



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 4, April 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512



9940 572 462



6381 907 438



ijirset@gmail.com



www.ijirset.com



Seismic Behavior of RC Framed Open Ground Storey Building With & Without Infill Wall

Abdul Rehman Tanwar¹, Dr. N.G Gore²

P.G. Student, Department of Civil Engineering, M.G.M.'S College of Engineering and Technology, Navi Mumbai, Maharashtra, India¹

Professor, Department of Civil Engineering, M.G.M.'S College of Engineering and Technology, Navi Mumbai, Maharashtra, India²

ABSTRACT: Open ground storey (OGS) buildings are known to be vulnerable under seismic loading due to early formation of collapse mechanism in the ground storey RC columns. A reinforced concrete building with masonry infill is most common type of construction in India. Traditionally, conventional clay bricks or AAC blocks which are heavy rigid materials have been used as infill wall. Infill walls in RC framed buildings provide lateral stiffness to the structure. AAC (autoclaved aerated light weight concrete) blocks are one of the available light weight and flexible infill materials. In this study, response spectrum analysis has been carried out using ETABS software to understand the seismic behaviour of open ground storey RC framed building with & without infill walls. The experimental result will show that the AAC blocks infilled RC frame exhibits better performance subjected to lateral loads than that of conventional bricks infilled frames. In this paper, a 10 storeyed building is analysed by using response spectrum method for seismic zone III for three different cases using with & without infill wall. The final results and conclusion will be based on the behaviour of building to the seismic forces and the comparative seismic parameters like base shear, lateral storey drift, displacement, scale factor etc of three cases.

KEYWORDS: AAC Block infill wall, bare frame, brick masonry infill wall Response Spectrum Method, Base Shear, Lateral storey drift, Displacement, scale factor etc.

I. INTRODUCTION

Open ground storey buildings are commonly used in the urban environment nowadays since they provide parking area which is most required. This type of building shows comparatively a higher tendency to collapse during earthquake because of the soft storey effect. Large lateral displacements get induced at the first floor level of such buildings yielding large curvatures in the ground storey columns. With the infill wall the strength and stiffness of bare frame is increased but at the open ground storey is not, then the fundamental time period component to bare frame and consequently increases the base shear demands in the ground storey beams and column. One of the widely used material is AAC blocks. Dr. Johan Eriksson developed Autoclaved Aerated Concrete block in 1923 and was patented for manufacturing in 1924. These blocks lower the environmental impact. The density of AAC is around 1/3rd of conventional clay bricks hence reduces the seismic forces on the structure. Experiments show that much lesser deflections take place in the structure when AAC blocks are used instead of clay bricks.

II. LITERATURE REVIEW

The present work is aimed at comparative study of behaviour of RC framed open ground Multi-Storeyed Buildings with & without infill wall. Various studies have been carried out till date for with & without infill wall in RC framed Open Ground Multi Story Building below as follows:

Mohammed Nauman, Nazrul Islam (2014) was studied about Behaviour of RC framed Multistorey Structure With and Without Infill Walls. Framed reinforced concrete structures are most commonly types of structures constructed all over the world due to ease of construction and rapid progress of work. Generally brick or block work masonry is done in these frames which act as an infill panels in the framed structure. Infill walls provide the lateral stiffness to the

structure. Its behaviour is very different from the bare frame structure. It was concluded that Lateral deflection in both the direction decreases considerably with the introduction of infill walls. It indicates that the stiffness of the structure is increased. Remarkable reduction in the storey drift has also been observed. Maximum reduction in the storey drifts in X and Z direction is 69.64% and 76.1% respectively. Drastic reduction in the storey shears has been observed in both the structures. Storey shears increase considerably after the addition of infill walls. After the addition of infill walls the building becomes stiff as compared to the bare frame structure, it will attract large amount of lateral forces as compared to the bare frame structure.

Krushna B. Avhad (2015) was studied about the Seismic Analysis of High-Rise Open Ground Storey Framed Building. In this paper the various aspects related to the performance of OGS buildings. The values of magnification factor recommended in literatures vary from 1.0 to 4.8 (Kaushik, 2009). The main objective of present study is the study of comparative performance of OGS buildings designed according to various MFs using nonlinear analysis. As the more realistic performance of the OGS building requires the modelling the stiffness and strength of the infill walls, the stiffness and strength of the infill walls also considered. The variations in the type of the infill walls using in Indian constructions are significant. Depending on the modulus of elasticity and the strength, it can be classified as strong or weak. The two extreme cases of infill walls, strong and weak are considered in the study. The behavior of buildings depends on the type of foundations and soils also. Depending on the foundations resting on soft or hard soils, the displacement boundary conditions at the bottom of foundations can be considered as hinged or fixed. As the modeling of soils is not in the scope of the study, two boundary conditions, fixed and hinged, that represent two extreme conditions are considered. Base shear Capacity of a 10 S6B bare frame designed with MF of 3.0 & 2.5 is about 28 % more than that designed with MF 1.0 whereas the deflection vary by not more than 15 mm between them. Base shear Capacity of a 10 S6B bare frame designed with MF of 3.0 & 2.5 is about 28% more than that designed with MF equal to 1.0 whereas the deflection vary by not more than 10 mm between them. Strong infill 10s frame with fixed support can take 3 times more load than that with weak infill whereas the deflection being almost same about 66 mm for both the cases.

