



JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A Seismic Response Analysis of Masonry In filled RC frames with Openings.

¹Alok Kumar, ²Prof. Harshavardhan Rangari, ³Prof. Girish Sawai

¹Research Scholar, ²Assistant Professor, ³Head of Department,

¹Civil Engineering Department,

¹V. M. Institute of Engineering and Technology, Nagpur, India

Abstract : Despite the fact that it is broadly acknowledged that the communication between stone work infill and primary individuals essentially influences the seismic reaction of supported concrete (RC) outlines, such an association is for the most part ignored in current plan situated seismic investigations of designs. Besides, the job of brick work infill is expected to be significantly more important on account of existing edge structures planned exclusively for gravitational burdens, as infill can altogether alter both sidelong strength and solidness. Be that as it may, the extra commitment to both strength and solidness is much of the time joined by an adjustment of the worldwide breakdown components conceivably bringing about weak disappointment modes, by and large connected with unpredictable dispersions of stone work dividers all through the outline. As an issue of rule, precise displaying of workmanship infill ought to be basically done by embracing nonlinear 2D components. Nonetheless, a few practice-arranged recommendations are presently accessible for displaying workmanship infill through same (nonlinear) swagger components. The current paper first and foremost blueprints a portion of the well-established models presently accessible in the logical writing for displaying infill boards in seismic examinations of RC outlines. Then, parametric nonlinear examinations are done to show the outcomes of considering such models in nonlinear static and dynamic investigations of existing RC structures. Two inlet outlines with two-, three-and four-stories are considered for performing nonlinear examinations pointed toward researching some basic parts of displaying brick work infill and their consequences for the primary reaction. Especially, responsiveness investigations about unambiguous boundaries associated with the meaning of the same swagger models, for example, the constitutive power uprooting law of the board, are proposed.

IndexTerms - masonry infill; nonlinear analysis; existing structures; reinforced concrete; strut models.

I. INTRODUCTION

The term in filled outline is utilized to indicate a composite design shaped by the mix of a second opposing plane casing and infill dividers. The workmanship can be of block, substantial units, or stones. Generally the RC outline is loaded up with blocks as non underlying divider for parcel of rooms. In the structure development, outlined structures are much of the time utilized because of simplicity of development and fast advancement of work. Stone work infill boards have been generally utilized as inside and outside parcel dividers for tasteful reasons and practical necessities. When infill dividers are excluded in a specific story, a delicate story is framed contrasted with a lot stiffer different stories. (Mahmud, Islam and Al-Amin). However multi-storeyed structures with stopping floor (delicate story) are powerless against breakdown because of seismic tremor loads. The impact of infill boards on the reaction of RC outlines exposed to seismic activity is broadly perceived and has been subject of various trial and scientific examinations over most recent fifty years. In the ongoing act of underlying model in India workmanship infill boards are treated as nonstructural component and their solidarity and firmness commitments are dismissed. In actuality the presence of infill divider changes the way of behaving of casing activity. Workmanship infill's are normally utilized in structures for practical and compositional reasons. Nonetheless, their primary commitments are generally ignored in the plan cycle. Execution of structures in the new seismic tremors (for example 1985 Mexico City tremor, 1995 Kobe quake, 2001 Bhuj seismic tremor) as displayed in fig 1.1, obviously delineate that the presence of infill dividers has huge underlying ramifications. The trouble in considering infill dividers in the plan processes is because of the absence of definitive trial and insightful outcomes about their way of behaving under sidelong seismic power.

II. LITERATURE REVIEW

In 1984 Liaum T.C. in his review "An underlying framework against quake", as addressed by different types of infilled outlines had arisen with training and conservative importance in the avoidance of complete breakdown of building. Hypothetical concentrate in connection with different sort of infilled outlines was audited and the pertinence of the technique for investigation was made sense of in the illumination of conduct of the different kind of infilled outlines. Trial examination was accounted for on the statics and elements qualities of model appearance that they can be utilized as compelling underlying frameworks against the harming sidelong stacking methodology during seismic tremor.

