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SEISMIC ANALYSIS OF RC FRAME WITH MASONRY INFILL WALLS USING ETABS

JEBIN JAMES

Head of Department ,United Cadd Solutions, Ernakulam, Kerala

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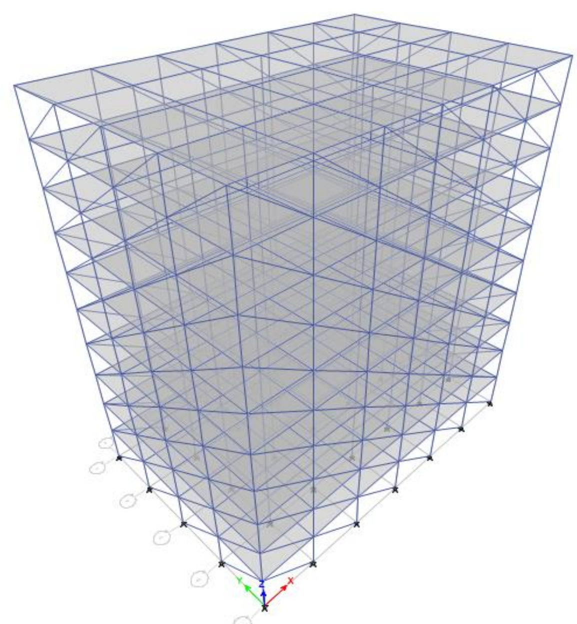
Abstract : *RC framed buildings are generally designed without considering the structural action of masonry infill walls present. These walls are widely used as partitions and considered as non-structural elements. But they affect both the structural and non-structural performance of the RC buildings during earthquakes. The effect of masonry infill panel on the response of RC frames subjected to seismic action is widely recognized and has been subject of numerous experimental investigations, while several attempts to model it analytically have been reported. In analytically analysis infill walls are modeled as equivalent strut approach there are various formula derived by research scholars and scientist for width of strut and modeling. Infill behaves like compression strut between column and beam and compression forces are transferred from one node to another. In this study the effect of masonry walls on high rise building is studied. The non-linear static pushover analysis is performed for RC frame with various infill arrangement.*

Key Words**: Seismic Analysis , Frame , Masonry , Infill walls , etabS**

INTRODUCTION

The reinforced cement concrete moment resisting frames in filled with unreinforced brick masonry walls are very common in India and in other developing countries. Masonry is a commonly used construction material in the world for reason that includes accessibility, functionality, and cost. The primary function of masonry is either to protect inside of the structure from the environment or to divide inside spaces. Engineer's often neglect their presence. Because of complexity of the problem, their interaction with the bounding frame is often neglected in the analysis of building structures. When masonry in fills are considered to interact with their surrounding frames, the lateral load capacity of the structure largely increases. This assumption may lead to an important inaccuracy in predicting the response of the structure. This occurs especially when subjected to lateral loading. Role of infills in altering the behavior of moment resisting frames and their participation in the transfer of loads has been established by decades of research. The survey of buildings damaged in earthquakes further reinforces this understanding.

The positive aspects of the presence of infills are higher strength and higher stiffness of the infilled frames. Never the less, it may not be appropriate to neglect their presence and declare the resulting design as conservative. Observed infill induced damage in buildings in the past earthquakes exposes the shortcomings of the current bare frame approach. In high rise buildings, the ordinarily occurring vertical loads, dead or live, do not pose much of a problem, but the lateral loads due to wind or earthquake



tremors are a matter of great concern and need special consideration in the design of buildings. These lateral forces can produce the critical stress in a structure, set up undesirable vibrations and in addition, cause lateral sway of the structure which can reach a stage of discomfort to the occupants. In many countries situated in seismic regions, reinforced concrete frames are in filled fully or partially by brick masonry panels with or without openings. Although the infill panels significantly enhance both the stiffness and strength of the frame, their contribution is often not taken into account because of the lack of knowledge of the composite behavior of the frame and the infill. Infill wall can be modeled in several forms such as, equivalent diagonal strut approach and finite element method etc. For new buildings, infill wall is modeled and designed to provide high rigidity.

SCOPE AND OBJECTIVE

SCOPE

The scope of the study is to find the effect of masonry infill panel on the response of RC frames subjected to seismic action by conducting pushover analysis, time history analysis for RC frame with infill wall at varying arrangement using ETABS.

