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A STUDY ON R.C.C STRUCTURE WITH FULLY, PARTIALLY AND WITHOUT INFILLED WALL IN DIFFERENT ZONES

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ABSTRACT: Behaviour of masonry infilled concrete frames under the lateral load is studied. Investigations showed that, one of the most appropriate ways of analyzing the masonry infilled concrete frames is to use the diagonally braced frame analogy. RCC buildings are generally analyzed and designed as bare frame. But after the provision of infill walls, mass of the building increases and this will result in the increase of the stiffness of the structure. During the seismic activities, response of the structure with infill walls is quite different for the structure without infill walls. Infill walls changes the dynamic behaviour of the structure. In this study two G+15 storeyed structure models are generated. In one structure, brick infill walls are modelled as strut element. These struts act as a compression members. In the other structure, only bare frame structure is modelled. All the parameters i.e. beam sizes, column sizes, floor height; load parameters etc are same for both the structures On the basis of this work results has been obtained. Results for Maximum Nodal Displacement, Maximum Reactions, Maximum Base Shear and Maximum Story Shear are compared for different models.

KEYWORDS: RC frame, infill walls, response spectrum, medium soil, seismic zone, STAADPRO.

I. INTRODUCTION

In multi-story structures, the RC frame structures are built initially due to ease of construction and speedy work in progress. The masonry infilled RC structure buildings are normally constructed for marketable, housing and industrialized buildings in seismic regions. Infilled frames are complex structures made by the amalgamation of moment resisting plane frame and infill wall. The infills are generally used as interior partition walls and exterior walls which are shielding from exterior environment to the building. The masonry infill panels are usually not considered in the design process and treated as architectural (non-structural) components. Reinforced concrete (RC) frame structures with brickwork infill walls have been widely constructed for commercial, industrial and multi-story residential uses in seismic areas. Masonry infill usually consists of bricks or concrete blocks constructed between beams and columns of a reinforced concrete frame. The incidence of masonry infill walls has aimportant impact on the seismic response of a reinforced concrete frame structure, increasing structural strength and rigidity. Properly designed infills can rise the overall strength, lateral resistance and energy degeneracy of the structure. An infill wall decreases the horizontal deflections and bending moments in the frame, thereby decreasing the likelihood of collapse. Recent studies have shown that the use of masonry infill panel has a significant effect not only on the strength and rigidity but also on the energy dissipation mechanism of the overall building. Ignoring the effects of masonry infill can lead to insufficient assessment of structural damage of infill frame structures exposed to strong ground motions.

In emerging countries like India there is growing need of high-rise buildings. High-rise building is a key of land scarcity in developing cities and due to scarcity of land commercial utilization of high-rise buildings and their construction is improved. Around the business section of cities wide workplace space is needed which is without difficulty available in high-rise buildings and tall structures. All these demands, requirement of large space, is easily be achieved by the high-rise building. Economical and well designed high-rise buildings will easily combine all these provisions. Technical and systematic progress in the high-rise buildings results in the socio-economic growth. Modern urbanization and development of large metropolises give birth to the a number of problems like dearth of land in cities, increasing in the rates of land which in turn results in the enlargement of high-rise building and a magnificent high-rise building efficiently serves the purpose. In present-day world of growing intense business competition high-rise constructions are the symbol of economic strength and make sureansignificantprofile-raising effect therefore they play akey role and best matched in present situation.

II. LITERATURE REVIEW

Based on the objective of thesis, a comprehensive review of the conceptual and theoretical foundation of the seismic analysis of infilled wall R.C. structure is discussed in this chapter with special emphasis on non-linear analysis of the structure. This Chapter reviews some significant technical information in the form of research papers and articles as,

Chidananda HR et al. (2015), carried out comparative study of a bare frame model and adiagonal strut frame model on ETABS software. In their study they have considered a G+ 14 RC framed building models, linear static analysis and response spectrum method is used for the analysis of the structures. Results were calculated on the basis of the following parameters such as Storey displacement, Storey shear, Storey drift, with soft storey considering the effects of infill wall with central and partial openings. In their result, displacement values show that there is a significant decrease in displacement by considering the effect of infills and slight increase in displacement due to openings.

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Mohammad H. Jinya et al. (2014), they used ETABS software along with G+9 R.C.Cframed building models, seismic coefficient method (SCM) and time-history method (THM) has been performed for analysis as per IS 1893:2002 and story displacement, base shear, story drift, axial force with and without soft story considering effect of infill walls with different percentage of opening are the parameters considered in this study. From their analysis it can be concluded that diagonal strut will change the seismic performance of RC building. Axial force in column increased, story displacement and story drift are decreased and base shear is increase with higher stiffness of infill. If in the ground level at least periphery wall is provided then soft story effect can be minimized. It can also be concluded, the increase in the percentage of opening leads to a decrease in the lateral stiffness.

