ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 2, February 2024

Effect of Shear wall on RCC Structure

Supriya R. Wankhade, Abhinandan R. Gupta

P.G. Student, Department of Structural Engineering, College of Engineering Akola, Maharashtra, India
Professor, Department of Structural Engineering, College of Engineering Akola, Maharashtra, India

ABSTRACT: In recent years, Shear walls are specially designed structural walls which are incorporated in buildings to resist lateral forces that are produced in the plane of wall due to earthquake, wind, and flexural members. Shear walls are structural members used to elongate the strength of R.C.C. structures. These shear walls will be construct in each level of the structure, to form an effective box structure. Equal length shear walls are placed symmetrically on opposite sides of outer walls of the building. Shear walls are added to the building interior to provide more strength and stiffness to the building when the exterior walls cannot provide sufficient strength and stiffness. It is necessary to provide these shear walls when the tolerable span-width ratio for the floor or roof diaphragm is exceeded. The present work deals with a study on the improvement location of shear walls in symmetrical high-rise building. Position of shear walls in symmetrical buildings has due considerations. In symmetrical buildings, the center of gravity and center of rigidity coincide, so that the shear walls are placed symmetrically over the outer edges or inner edges. So, it is very necessary to find the efficient and ideal location of shear walls in symmetrical buildings to minimize the torsion effect.

KEY WORDS: shear wall, types, methods of analysis

I. INTRODUCTION

Shear wall, in building construction, a rigid vertical diaphragm capable of transferring lateral forces from exterior walls, floors, and roofs to the ground foundation in a direction parallel to their planes. While columns and load bearing walls keep buildings standing up, carrying the compression load of the structure down to its foundation, the shear wall is that keeps structures from blowing over, resisting the lateral forces of wind and seismic activity. They are among the most generally used lateral load fighting off systems in high rise structures. They have high in plane stiffness and strength that you can use to concurrently resist large horizontal loads and support gravity loads which makes them quite beneficial in lots of structural engineering programs. Shear walls are particularly important in large, or high-rise buildings, or buildings in areas of high wind and seismic activity.

A) Need of shear wall

Shear walls are not only designed to resist gravity / vertical loads (due to its1self-weight and other living / moving loads), but they are also designed for Lateral loads of earthquakes / wind. The walls are structurally integrated with roofs / floors (diaphragms) and other Lateral walls running across at right angles, thereby giving the three-Dimensional stability for the building structures. Shear wall structural systems are more stable. Other lateral wall running across at right angle, thereby giving the three-dimensional stability for the building structures.

B) Objective of The Project

The different objectives of providing shear wall to high rise buildings are as following:
a) To study the seismic effects of earthquake forces on buildings
b) To analyze an R.C. building frame using STAAD pro. Software setup.
c) To study the results of maximum shear force and maximum bending moment buildings with and without shear wall.
d) To understand the purpose of using shear walls using STAAD pro. Through this work. This method is not especially effective; it may omit legitimate messages (called false positives) and passing actual spam messages.

II. SIGNIFICANCE OF THE SYSTEM

Multi storied building is the most important for day-to-day life. For earthquake resistant design of building wrong construction practices and ignorance were done in our country, most of the existing building affects to future earthquake. To prevent structural collapse, safety life and serviceability, effective structural system should be providing with all seismic performance. To get sufficient stiffness to the high-rise buildings for resistance to lateral loads due to wind or

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 2, February 2024

seismic events. The location of building with reinforced concrete shear wall are designed because of their high bearing capacity, high ductility, and rigidity. The dimensions of beam and column are large and reinforcement at beam column joint are quite heavy in high rise building, so lot of clogging at these joint and difficult to place and vibrate concrete at these places which is not safe for the buildings. Shear wall is used to overcome this problem in high rise building. ETABS is the software which is easy to use for analysis and design for developed specifically for building systems in High rise buildings. ETAB software are quick and easy for the simple, largest, and most complex building. Although quick and easy for simple structures. It is the best tool for structural engineer in the construction industry. Shear walls should have sufficient ductility to avoid brittle failure under the action of strong lateral earthquake forces.

