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Seismic Behaviour of Reinforced Concrete Frame with Infill Walls

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ABSTRACT

This paper describe the behaviour of RC frame with G+6 storey with different masonry infill such as complete filled (CF), Bared frame (BF), Soft storey (SS), Partially Infilled (PI). Also analysis is done on additional set back option for RC frame, without making structure irregular to minimize the soft storey failure. The Non linear time history analysis for Elcentro and sanfernando earthquake is done and result are interpreted & compared for base shear, ground floor displacement, top floor displacement, seismic weight and overall damage index of overall structure

Keywords **–** Infill wall, Soft Storey, set back, displacement, overall damage index

I. INTRODUCTION

Infill-frames have been used in many parts of the world over a long time. In these structures, exterior masonry walls and/or interior partitions, usually regarded as nonstructural architectural elements, are built as an infill between the frame members. However, the usual practice in the structural design of infill-frames is to ignore the structural interaction between the frame and infill. This implies that the infill has no influence on the structural behaviour of the building except for its mass. This would be appropriate if the frame and infill panel were separated by providing a sufficient gap between them. However, gaps are not usually specified and the actual behaviour of infill frames observed during past earthquakes shows that their response is sometimes wrongly predicted. Infill-frames have often demonstrated good earthquake-resistant behaviour, at least for serviceability level earthquakes in which the masonry infill can provide enhanced stiffness and strength. It is expected that this structural system will continue to be used in many countries because the masonry infill panels are often cost-effective and suitable for temperature and sound insulation purposes. Hence, further investigation of the actual behaviour of these frames is warranted, with a goal towards developing a displacement-based approach to their design.

Many of the residential & commercial building are constructed with parking floor open without the infill, these structure lead to soft storey problem. To avoid these soft storey problem the many techniques are adopted such as diagonal bracing in parking area, provision of infill, increase of column size in lower floor etc. but these technique are not being adopted in large scale. Because of practical problem like space utilization of parking, reduction in parking space, and also obstruct the runway of parking vehicle. The purpose of this paper is to introduce the set back option for main structure to minimize the failure of soft storey and overall damage to structure, without disturbing the parking space. These additional set back can be used for gardening, parking or any other commercial activity. This paper includes the Non linear time history analysis of G+6 storey building with different infill structure such as Completely filled (CF), Bared frame (BF), Soft storey (SS), SS with Ground floor set back, SS with G+1 set back, SS with G+2 set back, SS with G+3 set back, SS with G+4 set back. These width of setback is provided such that the structure will not be irregular structure as per IS 1893-2002. The analysis is done for different earthquake frequency like Elcentro, sanfernando and result are interpreted. The parameter like base shear (BS), ground floor displacement (GFD), top floor displacement (TFD), seismic weight (SW), overall structural damage (OSD) for all the configurations. These results are generated from IDARC software.

II. OBJECTIVES

1. To understand the effect of infill panels/walls during the earthquake.
2. To assess the R/C frames with infilled walls with different configuration of infill.
3. To assess the irregular masonry infill distribution in R/C frame under seismic loading.
4. To assess the R/C frames with infilled walls with different geometry of frame.
5. To analytical investigation the set back structure for different floors
6. To analytical investigation the soft storey structure with these set back
7. Come with the decision making conclusion to avoid the dynamic analysis

III. INVESTIGATIONS ON DIFFERENT CONFIGURATIONS OF INFILL WALL IN RC BUILDING

The plan and configuration of the building considered and analyzed the structure considering the

bared frame (BF), completely infilled (CF), soft storey (SS), partial infilled (PI)frame and compared the analysis result to access the behaviour of RC frame is as follows in IDARC:

- Column size = 300 x 450
- Beam dimension = 230 x 400
- Material property
  M20 Grade of concrete
  FE 415 steel
- Load Calculation

Weight of masonry infilled = 18 kN/M
Dead Load = 3.125 kN/M
Live Load = 3kN/M^2
Floor Finish = 1.5kN/M^2

