

A Comparative Study of Conventional Structural System with Monolithic Structural System

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Abstract

In the seismic design of buildings, reinforced concrete structural walls, or shear walls, act as major earthquake resisting members. Structural walls provide an efficient bracing system and offer great potential for lateral load resistance. The properties of these seismic shear walls dominate the response of the buildings, and therefore, it is important to evaluate the seismic response of the walls appropriately. In these paper conventional and monolithic structural systems for G+5 story was studied with the help of ETABS v 13. Parameters like Lateral displacement, story drift are calculated for both the structures.

Keywords: Conventional Structural System, Monolithic Structural System, ETABS v 13

I. INTRODUCTION

Building can be defined as an enclosed structure intended for human occupancy. It is found that some structural systems perform better in earthquake than others. For the research purpose, researchers have focused on two structure system namely,

- 1) Conventional Structural System
- 2) Monolithic Structural System

In Monolithic System instead of traditional column and beam construction; all walls, floors, slabs, columns, beams, stairs, together with door and window openings are cast in place in one operation at site by use of specially designed, easy to handle with less labour and equipment efforts modular form work made of Aluminium Plastic composite. Using the formwork system, quick construction of several units is possible.

II. OBJECTIVE OF STUDIES

- The objective of the study is to carry out comparative study of Conventional structural system with and without shear wall with monolithic structural system.
- To determine the suitability, adoptability and economic feasibility of conventional structural system against monolithic structural system.
- To compare the various Parameters.

III. METHODOLOGY

For this study, a 5-story building with lift room having a 3-meters height for each story is modelled. The sections of structural elements is rectangular with common dimensions. The buildings are modelled using software ETAB v 13, three different models - Conventional Structural System (with and without shear wall) and Monolithic Structural System.

Dead load & live load calculation is as per IS 875, and Earthquake load calculation is as per IS 1893 taking EQ Zone-III by using static coefficient method.

The data for these frames are given below.

Seismic Zone – III, No of storeys – 1 to 5, Floor Height – 3m, Thickness of Shear wall– 150mm, Materials – M25, Fe 415, Depth of Slab – 125mm, Unit Weight of RCC – 25kN/m³, Type of soil – Medium. Size of beam 300x415 mm, Size of column 300x425 mm.