OBJECTIVE

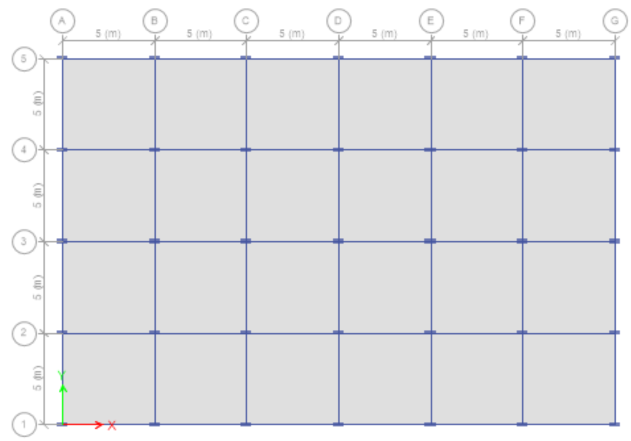
- To compare various parameters such as displacement, storey drift and base shear.
- To study the performance of RC frame at varying infill.

METHODOLOGY

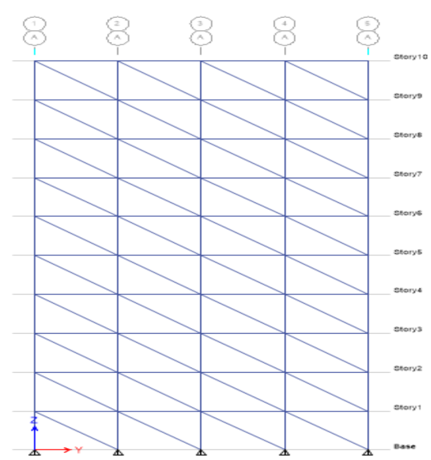
- The grid of the plan is prepared.
- IS456-2000 is defined to models.
- Properties of slab, beams and columns are given.
- Define the static load cases and apply them to slab and beams
- Assign the support condition as a fixed support to the bottom
- Define mass sources.
- Run the analysis and various results are obtained. Designs are carried out as per IS456-2000, and then select all the beams and columns to assign hinge properties. Moment and shear hinges are considered for beam element; and axial with biaxial moment hinges are considered for column elements.
- Defining static nonlinear load cases.
- Run the pushover analysis.

Following data is used in the analysis of the RC frame building models

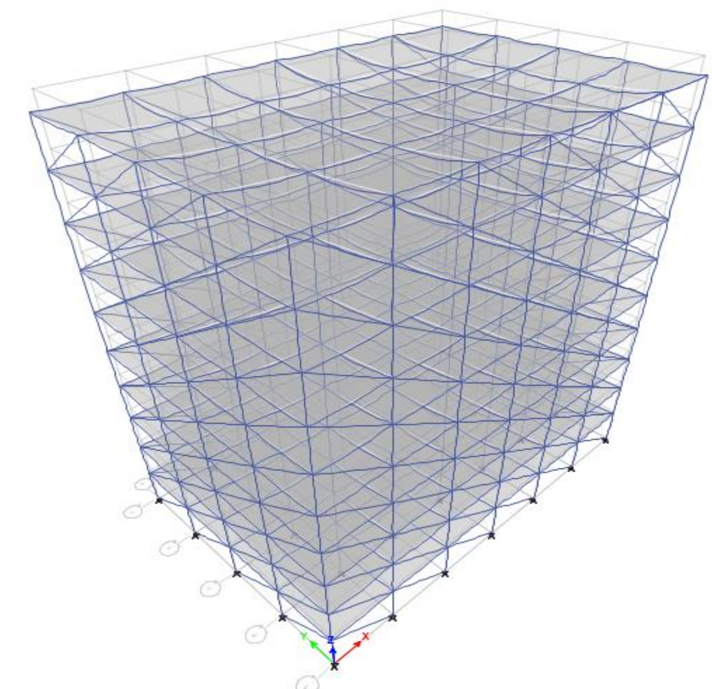
Number of storey: Ten Seismic zone: III
Floor height: 3.5 m
Depth of Slab: 150 mm
Size of beam: (230 × 450) mm
Size of column: (230 × 600) mm
Spacing between frames: 5 m along both directions
Live load on floor: 3 KN/m2
Floor finish: 0.6 KN/m2
Terrace water proofing: 1.5 KN/m2
Materials: M 20 concrete, Fe 415 steel and Brick infill
Thickness of infill wall: 230 mm
Density of concrete: 25 KN/m3
Density of infill: 20 KN/m3
Type of soil: Medium
Ei =5500MPa
Poisson's Ratio of masonry infill = 0.15



