SEISMIC PERFORMANCE STUDY OF RC BARE AND INFILL FRAME WITH SOFT STOREY AT DIFFERENT FLOORS BY NON-LINEAR STATIC METHOD

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Abstract - *Reinforced concrete frames with having masonry infill are a collective repetition in countries like India, by in which the constituency is demanded activity of seismic action. Commonly the infills are preserved as nonstructural constituent in structural defining along the assignment and merely the involvement of bulk is measured and operational possessions like stiffness and strength is largely not reflected.*

More damages will be consequently occurs in such areas where the presence of high point of seismic action. At a distance from the significance load structure need to tolerate to horizontal load which may advance high stresses. At present days the most of expose element structures are building with the intimate contact of infill. Normally while in the time of constructions usually the gaps in the frames are tended by construction of beams and columns they may be of vertical or horizontal gaps, and those gaps can be easily covered by using the filling process by masonry and such a process denoted as infill of brick wall.

And in this present study the models are done for the comparative elements between the bare and infill frames for those the models are diagnosed as per the code factors in assigning the elements and also in load cases as a first part. And in second part the introduction of soft storey at different storey level come to an existence in which the model going to be fully infilled panel and soft storey replaced in alternate floors. The major factor is infill walls in the models are assigning as the "DIAGONAL SRUTS".

Key Words: **Etabs 2015, bare frame, masonry infill frame, soft storey at different floor, diagonal strut, and seismic evaluation.**

1. INTRODUCTION

Earthquake is most in all amazing and damaging occurrences in the nature it is appalling after the effects. From past years many most earthquakes raised. Most in that all are having smaller intensity and do not causes such damage. But in considerably in such populated areas where it causes more damage and effect to the life. Most of all the prevailing buildings in India and worldwide are constructed without keeping the effect of seismic shake applicable procedure and, hence are susceptible to Effect at the time of seismic.

Many of Reinforced concrete element structures which are of infilled with suitable materials are open structures. Previous earthquakes in the biosphere expose the greater seismic absences in the RC constructions, few of them commanded to appalling collapses initiating effects. The RC parameters have been considered only for importance loads, and in this the collective design includes the infill as a not a structural factor. By deserting the wall of masonry infill in the design, it will assume that infill structure do possess the same consistency as of individual. In the other word the non-structural infill wall are to be suggestively change the seismic behaviour of infill. The intricate contact between frame and infill can make the seismic behaviour and the lateral strength difficult to compute.

Masonry in the structures is basically used as an infill or load bearing elements in the un-framed structures. Commonly the brick walls are subjected to many lateral loads, and at certain instance the wind and the earthquake forces comes on the brick infill wall, this force specifically acts on enclosed structures and the horizontal earth stress in retaining wall and tunnels. The frame and infill walls acts in fully complex way at time of low lateral forces, as the force of adjacent level upturns, the frame tries to warp in flexural approach whereas the infill inclines to warp in a shear approach. The intimate contact between the infill and frame section considerably escalations the horizontal stiffness of infill frame and severally modifies the vibrant response of the structure.

The lateral loads on infill frames are not received suitable attention specially when considering the effect of opening on infill. Hence it is frequently neglected by the engineers in the analysis.

2. LITERATURE SURVEY

From last five decades, manipulate of infill on the casing structures in standings of stiffness, load carrying capability and failure modes has been one of the most interesting research studies carried out. The first recognition of the masonry infill in counterattacking horizontal tons was identified subsequently the accomplishment of Empire State Construction in New York. Diagonal cracks of masonry infill partitions are seemed through a storm with a wind speed more than 90m/hr. Departure of crakes among the frame and masonry walls are also renowned. Initially, straining gauges involved steel frame which is not registered any strains preceding to cracking of the masonry regardless in the attention of wind. The replace of infill will reduce the effect going on to the steel frame. Until the stresses were within the furious capability of the infill. Once the infill was stress outside the cracking capability, considerable reduction in the stiffness of the infill. Subsequently, strain gauges activated to catalogue stains signifying within wind load condition the steel frames have tended the ability to act against. During post cracking. The infills build among the within section of the steel frame so there it can regularly take the resistance offering to the horizontal thrust effect. Constantly later this occurrence, the behavior subject has come to of interest with various investigators all over the world.

