

Evolution Of Seismic Response of RCC Buildings with and Without Infill Walls

Prof. Gujar Prashant D.¹, Dr. P.M. Patil², Jadhav Rameshvar B.³, Pawar Akash A.⁴,
Dhotre Tushar S.⁵, Brahmkar Umesh L.⁶

¹Guide, Civil Engineering, Adsul's Technical Campus

²Principal & Director, Adsul's Technical Campus

³⁻⁶Students, Civil Engineering, Adsul's Technical Campus

Abstract—The seismic performance of reinforced concrete (RCC) buildings is greatly affected by the presence of masonry infill walls. Although infill walls are generally considered non-structural elements, they significantly influence the stiffness, strength, and dynamic characteristics of buildings subjected to earthquake loads. This study investigates the seismic response of a G+14 RCC building with and without masonry infill walls using ETABS software. The seismic analysis is carried out according to IS 1893 (Part 1): 2016. Parameters such as storey displacement, storey drift, and storey shear are evaluated and compared for symmetric and unsymmetrical building configurations. Results indicate that infill walls considerably reduce lateral displacement and drift while increasing storey shear and overall structural stiffness. The study emphasizes the importance of including masonry infill walls in analytical models for realistic seismic assessment and safer structural design.

Index Terms—RCC Building, Masonry Infill Wall, Seismic Analysis, ETABS, Storey Drift, Storey Shear, Earthquake Resistance.

I. INTRODUCTION

Earthquakes are among the most destructive natural hazards affecting the safety and stability of buildings. Reinforced Concrete (RCC) framed structures are widely used in urban construction due to their strength, durability, and economic advantages. Most RCC buildings contain masonry infill walls that are commonly treated as non-structural components during design.

However, during seismic events, these walls interact with the surrounding frame and contribute significantly to the lateral stiffness and strength of the

structure. Ignoring the effect of infill walls may lead to inaccurate prediction of seismic behavior and unsafe structural designs.

This research investigates the effect of masonry infill walls on the seismic response of RCC buildings. Two structural models are analyzed:

1. Bare RCC Frame (Without Infill Walls)
2. RCC Frame with Masonry Infill Walls

The comparison helps in understanding the role of infill walls in improving earthquake resistance.

II. OBJECTIVES OF THE STUDY

The major objectives of the study are:

- To analyze the seismic behavior of a G+14 RCC building.
- To compare buildings with and without masonry infill walls.
- To evaluate storey displacement, storey drift, and storey shear.
- To determine the influence of infill walls on structural stiffness.
- To identify the seismic advantages of infill wall systems.
- To recommend suitable design practices for earthquake-resistant structures.

III. TYPES OF INFILL WALLS

The commonly used infill walls are:

3.1 Light Steel Framed Infill Walls

Lightweight steel sections are used to create wall systems with high strength and durability.

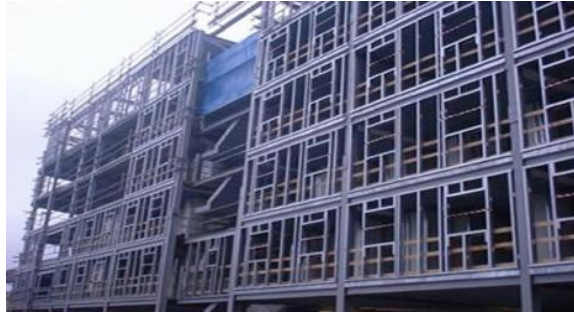


Fig.1. Light Steel Framed Infill Walls



Fig.2. Light Steel Separating Walls

3.2 Light Steel Separating Walls

These walls provide acoustic and fire resistance while maintaining structural separation.

3.3 Masonry Infill Walls

Constructed using bricks or concrete blocks, masonry infill walls contribute significantly to lateral strength.

3.4 Timber Infill Walls

Timber sections are used for lightweight construction and moderate structural support.



Fig.3.Masonry & Timber Infill Walls



Fig.4.Concrete Infill Walls

3.5 Concrete Infill Walls

Precast concrete panels provide excellent strength and stiffness.

IV. METHODOLOGY

The seismic analysis was performed using ETABS software.