Narendra A. Kaple et al. (2016), prepared G+6 R.C.C framed building models on ETABSsoftware and Seismic coefficient method and Response Spectrum analysis has been performed on the building for analysis as per IS 1893:2002 and results obtained from the analysis are compared in terms of strength and stiffness for bare frame and infill wall. When the bare frame model is subjected to lateral load, mass of each floor acts independently resulting each floor to displacement with respect to adjacent floors. Thus, the building frame behaves in the flexible manner causing distribution of horizontal shear across floors. In presence of infill wall (panel), the relative drift between adjacent floors is restricted causing mass of the upper floors to act together as a single mass, Deflection in case of bare frame is very large, when compared to solid brick infill conditions, the presence of walls in upper storeys (i.e. for Model4) makes them much stiffer than bottom ground storey.

Kiran Tidke et al. (2016), studied the effect of masonry infill wall on a G+7 R.C. framebuilding, Analysis is carried by SAP2000 software considering Response spectrum and time history analysis. Parameters such as Base shear, Max. storey drift, Displacement are calculated and compared for all models. They concluded that RC frame with masonry infill with and without soft storey is having highest value of base shear than bare frame the presence of infill wall can affect the seismic behaviour of frame structure to large extent, and the infill wall increases the strength of stiffness of structure. The maximum storey drift of infill wall without soft storey is 0.0325% and infill wall with one soft storey is 0.0063% less compared to bare frame. The displacement of infill wall without soft storey is 0.4785% and infill wall with one, two soft storeys is 0.3845%, 0.2447% respectively less compared to bare frame.

III. METHODOLOGY

In this work, the analysis which is based on response spectrum method is used to investigate the AComparative Study on R.C.C. Structure with Fully, Partially and Without Infilled Wall in Different Seismic Zones of India as per IS-standards.

Table 1: Model Description

Software used	Configuration of Building	Model Dimensions	Story	Remarks
STAAD Pro.	Rectangular with Full Infilled walls	40m x 30m	16	Seismic forces of ZONE IV and V as per IS: 1893:2002.
STAAD Pro.	Rectangular with Partial Infilled walls	40m x 30m	16	Seismic load of ZONE IV and V as per IS: 1893:2002.
STAAD Pro.	Rectangular without Infilled walls	40m x 30m	16	Seismic load of ZONE IV and V as per IS: 1893:2002.

3.2 LOAD CASE DETAILS

In the study of structure, various types of loading conditions are studied and given below:

3.2.1 STATIC LOAD:

3.2.1.1 Dead load (IS:875: Part 1):

These are the external loads, acts vertically downward and rise due to the self-weight of the structure. Dead loads include weight of the structural member such as beams, columns, slabs etc. as well as that of non-structural elements such as floor coverings, false ceilings etc. Dead load is calculated as per its cross-sectional area multiply with the density of material used. Density of following material:

Density of RCC member = 25 KN/m^3.

Density of PCC member = 20 KN/m^3.

IV. RESULTS AND DISCUSSIONS

MAXIMUM REACTIONS IN ZONE IV

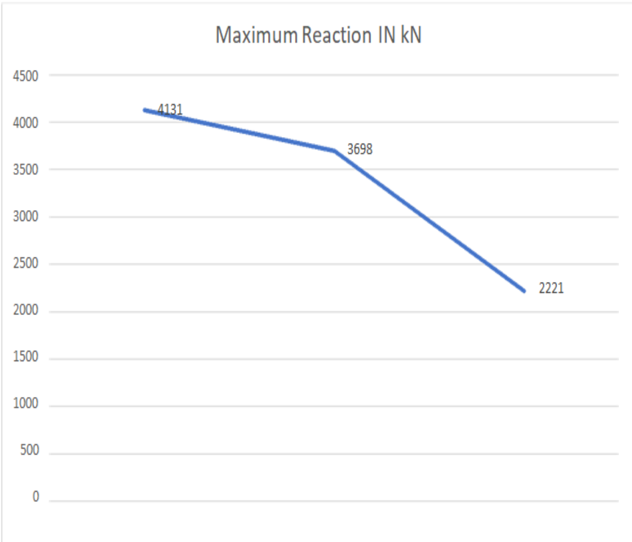

Fig. Figure showing maximum reaction in zone IV in the structures

MAXIMUM REACTIONS IN ZONE V

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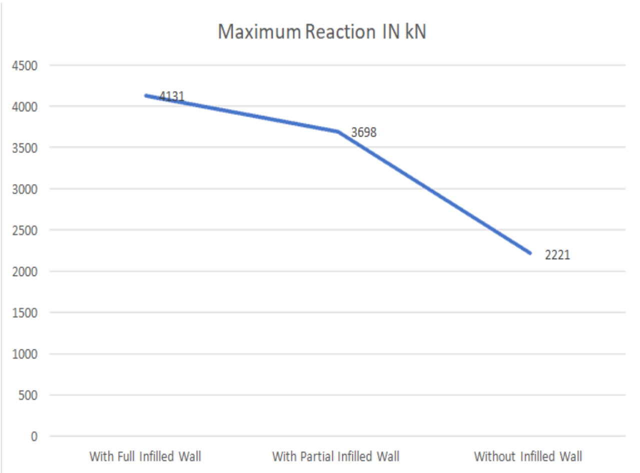