The literature survey is being carried out to identify the work related to the present study. Significant quantity of exploration been conceded out in the field of Infilled frames. This segment highpoints numerous tentative and speculative studies accompanied in the field.

2.1 Analytical and Experimental Study on Infill RC Frame Structure

Polyakov (1956): In Moscow at the institute of research central for a structure conducted the research of infilled frame exposed to afflicting load. Primarily, infill masonry and the frame elements perform monolithically until departure concerning the infill and the frame develops along the frame infill crossing point excepting for small expanses for two diagonally opposite corners. It has been found that the usual failure of infill was by extremely of the mortar joints along the compression diagonal.

It has been reported that in all the tests the infill effect was by the cracking about the boundary consenting the departure of the element by the infill excluding near compression turns. Based on these results it has stayed projected to analyses

Infilled frames by supposing the infill to behave as “diagonal bracing struts”.

Stafford Smith (1962): at Bristol University, England performed a sequence of checks on horizontally loaded square steel frame infilled through micro concrete. Based on the results, he came for a supposition that, wall could be interchanged with equivalent diagonal strut fixing the loaded corners. For infill of different proposition it has been shown theoretically as well as by experiments that the operative width of equivalent strut was hang on on aspect ratio of the infill. The operational width of the equivalent strut diverges from d/4 to d/11 and having sideways ratio to the number 5 to1.

3. METHODOLOGY

The bare and infill models are modelled using ETABS the analytical macro models are modelled and analyse using ETABS software package for nonlinear analysis. Pushover analysis is adopted for the analysis. Seismic forces are considered to act in two directions. For pushover analysis default hinge properties are used for beams and columns and user defined hinge is assigned for equivalent diagonal strut element. Base shear the responses like storey drift and roof displacements are identified. Vulnerability index and fragility curves are developed for considered earthquake level.

3.1 NON LINEAR STATIC METHOD

The practice in method (pushover analysis) approached in to exercise in 1970 impending of pushover exploration has been documented for last 10to15 years. This practice is primarily recycled to appraisal the strength and implication capability of prevailing construction and seismic claim for the assembly imperiled to particular trembling. This system can also use for inspecting the suitability design.

Push over exploration is nonlinear process which the enormousness of the horizontal consignment is improved monotonically preserving a dispersal outline laterally. Construction is exiled till the ‘control node’ extents ‘target displacement’. The organization of hinge, crack and failure of the structural constituents during the practice is experiential. In count base shear and displacement of control node is schemed to analysis. Development of base shear –curve displacement is only utmost significant fragment in analysis. This curve predictably termed as push over curve or capacity curve.

4. STRUCTURAL MODEL

The models in the present study are considered are four and six storey with single bay. Having 3m each storey height and spacing of column 5m in both direction. In which six storey model is completely analysed and designed as bare and infill frame respectively. Where in four storey building is modelled with fully infill by introducing soft storey at different storey level. And the analysis is done by non-linear static method.

The sizes of beams are 300x450mm and sizes of columns are300x600mm. Slabs are of 150mm thick, wall is of 200mm thick with density of 19KN/m3. M25 concrete is used. Slabs are rigid and continuous, and loads are applied according to provisions of IS code