In 2000 Murty and Jain announced that workmanship infills in built up substantial structures cause a few unwanted impacts under seismic stacking as short-section impact, delicate story impact, twist, and out-of-plane breakdown. Exploratory outcomes on cyclic

trial of RC outlines with workmanship infills showed that brick work infills contribute critical horizontal firmness, strength, in general flexibility and energy dissemination limit.

In 2001 Syrmakezis C. A. what's more, Asteris P. G. explored the seismic way of behaving of multistorey, supported concrete, to some extent infilled outlines. The Method of Contact Points was utilized to concentrate because of the stone work infill board opening on firmness of infilled outlines by differing region and the place of the workmanship infill board opening.

In 2002 Dolsek Matjaz and Fajfar Peter concentrated on the seismic reaction of infilled RC outlines utilizing numerical demonstrating. The trait of identical swaggers were researched exhaustively. A few variations of a four-storey and a three-storey built up concrete (RC) building, and a shaking table test performed at ISMES on an imbalance two-storey RC building were reproduced mathematically. It was seen from the outcomes that the impact of infills ought to be remembered for numerical models.

III. METHODOLOGY

Problem of the present study

In the present study three storey buildings (G+2) with symmetrically placed infill walls having central and corner openings as shown in figure 2.1 to 2.11. have been analysed.

Following parameters have been varied:

- Infill thickness.
- Location of the openings.
- Horizontal and vertical distribution of opening.

2.2.1 Input parameters

1. Height of the building- 10.5m ,with each storey height- 3.5 m
2. Column Size- 450 mm X 450 mm
3. Beam Size- 450 mm X 300 mm
4. Thickness of masonry infill
 - T1 = 300 mm
 - T2 = 200 mm
 - T3 = 100 mm
5. Live load- 3 kN/m²
6. Dead load of plane frame- 5.529 kN/m² (Calculated by STAAD)
7. Dead load of Plane frame with infill- 19.20 kN/m² (Calculated by STAAD)
8. Zone - V
9. Importance factor - 1
10. Response Reduction factor - 5
11. Soil type – Hard
12. Damping - 5 %
13. Load combination as per IS 456
14. BRICK PROPERTIES
 - Brick Density - 19.54 kN/m³
 - Young's Modulus of Elasticity – 8273708.736 kN/m²
 - Poisson's Ratio – 0.16
 - Shear Modulus - 1500X103 kN/m²
 - Thermal Coefficient – 0.000006
 - Damping – 3%

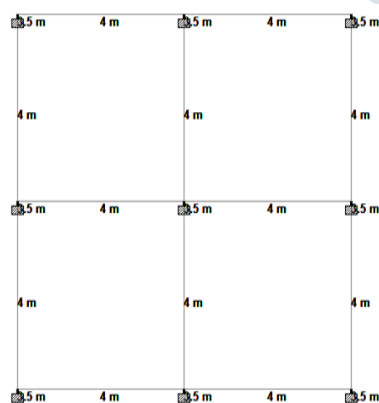


Fig. Plan of the building

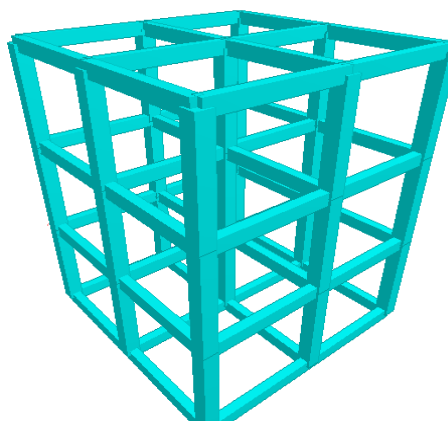


Fig. 3D Plane Frame

IV. RESULT AND DISCUSSION

Effect of opening

The presence of openings is an essential requirement in a building due to functional and aesthetic requirements. However, the presence of openings results in change of seismic response parameters like displacement, moment and shear. The openings may be present at different location in a storey like at centre or at corner. The location of opening also affects the seismic response significantly.