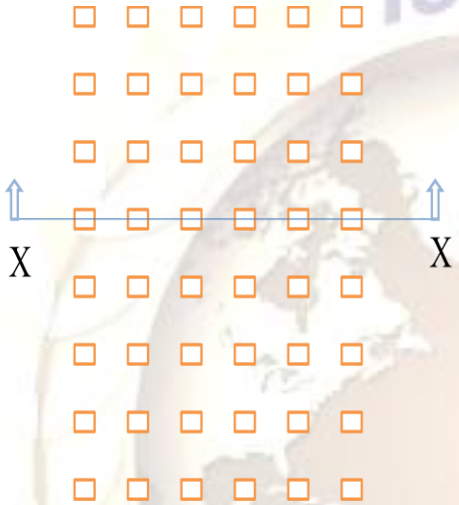
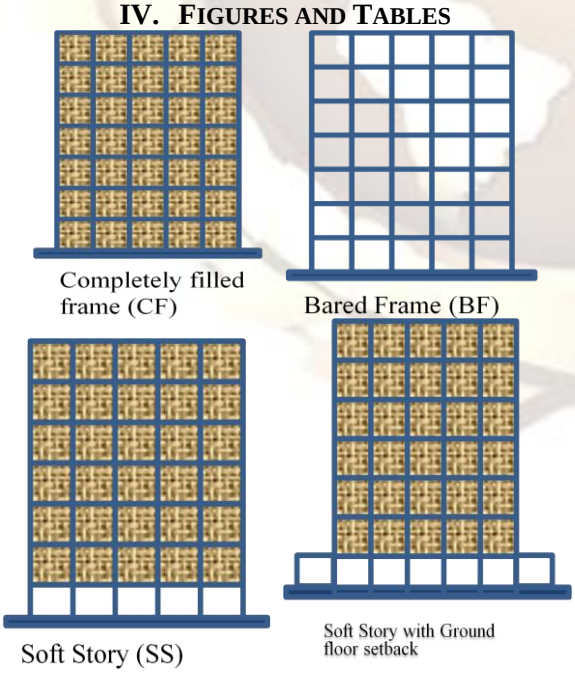
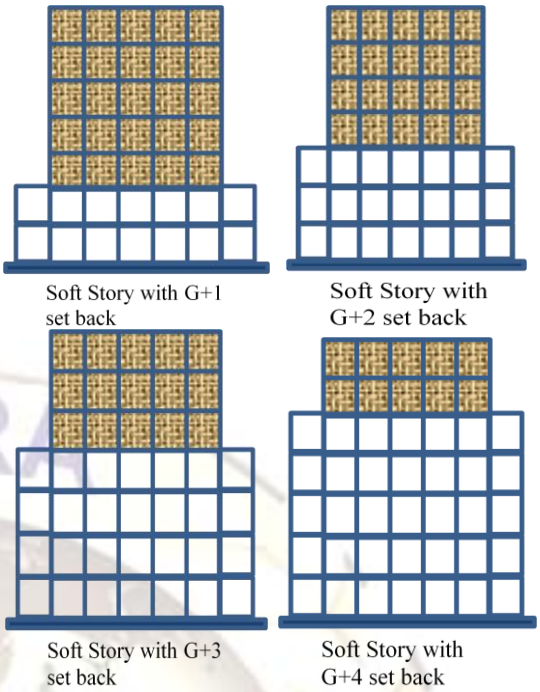


Fig: 1 Column Positioning of building in considered

IV. FIGURES AND TABLES





V. DISSCUSSIONS AND RESULTS

The Non linear time history analysis is performed for Elcentro and Sanfernando earthquake for different configuration of infills and with setback also is analyzed in IDARC software. The following results are obtained. These results are compared for different the combination of infill and setback of frame as shown in fig. i.e. for Completely filled (CF), Bared frame (BF), Soft story (SS), Soft story with Ground floor set back, SS with G+1 set back, SS with G+2 set back, SS with G+3 set back, SS with G+4 set back and results are obtained for Base shear (BS), Ground floor displacement (GFD), Top floor displacement (TFD), seismic weight (SW), Over structural damage Index (OSD).