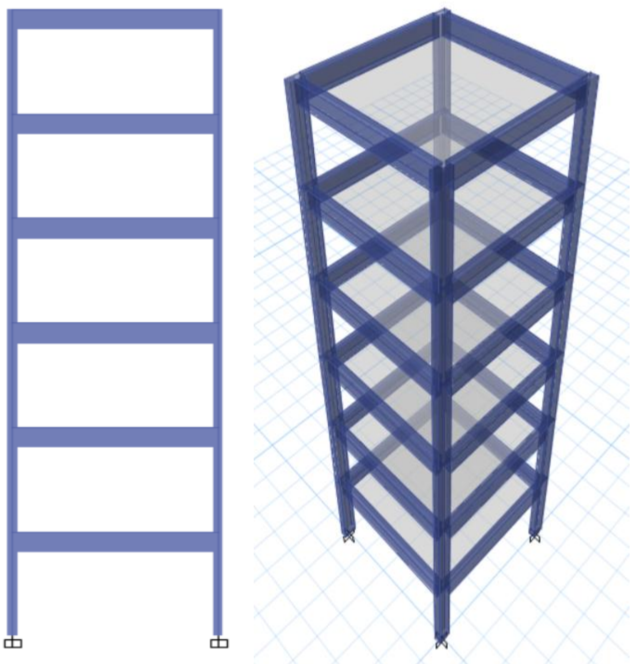

Fig-1: Elevation and 3D view of the bar frame model

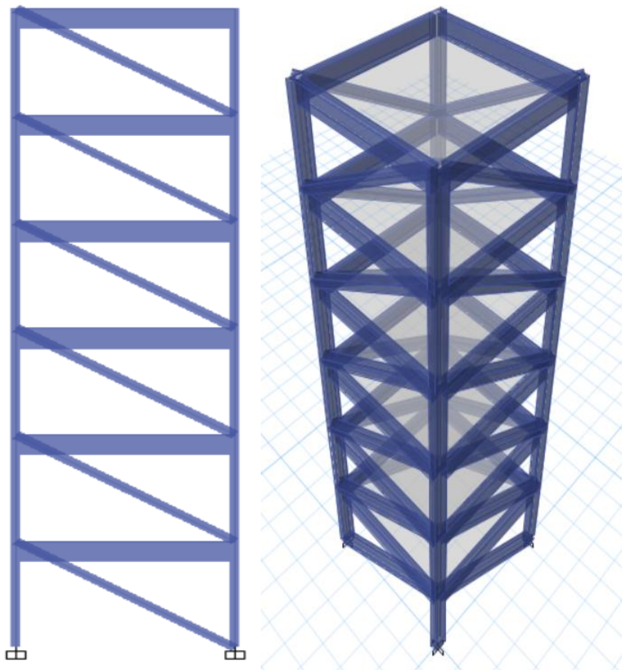

Fig-2: Elevation and 3D view of the infill frame model

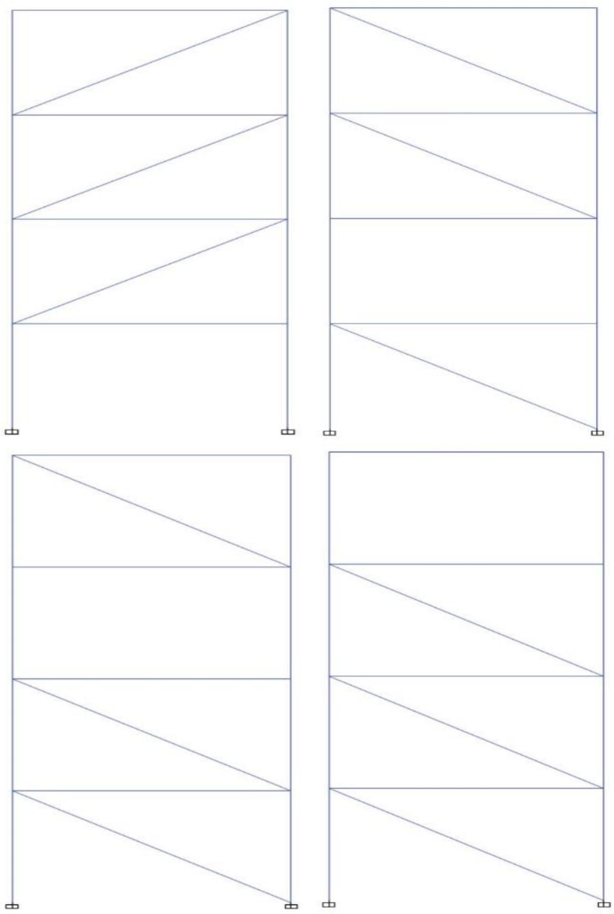

Fig-3: Elevation of infill frame with soft storey at different floor.