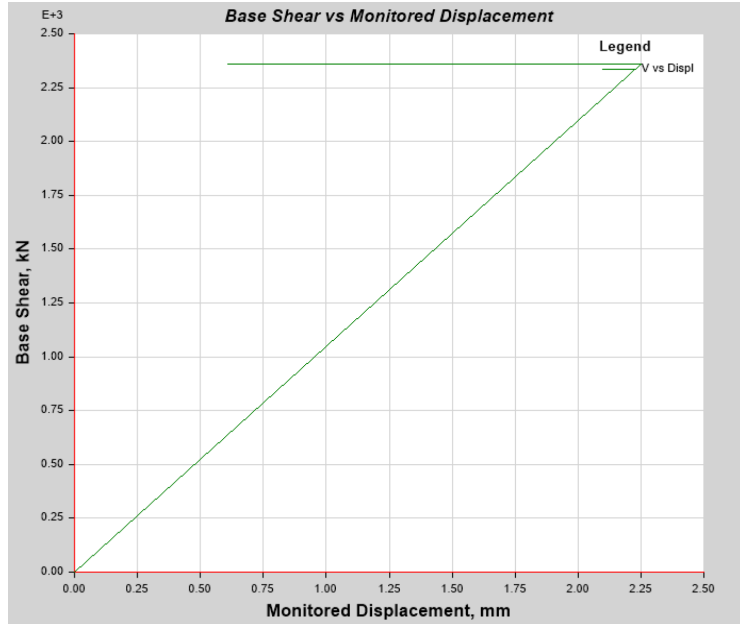
plan



ANALYSIS AND RESULTS



Deformed shape



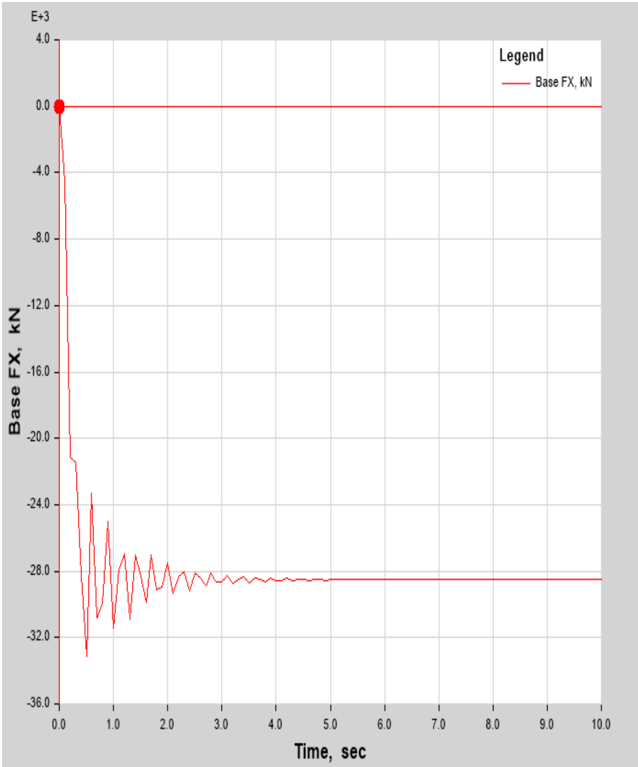
Pushover Curve - Base Shear vs Monitored Displacement

Tabulated Plot Coordinates

Capacity Curve Coordinates (Part 1 of 2)

Step	Monitored Displ	Base Force	A-B	B-C	C-D	D-E	>E	A-IO	IO-LS	LS-CP	
	mm	kN									
0	0	0	0	0	0	0	0	0	0	0	
1	2.2	2365.8745	0	0	0	0	0	0	0	0	
2	0.6	2365.8745	0	0	0	0	0	0	0	0	
3	2.2	2365.8745	0	0	0	0	0	0	0	0	
4	0.6	2365.8745	0	0	0	0	0	0	0	0	
5	2.2	2365.8745	0	0	0	0	0	0	0	0	

Time History



Column1	Column2
Time	Base FX
sec	kN
0	0
0.1	-4554.5034
0.5	-33176.685
1	-31430.753
1.5	-28364.891
2	-27502.039
2.5	-28120.893
10	-28519.677

CONCLUSION

Due to infill walls in the High Rise Building top storey displacement is reduces. Base shear is increased. The presence of non-structural masonry infill walls can modify the seismic behavior of RCC Framed High Rise building to large extent. Arrangement of infill wall also alters the displacement and base shear the top of building displacements gets reduces. In case of infill having irregularities in elevation such as soft storey that is damage was occur at level where change in infill pattern is occur. The result of the present study show that structural infill wall have very important effect on structural behavior under earthquake effect. On structural capacity under earthquake effect displacement and relative story displacement are affected by the structural irregularities.

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