VI. RESULTS & DISCUSSIONS

A) Elcentro Earthquake

Type /parameter	CF	BF	SS
BS in Kn	1536	466	1142
GFD in mm	13.07	14.27	32
TFD in mm	52.047	142.83	62
SW in Kn	5460	5460	5460
OSD ratio	0.075	0.119	0.259

Type	SS (G+1) SB	SS (G+2) SB	SS (G+3) SB	SS (G+4) SB	SS (G+5) SB
B.S.	1122	974	772	733	773
G.F.D.	25	22	15	14	14
T.F.D.	64	79	80	92	107
S.W.	6360	6810	7260	7710	8160
O.S.D.	0.203	0.206	0.119	0.128	0.125

B) For sanfernando earthquake

Type /parameter	CF	BF	SS
B.S.	1805	749	1389
G.F.D.	98	88	289
T.F.D.	2	505	495
S.W.	5460	5460	5460
O.S.D.	0.569	0.402	1.469

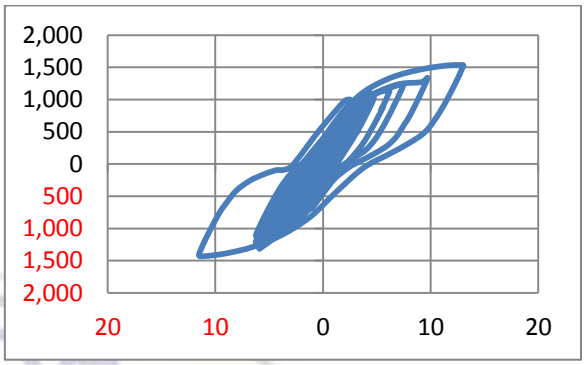
Type	SS (G+1) SB	SS (G+2) SB	SS (G+3) SB	SS (G+4) SB	SS (G+4) SB
BS	1517	1329	1457	1409	1261
GFD	142	111	95	92	92
TFD	468	389	421	142	462
SW	6360	6810	7260	7710	8160
OSD	0.921	0.812	0.706	0.596	0.516

VII. Hysteresis Curves

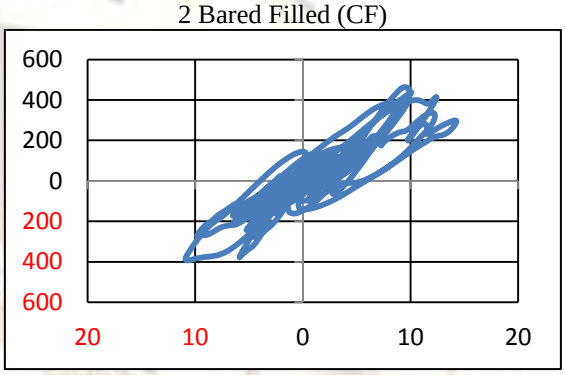
The Hysteresis curve shows the Base shear (BS) versus displacement for different masonry infill and set back structure.

A) For Elcentro Earthquake

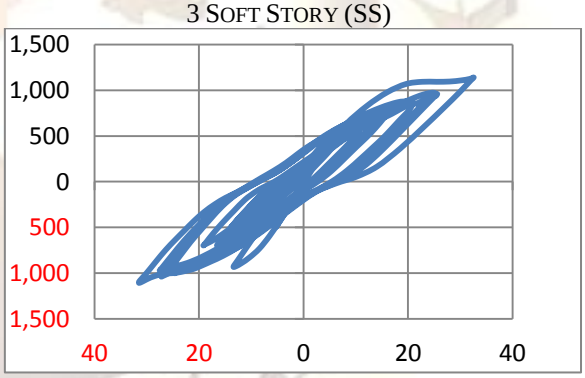
1 Completely filled (CF)