Building Details

Parameter	Value
Building Type	RCC Frame
Storeys	G+14
Storey Height	3 m
Total Height	42 m
Beam Size	300 × 450 mm
Column Size	500 × 500 mm
Slab Thickness	150 mm
Wall Thickness	250 mm

Material Properties

Material	Value
Concrete Grade	M50
Steel Grade	Fe500
Density of RCC	25 kN/m ³
Masonry Density	20 kN/m ³

V. STRUCTURAL MODELING

Two models were developed in ETABS:

Model 1: Bare Frame

RCC structure without masonry infill walls.

Model 2: Infilled Frame

Masonry infill walls modeled using equivalent diagonal strut method.

Seismic Parameters

Parameter	Value
Seismic Zone	V
Zone Factor	0.36
Importance Factor	1.2
Response Reduction Factor	5
Soil Type	Medium (Type II)
Damping	5%

VI. RESULTS AND DISCUSSION

6.1 Storey Displacement

Without Infill Walls

Maximum displacement observed at terrace:

- Symmetric Model = 40.025 mm
- Unsymmetrical Model = 40.879 mm

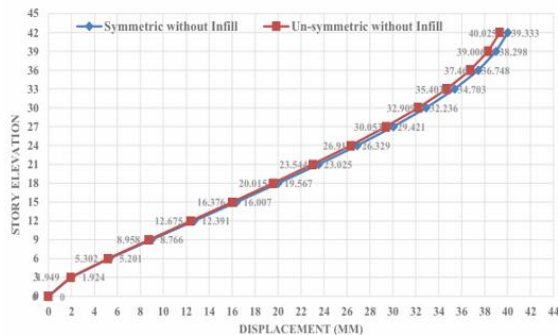
With Infill Walls

Maximum displacement observed:

- Symmetric Model = 7.768 mm
- Unsymmetrical Model = 10.888 mm

Observation

Infill walls reduced displacement by approximately 75–80%.



6.2 Storey Drift

Without Infill Walls

Maximum drift:

- 0.00124

With Infill Walls

Maximum drift:

- 0.000341

Observation

Storey drift reduced by nearly 70–75% due to the inclusion of infill walls.

All values remained within IS 1893 permissible limits.

6.3 Storey Shear

Without Infill Walls

Maximum storey shear:

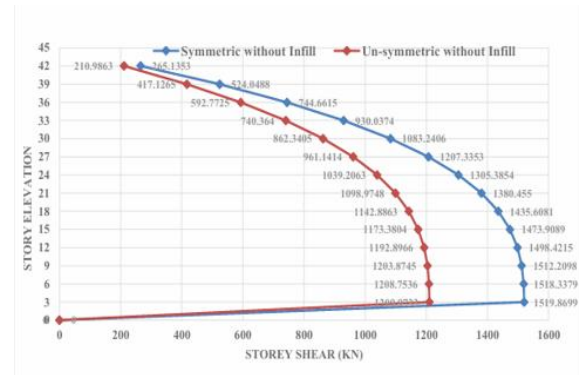
- Symmetric = 1519.87 kN
- Unsymmetric = 1209.97 kN

Observation

Symmetric structures exhibit better lateral load resistance.

Effect of Infill Walls

Infill walls increased structural stiffness and enhanced seismic resistance.



VII. COMPARATIVE ANALYSIS

Parameter	Without Infill	With Infill
Maximum Displacement	40.88 mm	10.88 mm
Maximum Drift	0.00124	0.00034
Structural Stiffness	Low	High
Seismic Resistance	Moderate	Excellent

The results clearly demonstrate the beneficial effects of masonry infill walls in improving seismic performance.

VIII. CONCLUSION

Based on the analytical investigation carried out using ETABS, the following conclusions are drawn:

1. Masonry infill walls significantly improve the seismic performance of RCC buildings.
2. Storey displacement decreases by approximately 75–80%.
3. Storey drift decreases by nearly 70–75%.
4. Structural stiffness increases substantially.
5. Symmetric structures perform better than unsymmetric structures.
6. Buildings with infill walls exhibit improved earthquake resistance and stability.

7. Neglecting infill walls during analysis may lead to inaccurate estimation of seismic behavior.
8. Infill walls should be incorporated in seismic analysis for realistic structural assessment.

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