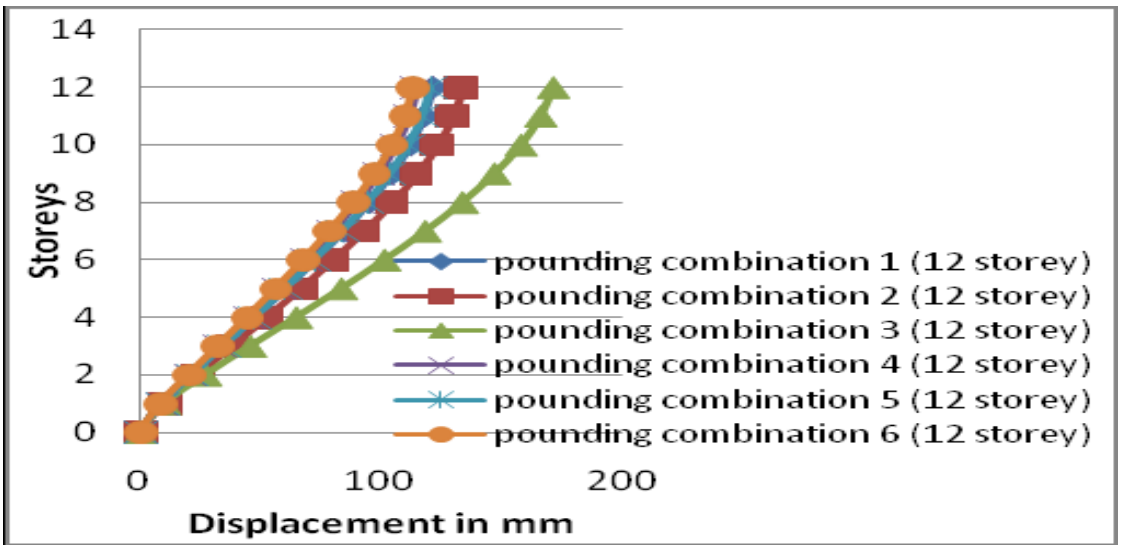

Figure G-3 Displacement of 12 storey building at Zone V

III. CONCLUSION

- During pounding smaller building experience more displacement and greater damage then larger building.
- In case of pounding constructing the buildings by providing safe separation distance between them is the best way of preventing structural pounding.
- Stiffness of buildings can be increase by providing shear walls, steel bracings, combination of both and dampers.
- Cable strengthening can be effectively use for existing building for control displacement.
- Soil structure interaction has a significant effect on low rise building.

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