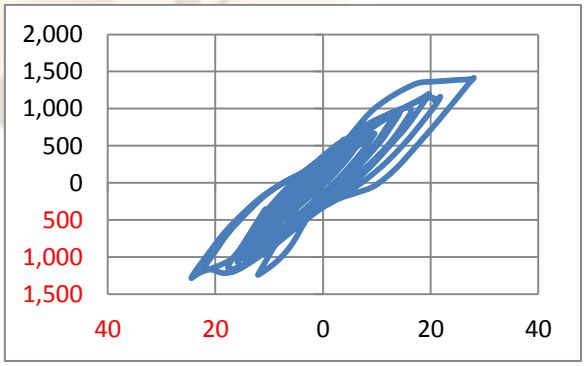
2 Bared Filled (CF)



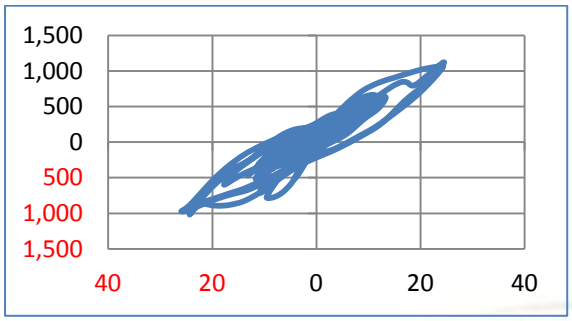
3 SOFT STORY (SS)