Fig. Figure showing maximum reactions in zone V in the structures

MAXIMUM STOREY DISPLACEMENT IN ZONE IV

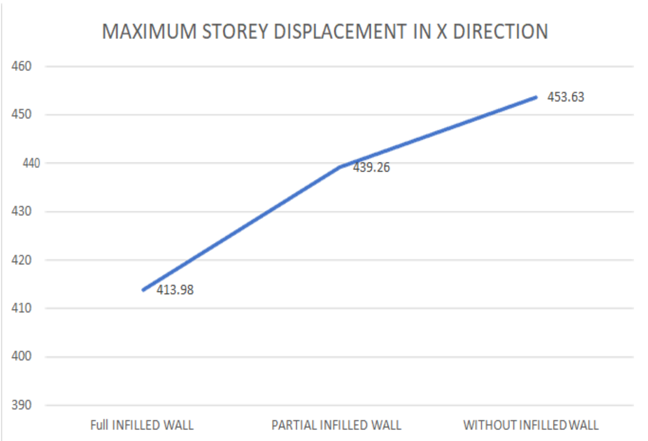

Fig. Figure showing maximum storey displacement in X direction in zone IV inthe structures

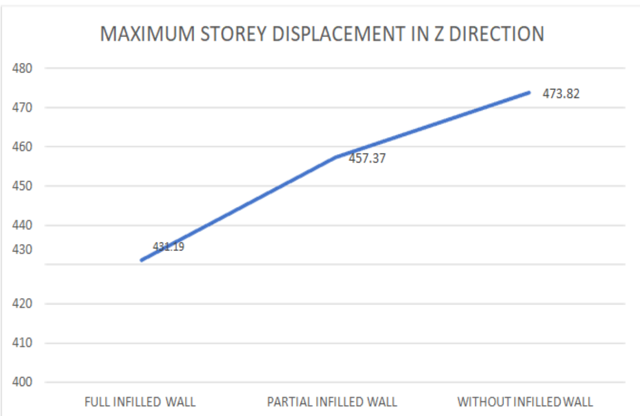

Fig. Figure showing maximum Storey displacement in Z direction in zone IV in the structures

MAXIMUM STOREY DISPLACEMENT IN ZONE V

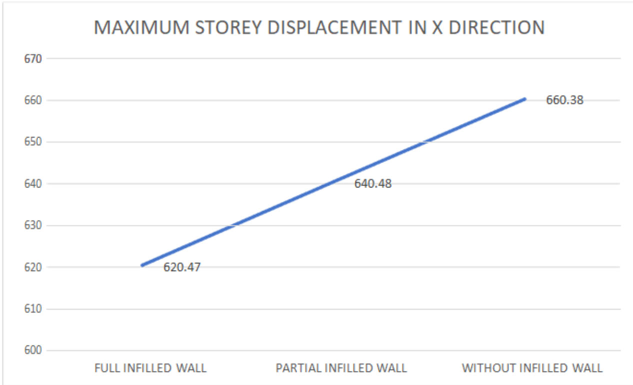

Fig. Figure showing maximum storey displacement in X direction in zone V in the structures

V. CONCLUSION

In the above study response spectrum method of seismic analysis was considered for analysing a G+15 (16 story structure) in the presence and absence of infilled wall. Following conclusions are drawn from the above study:

- Maximum Reactions increases as we provide partial infill wall and full infill wall in the structure and are minimum for No infill wall structure.
- The value of Reaction does not depend on seismic zone so it is same for Full infilled wall structure, Partial infilled wall structure and No infilled wall structure in seismic zone IV and V and Full Infilled wall structure has more reaction than Partial and Without or No Infilled wall structure.
- Base Shear shows no change for all the three cases and only depends upon the zone.
- With the increase in seismic zone from IV to V base shear increases from an amount of 51% in all the structures.
- Maximum storey displacements are minimum for Full infill wall structure and increases as we provide partial infill wall structure and are maximum for no infill wall structure. Hence, we can conclude infill wall plays an important role if maximum storey displacement parameter has given more importance.
- Maximum storey displacement increases by an amount of 16.8 mm and 26.5 mm in X direction and Z direction respectively in seismic zone IV and V respectively because we have taken a rectangular geometry with 40 m in X direction and 30 m in z direction.
- With the increase in seismic zone from IV to V maximum storey displacement increases from an amount of 66.68% in X and Z direction both.
- The values of Maximum Overturning Moments are more for infilled wall structure because the weight of the structure is more in full infill wall structure as compared to partial and no infilled wall structure for both the seismic zones.
- The maximum displacement at all the stories decreases by an amount of approximately 11 % if we provide Partial infill wall and by an amount of approximately 19 % if we provide Full infill wall as

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compared to the structure having No infill wall.

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