III. LITERATURE SURVEY

Radhika Rajeev et al 1 In this paper they had aimed to study the various research works done for improving the performance of shear wall and locating its best position in a building. The shape and plan position of the shear wall influences the behavior of the structure considerably. Shear walls have proved to be very successful in resisting strong earthquake so far. The shape and plan position of the shear wall influences the behavior of the structure considerably. **P. P. Chandurkar et al 2** In this present study, focus is to determine the solution for shear wall location in multi-storey building. Effectiveness of shear wall has been studied with the help of four different models. Model one is bare frame structural system and other three models are dual type structural system. An earthquake load is applied to a building of ten stories located in zone II, zone III, zone IV and zone V. Parameters like Lateral displacement, story drift and total cost required for ground floor are calculated in both the cases replacing column with shear wall. **Rishab Jain et al 3** In this research work, we analysed the G+15 storey without shear walls RCC building and with using shear walls RCC building the analysis is done by Response Spectrum Method with the help of ETABS Software as per Indian Standard Code and compared the results in the term of Maximum shear wall moments and maximum deflections, storey drift etc. **Akansha Dwivedi et al 4** In this study, the effect of presence of shear walls in RCC and composite structures in being analysed on basis of storey displacement, storey drift, stiffness, lateral force, and base shear for G+19 buildings. Effectiveness of shear wall is being studied with the help of four different models. Model 1 is RCC building without shear wall, Model 2 is RCC building with shear wall, Model 3 is building with composite columns having no shear wall and Model 4 is building with composite columns in presence of shear wall. The earthquake load is applied to a building in zone IV and the analysis is done using both static analysis method and response spectrum analysis method.

IV. METHODOLOGY

4.1 Detail Methodology

The project work will be work out in following phases.

PHASE-I

a) To General need, aim and objectives of the present work
b) Study various literates for deciding the parameters and models consideration
c) Finalizing the workflow steps.

PHASE-II

a) Detail study will be done for finalizing structural models
b) study will be done for effect of earthquake and shear wall on structure.
c) Studying types of loading and their combinations.
d) Fixing All general Structural Data and Case Considerations of Models

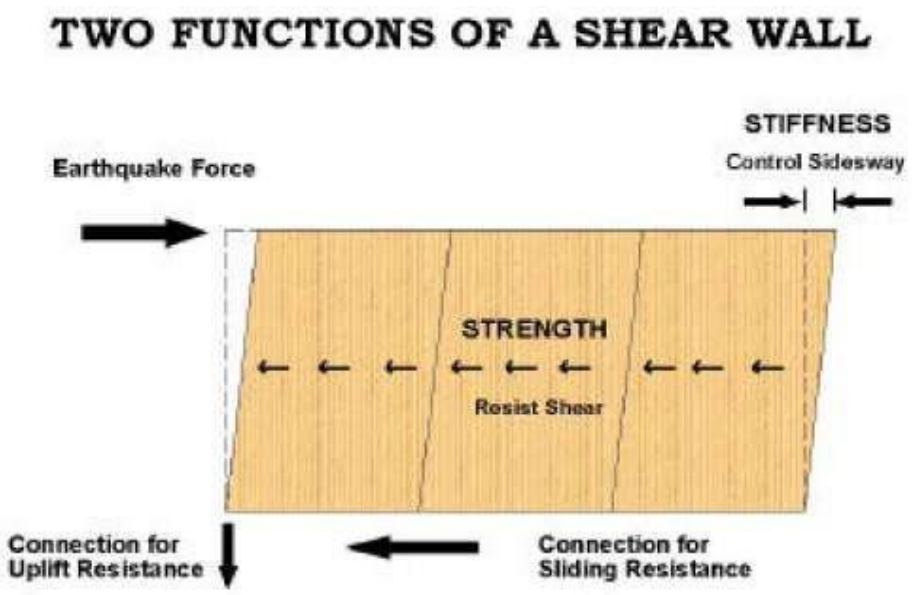
PHASE –III

a) Analyzing all the selected model patterns by using structural analysis software. (STAAD pro.)
b) Preparing the comparative result statements.
c) After result comparisons conclusions will be draft.