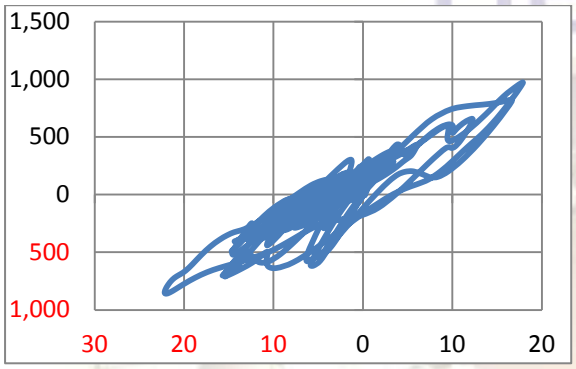
4 S.S. with Ground Floor set Back



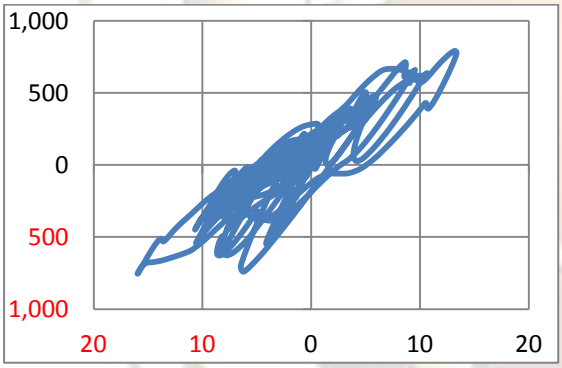
5 S.S with G+1 Set soft



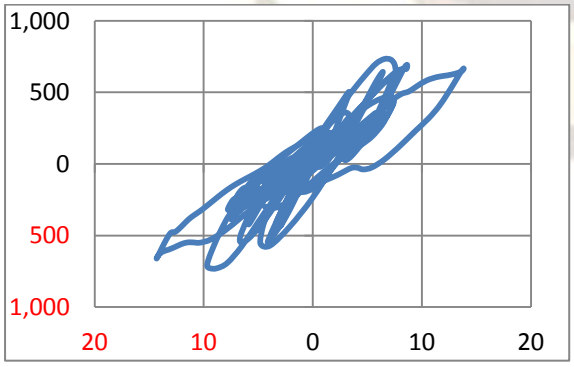
6 S.S. with G+2 set back



7 S.S. with G+3 set back

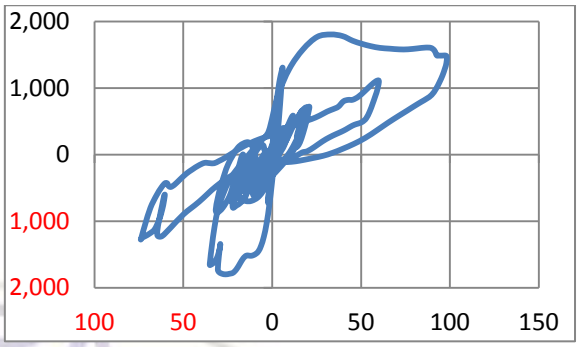


8 S.S. with G+4 Set back

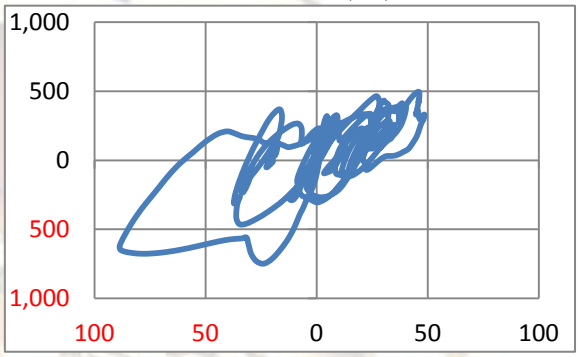


A) For Sanfernando Earthquake

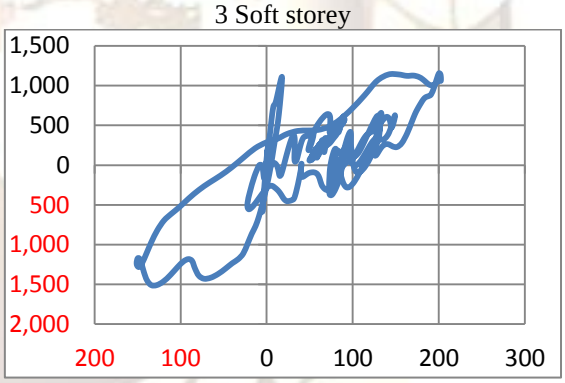
1 Completely Filled (CF)



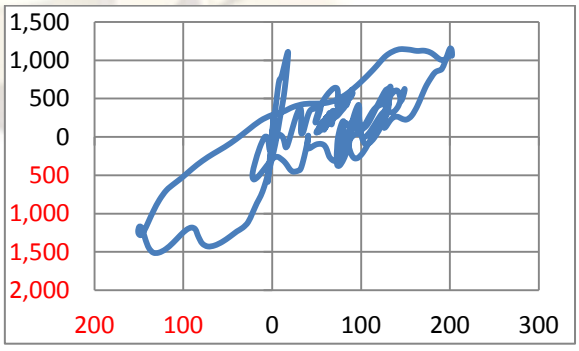
2 Bared frame (BF)