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5. CRITICAL REVIEW OF MACRO MODELS

Infilled framed constructions are often used to provide horizontal resistance in provinces of high seismicity, principally in those places where masonry is still a expedient material, due to economical traditional reasons. The infilled frame constructions are designed and integrated formerly the expansion of definite seismic codes organize a central part of the high risk structures in altered countries. Recuperation of these constructions to counterattack seismic action implies, Infilled frames have sustained the interest of researchers for a long period of nearly five decades but they have been unable to carve a place in the code of practices of any country. Consequently, the analytical modelling of this type of structure represents an important issue for engineers and researchers involved in seismic design.

One of the major ill effects is the soft story effect. This is due to absence of infill wall in a particular storey. The absence of infill in some portion of an irregularly planned building will induce torsion moment. Also, the partially infilled wall, if not properly placed may induce short column effect or captive column effect creating localized stress concentration.

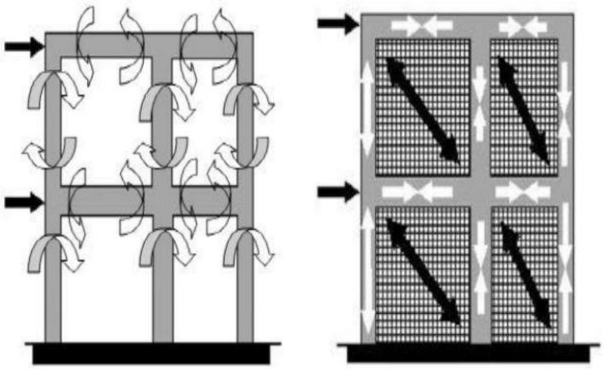

Fig-4: Behaviour of bare frame and infill frame under lateral load

The behavior of infilled frames is briefly discussed to determine important aspects that need to be considered and accommodated by the FE modelling approaches. A brief review of the modelling approaches and models used specifically for masonry-infilled frames are presented.

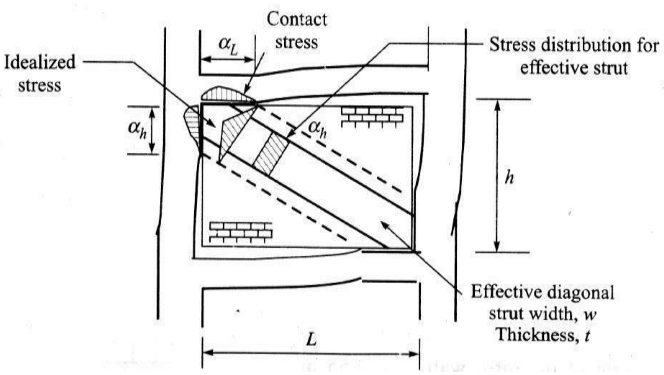

Fig-5: Equivalent diagonal strut

6. ANALYSIS AND RESULTS

This section discusses the outcomes obtained in the present work. This section presents the significance of the current results and their consequence and applications to universal engineering applies. Behaviour of bare and masonry infill frames under lateral forces using macro model method are studied. Significance and effect of different parameters are studied in detail. Seismic assignment Push over analysis adopted for nonlinear static method of the structure and the following aspects are discussed.

6.1 Base shear and displacement

Frame is assigned with nonlinear static analysis method and the base shear and displacements are obtained from analysis using ETABS. When infill stiffness was considered, the displacement of the structure reduced and the structure attracted maximum base shear.