Centre opening

Figure shows the variation of displacement along the building height for opening located in center in ground storey only. It has been observed from fig. that the storey displacement increased along the building height with maximum increase of 87.8%. The percentage of increase of storey displacement also increased with increase in the building height for frames with and without openings the maximum percentage of increase observed for the top storey. The masonry infill thickness results in reduction of deformation demand as shown in Table.3.1 (a).

Figure) depicts that the base shear was maximum at the base with 84.07% of increments with respect to plane frame of the building and it decreased along the building height. This is due to fact that

$$V_b = A_h.W$$

Where A_h is the seismic coefficient which depends upon various seismic parameters like Z , I , R etc. So the seismic weight is maximum at the bottom storey. Therefore, the base shear increases and lateral force decreases consequently.

From Figure shows the variation of storey moment with the building height for the frames with and without openings. It has been observed from Figure that the storey moment is maximum at the first storey and it decreases along the building height with the maximum percentage of 90.07%, observed for the bottom storey. This is due to the fact that the top storey has the maximum lateral force and as per the classical principle of the structural mechanics “the moment is minimum where the lateral force is maximum”. As the lateral force is maximum at the top storey, the moment is minimum. The percentage variation of the moment was maximum for the plane frame and it increased with the presence of opening and decreased with the increase in thickness of the masonry wall.

The pattern of variation of the seismic response parameters for first and second storey followed a similar pattern as for the ground storey as evident from figure and figure. However, the percentage of variation of seismic response parameters was different and has been indicated in Table and.

Ground storey

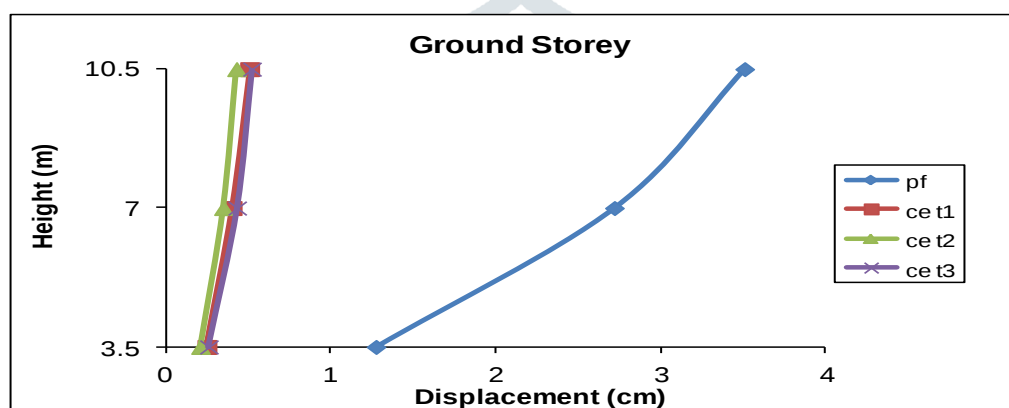


Fig Displacement due to center opening in Ground Storey (ce)

Joint Displacement (cm)						Percentage difference		
JOINT	Height	pf	ce t1	Ce t2	ce t3	%pf-cet1	%pf-cet2	%pf-cet3
26	3.5	1.27	0.24	0.20	0.26	80.52	83.57	79.54
27	7	2.71	0.40	0.34	0.43	85.25	87.19	84.11
28	10.5	3.50	0.50	0.42	0.52	85.54	87.80	85.13

V. CONCLUSION

From the analytical results following conclusions can be deduced.

- The increase in thickness of masonry infill results in reduction in storey displacement, this is due to fact that the masonry infill thickness increases the seismic weight of structure and it is difficult to displace a heavier mass.
- The increase in masonry infill thickness increased the base shear and reduced the storey moment due to above mention reason.
- From the analysis result it can be observed that the presence of openings in masonry infill at bottom storey is more critical as compared to its presence in upper storey. It is evident from the higher percentage of variation of seismic response parameter for the case when the opening is present in bottom storey.

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