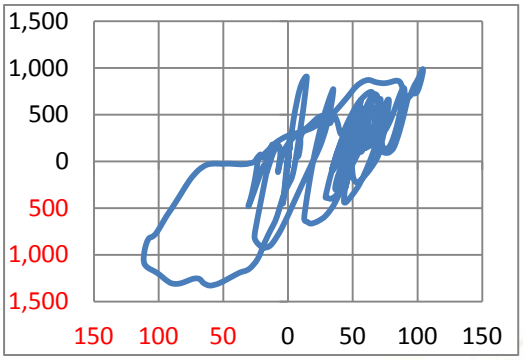
3 Soft storey



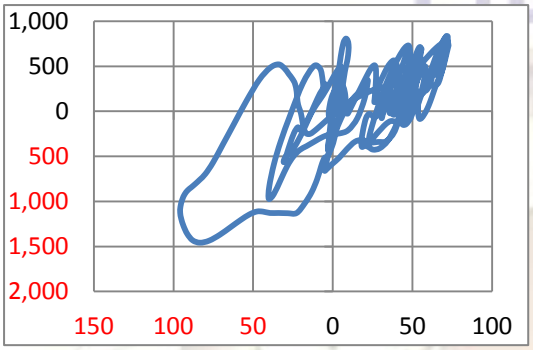
4. S.S with G+1 set back



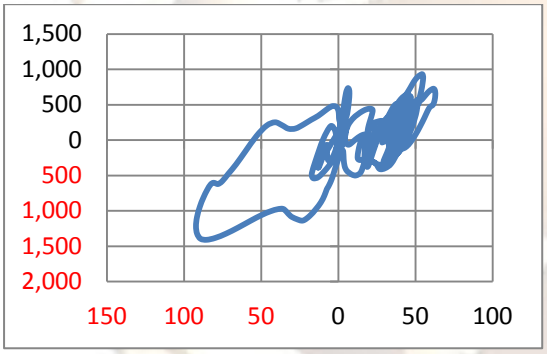
5. S.S. with G+2 Set back



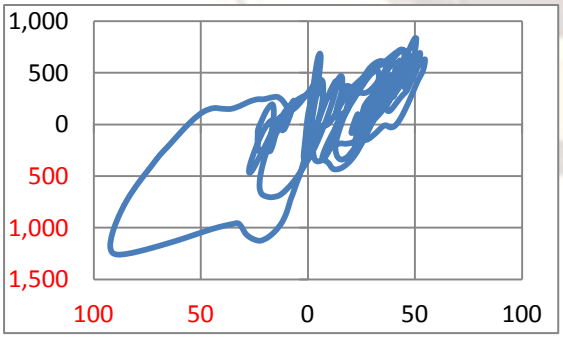
6. S.S. with G+3 set back



7 S.S. WITH G+4 SET BACK



8 S.S. with G+5 set back



The analysis shown, the provision of set back for structure without making it irregular reduces the ground floor displacement, overall structural damage that means there is reduction in damage to structure. These additional set back can be used for parking, gardening purpose and for commercial utilization etc. without disturbing the parking space. These set back improves the earthquake performance of soft storey structure.

VIII Conclusions

1. Completely filled frame gives least displacement at top and bottom, Soft Story give largest displacement.
2. The setback frame improves the earthquake resistance of soft storey structure.
3. The Additional setback for frame, without making the structure irregular improve the earthquake resistance of soft storey structure.
4. These Set back frame reduced the displacement in lower story level.
5. These set back frame reduces the overall structural damage Index of structure.
6. These set back bay can be utilized for parking area, gardening & commercial purpose

References

[1]. ELENA VASEVA, "*Seismic Analysis of Infilled R/C Frames with Implementation of a Masonry Panel Models*", 11th National Congress on Theoretical and Applied Mechanics, 2-5 Sept. 2009, Borovets, Bulgaria

[2]. Anand S. Arya and Ankush Agarwal**,** "*Seismic Assessment of brick masonry buildings in India*", National Disaster Management Div., Ministry of Home Affairs, New Delhi.

[3]. BELL D.K. AND B.J.DAVIDSON, "*Evaluation of Earthquake Risk Buildings with Masonry Infill Panel*", No.4.02.01 NZSEE 2001 Conference

[4]. COMBESCURE D. & PEGON P. 2000. "*Application of the local to global approach to the study of infilled frame structures under seismic loading. Proceedings 12th World Conference on Earthquake Engineering*", Auckland, New Zealand.

[5]. EUROCODE 8: "*Design of structures for earthquake resistance – Part 1: General rules, seismic actions and rules for buildings*", Ref. No. EN 1998- 1:2004, EC, CEN.

[6]. KAPPOS A.J. & ELLUL F. 2000. "*Seismic design and performance assessment of masonry infilled RC frames. Proceedings 12th World Conference on Earthquake Engineering*", Auckland, New Zealand.

[7]. Alireza Mohyeddin-Kermani1, et.al., "*A Review of the Seismic Behaviour of RC Frames with Masonry Infill*", Journal of Structural Division, 88(No. ST6).

[8]. "IDARC2D Version 7.0 - A computer Program for the Inelastic Drainage Analysis of Buildings," By REINHORN, A