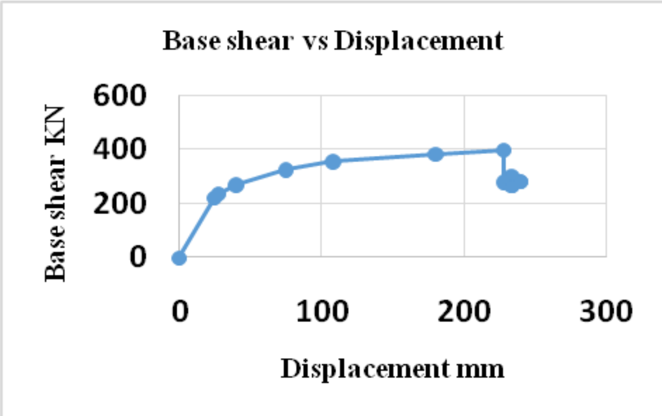

Chart-1: Base shear v/s Displacement curve for bare frame structure

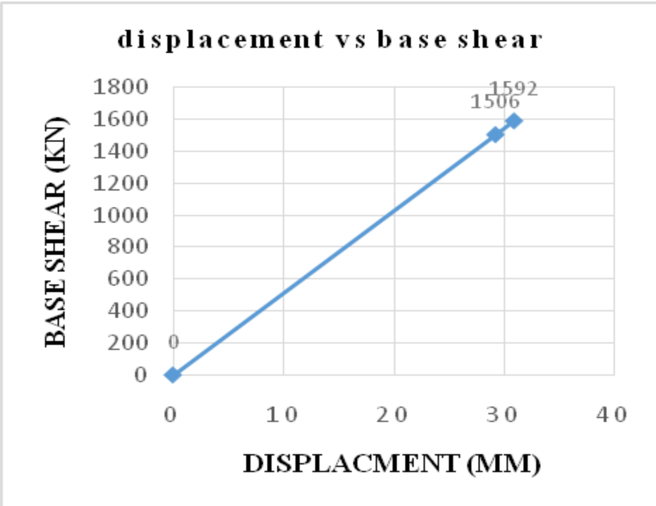

Chart-2: Base shear v/s displacement curve for infill frame structure

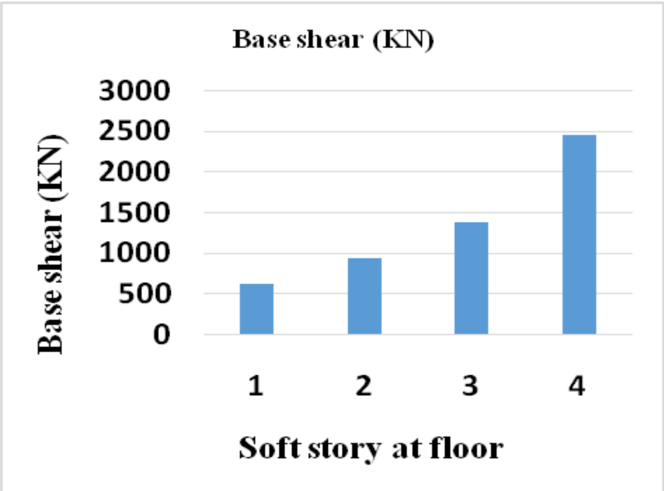

Chart-3: base shear chart of soft story position at different storey

Table-1: Deflection (mm) at each storey level

Storey	Displacement in (mm)
3	37.1
2	26.8
1	25.9
GROUND	16

The variation of Base shear at each storey level from nonlinear static method is tabulated in Table 6.3.

Table-2: Base shear (KN) at each storey level

Storey	Base shear (KN)
3	2442
2	1379
1	932
G	620

6.2 Hinge conditions

In order to modelling of bare and infill frames the hinges are to be assigned for the structures.
The total 96 numbers of hinges are assigned for the bare frame structure and,
Total 120 numbers of hinges are assigned for the infill frame structure in which in infill frames the addition hinges are add for the infill as a diagonal strut.