Kumbhar S. S, Rajguru R. S (2015) was studied about Seismic Analysis of Masonry Infill in Multi-Storey RC Buildings. In this paper masonry infill is the most common structural system of construction of RC frame who behaves as the exterior walls as well as partition walls. So it is important to study the significance of infill in the structure. Various researches on RC buildings with masonry infilled walls was carried out by many researchers using brick masonry in most cases and AAC in some cases. In this study, AAC block is selected as material for the infill since it has less density, larger block size, lightweight, porous nature and other useful properties. A bare frame model and AAC block masonry infilled frame model with and without openings are modelled using the software ETABS. The infills in the structure are modelled as equivalent struts. The assumed structure is an apartment building of G+3 storeys in seismic zone III with a medium soil strata. Seismic coefficient method of analysis is adopted. Influence of AAC blocks on various responses of RC framed structure is studied. Values of base shear, storey displacements and inter-storey drift are derived and compared to evaluate the effect of infill on the structure. AAC block has a significant effect on the performance of a RC building. Compared to bare frame, infilled frame has less storey displacement as well as storey drift. If partially infilled frame is compared with fully infilled frame, partially infilled frame is more subjected to storey displacement as well as storey drift. Infilled frame has more storey shear compared to bare frame. Storey shear is maximum in fully infilled and then infilled frame with opening, partially infilled frame and minimum in bare frame.

Ashitosh C. Rajurkar and Neeta K. Meshram (2016) are concluded as the Maximum axial force is found in bare frame model. In interior columns, with considering infill wall effects and open ground storey the value of shear force is maximum. In interior columns, without considering infill wall effects and stiffer size column the value of moments is maximum. Soft storey building exhibits deficient performance during earthquake. Damage induced for ground floor columns and ground storey are very large for soft storey building. Soft storey at ground level in RC frame building shows deficient performance during earthquake as the stiffness of soft storey is less.

III. METHODOLOGY

The following steps are undertaken within the present study are as follows: 1. In present research 3 different model 10 storey building structure using with infill wall that is AAC Block & brick masonry infill wall & without infill wall that is bare framed is done. 2. Modelling of the structure is done using ETABS. 3. Seismic analysis as per IS 1893-2016. 4. Design and analysis of structure using IS 456-2000. 5. Obtaining seismic parameters like base shear, lateral drift, displacement & scale factor. 6. Design and analytical work is been carried out by method using response spectrum analysis. 7. Observation and comparison of result. 8. Conclusion.



IV. STRUCTURAL MODELLING

In this study, structure will be model for the following cases: 1. 10 storeyed building RC framed open ground storey building with & without infill wall. 2. Analysis and conclusion of same structure by using response spectrum method. 3. Analysis and conclusion by using response spectrum method. 3. The RC frame structure will be modelled using ETABS software with storey height of 3m & ground storey height 3.5 m. the member size are varied as per the design requirements. 4. The model is analysis with 3 different model 10 storey building structure using with infill wall that is AAC Block & brick masonry infill wall & without infill wall that is bare frame.. 5. Model is design RC framed as according to IS 456-2000.

V. PRELIMINARY DATA

Following are the data assumed for carrying out this study, 1. Length in X direction=40m. 2. Length in Y direction=32m. 3. Typical storey height=3m. 4. Ground storey height=3.5m. 5. No. of storey= 10. 6. Height of bldg. =30.5 m. 7. Bay spacing in X & Y direction= 8m Load consideration are as follows: 1. Dead load: as per calculation of changes in density, compressive strength, Poisson's, modulus of elasticity. 2. Live load: 3 kN/m². 3. Earthquake load as per IS-1893:2016 4. Seismic zones: III.

REFERENCES

- [1] Holmes, M. (1961) "Steel frames with brick and concrete infilling" Proceedings of Institution of Civil Engineers. Vol19, issue no.4, pp473-478
- [2] Mallick D.V. and Severn R.T., (1967), "The Behaviour of Infilled Frames under Static Loading", The Institution of Civil Engineers, Proceedings.vol 39, issue no. 6, pp 639-656.
- [3] Chopra A. K. (1973) "Earthquake resistance of buildings with a soft first storey. Earthquake and Structural Dynamics", Vol 1, issue 4pp 347-355
- [4] Vikas P. Jadhao, Prakash S. Pajgade, "Influence of Masonry Infill Walls on Seismic Performance of RC Framed Structures a Comparison of AAC and Conventional Brick Infill", International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 –8958, Volume-2, Issue-4, April 2013
- [5] Sharad P. Desai, Swapnil B. Cholekar, "Seismic Behaviour of Flat Slab Framed Structure With And Without Masonry Infill Wall", International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 7, July 2013
- [6] Krushna B. Avhad, "Seismic Analysis of High-Rise Open Ground Storey Framed Building", International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-3 Issue-4, September 2014
- [7] Mohammed Nauman, Nazrul Islam, "Behaviour of RCC Multistorey Structure With and Without Infill Walls", International Journal of Innovative Research in Science, Engineering and Technology ISSN: 2319-8753, January 2014
- [8] Lini M Thomas, Kavitha P.E., "Effect of Infill Walls on the Seismic Performance of the Multistoried Buildings", IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 , pISSN: 2321-7308, October 2015
- [9] Vipin v. Halde1, Aditi h. Deshmukh2 "Review on behavior of soft storey in building", international research journal of engineering and technology (irjet) e-ISSN: 2395 -0056, p-ISSN: 2395-0072 Nov 2015
- [10] Kumbhar S. S, Rajguru R. S, "Seismic Analysis of Masonry Infill in Multi-Storey RC Buildings", International Journal of Science, Engineering and Technology Research (IJSETR), Volume 4, Issue 6, June 2015



**Impact Factor:
7.512**



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

9940 572 462 6381 907 438 ijirset@gmail.com



www.ijirset.com

Scan to save the contact details