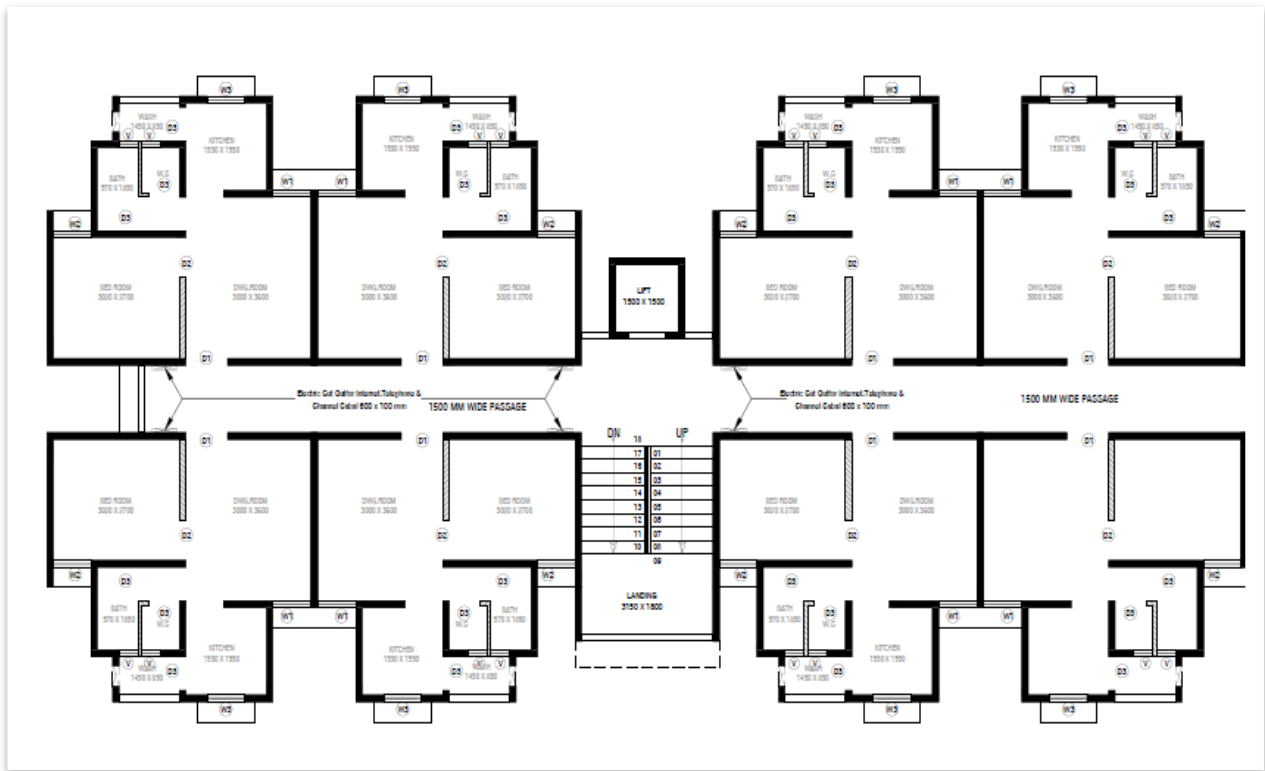


Fig. 1: Building Plan

IV. RESULTS

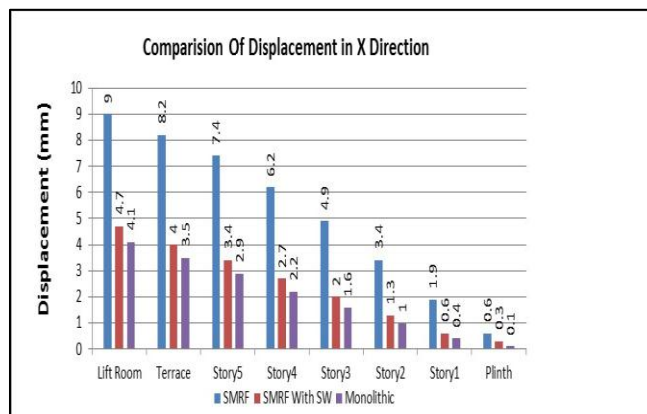


Fig. 2: Comparison of Displacement in X Direction

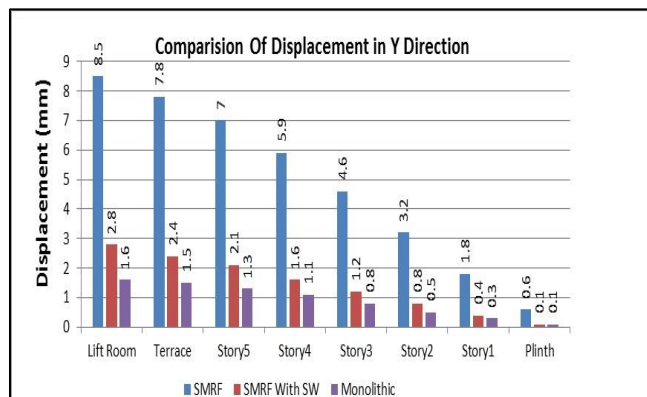


Fig. 3: Comparison of Displacement in Y Direction

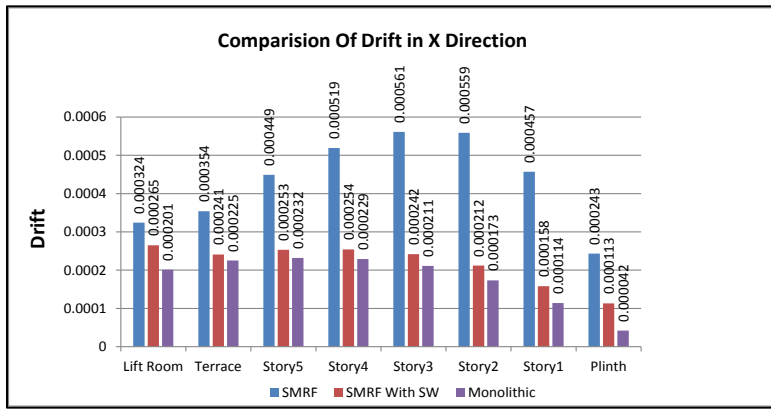


Fig. 4: Comparison of Drift in X Direction

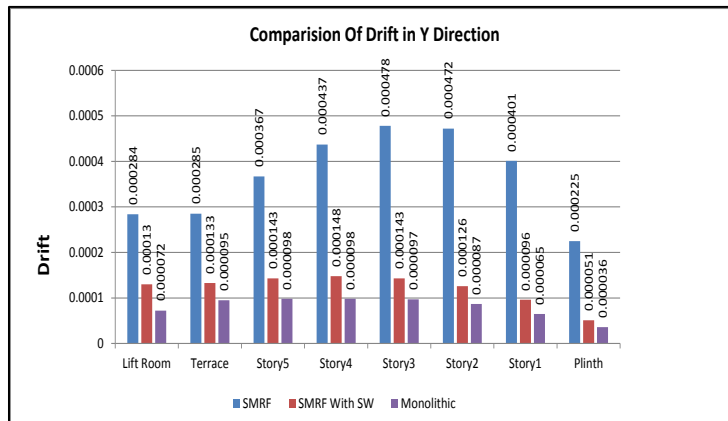


Fig. 5: Comparison of Drift in Y Direction

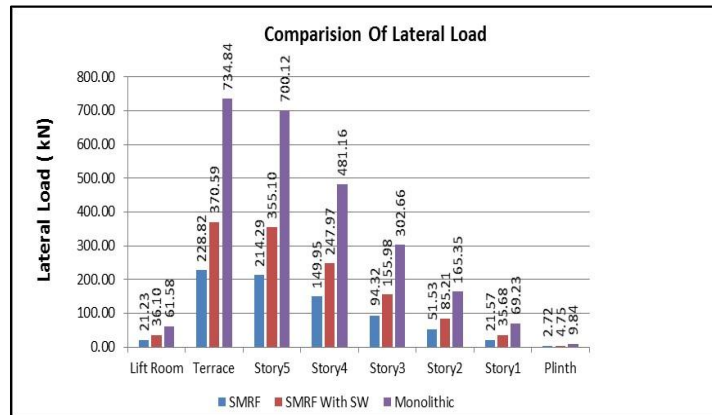


Fig. 6: Comparison of Lateral Load

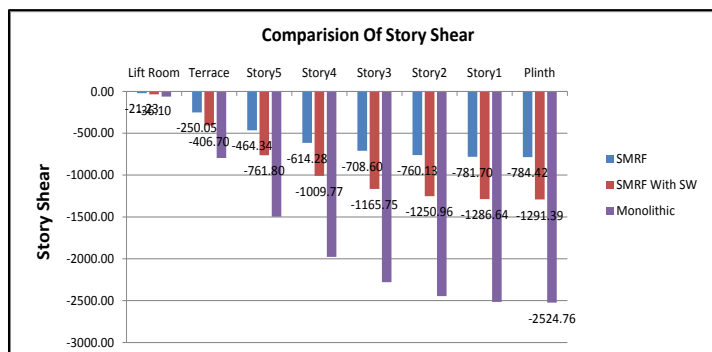


Fig. 7: Comparison of Story Shear

V. DISCUSSION

One to five storeyed building with and without shear wall and Monolithic System were analysed and designed as per the codal provisions and the results are compared in various aspects. It is found that storeyed displacement in Monolithic Structural System decreases as compared to conventional structural system in both the directions. Drift is also decreases in both the directions for Monolithic Structural System as compared to conventional structural system. As stiffness increases lateral load on structure increases. It is found that decrease in displacement in X direction, in monolithic system is varied from 50-80% as compared to conventional structural system (without shear wall). And the variance is 80% in the case of Y directions. In the case of Drift, in both X and Y direction variance ranges between 55-80% on an average.

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