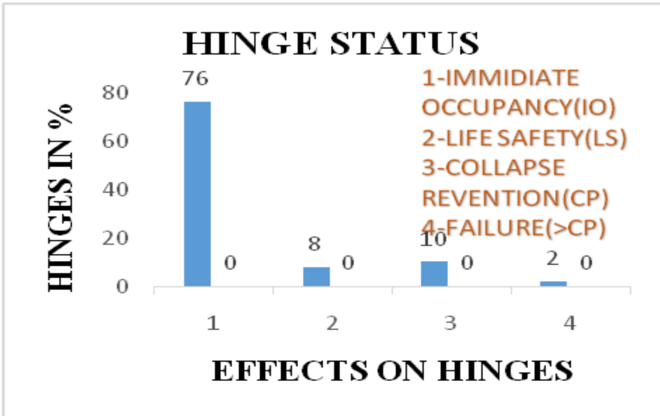

Chart-4: Hinge status chart for bare frame structure

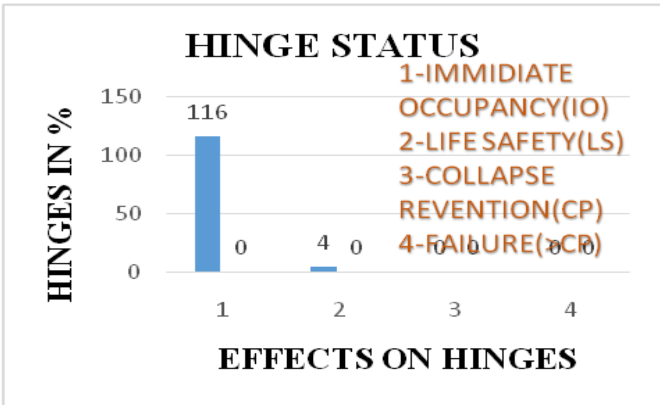

Chart-5: Hinge status chart for infill frame structure

6.3 Bending moment and shear force

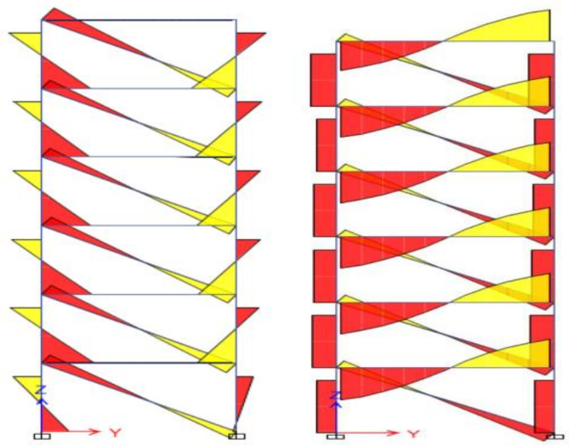

Fig-6: Bending moment and shear force diagram

7. CONCLUSION

The conclusions that are drawn from the results discussed in the present study are:

- The infill walls are primarily diverts the behavior of the frame structure and it is essential to take the part and to contemplate the walls of infill for seismic analysis of structure.
- Overview on panel infill in the RC frame condenses the dislocation of bare frames and also improves the structure ability against the stiffness. The fully infilled element has the lowermost storey sense value and the uppermost base shear value.
- The reduction factor λ, is tended as a duplication feature on well-known equations to evaluate the condensed equivalent width of firmness struts, as far as to implement the model.
- Infill increases the initial stiffness of structure and also increases the base shear carrying capacity of structure.
- It is confirmed from the delicateness curves advanced for both bare frame and infilled frame that occurrence of frames of infill bring up the vulnerability index of the structure.
- Nonlinear method is a good methodology to evaluate the capability of a structure to the seismic charging. It can provide the performance details of a structure beyond the design lateral load and beyond the elastic limits.
- Variation of base shear and roof translation by pushover analysis gives sufficient reduction in base shear and displacement.
- For more accurate analysis and for the assignment of structures to seismic charging, it is advisable to design by force based approach and check the adequacy from pushover analysis.

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BIOGRAPHIES

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