4.2 Functions of Shear Wall

Figure showing functions of shear wall Shear walls must provide the necessary lateral strength to resist horizontal earthquake forces. When shear walls are strong enough, they will transfer these horizontal forces to the next element in the load path below them. These other components in the load path may be other shear walls, floors, foundation walls, slabs or footings. Shear walls also provide lateral stiffness to prevent the roof or floor above from excessive side-sway. When shear walls are stiff enough, they will prevent floor and roof framing members from moving off their supports. Also, buildings that are sufficiently stiff will usually suffer less non-structural damage.

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 2, February 2024



Functions of Shear Wall

Types Of Shear Walls
1) RC Shear Wall
2) Plywood Shear Wall
3) Midply Shear Wall
4) RC Hollow Concrete Block Masonry Wall

Ductile Design of Shear Walls

Just like reinforced concrete (RC) beams and columns, RC shear walls also perform much better if designed to be ductile. Overall geometric proportions of the wall, types and amount of reinforcement, and connection with remaining elements in the building help in improving the ductility of walls. The Indian Standard *Ductile Detailing Code* for RC members (IS:13920-1993) provides special design guidelines for ductile detailing of shear walls.

Geometry of Walls
Shear walls are oblong in cross-section, *i.e.*, one dimension of the cross-section is much larger than the other. While rectangular cross-section is common, L- and U-shaped sections.

Reinforcement Bars in RC Walls
Steel reinforcing bars are to be provided in walls in regularly spaced vertical and horizontal grids. The vertical and horizontal reinforcement in the wall can be placed in one or two parallel layers called curtains. Horizontal reinforcement needs to be anchored at the ends of walls. The minimum area of reinforcing steel to be provided is 0.0025 times the cross-sectional area, along each of the horizontal and vertical directions. This vertical reinforcement should be distributed uniformly across the wall cross-section.

Determination of Base Shear:
For the determination of seismic forces, the country is classified in four seismic zones. The total design lateral force or design base shear along any principal direction shall be determined by this expression:

Vb =Ah W
Where, Ah = design horizontal seismic coefficient for a structure
W= seismic weight of building

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 2, February 2024

The design horizontal seismic coefficient for a structure Ah is given by:
Ah = (ZISa)/ (2Rg)

Steel Required

4.2.1: clause 9.1.4 IS :13920
Shear walls shall be provided with reinforcement in the longitudinal and transverse directions in the plane of the wall. The minimum reinforcement ratio shall be 0.0025 of the gross area in each direction. This reinforcement shall be distributed uniformly across the cross section of the wall.

4.2.2: clause 9.1.7 IS :13920
The maximum spacing of reinforcement in either direction shall not exceed the smaller of lw/5, 3 tw, and 450 mm; where lw is the horizontal length of the wall, and tw is the thickness of the wall web.

V. CONCLUSION AND FUTURE WORK

This paper reports on research development on the seismic performance of multi-storied building with shear wall and without shear wall. All researchers concluded that the maximum deflection of multi storied building with shear wall is less compare to that without shear wall or a framed structure. Some authors sum up that by providing shear wall it will affect the seismic behavior to a large extend by increasing the strength and stiffness of the building. Some authors also provide the economical location of the shear wall for improving the stability of the structure.

REFERENCES

1) Radhika Rajeev1, R. Senthil Kumar2, Analysis of RCC Building with and Without Shear Wall - An Overview International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org ICART - 2022 Conference Proceedings
2) P. P. Chandurkar1, Dr. P. S. Pajgade2 Seismic Analysis of RCC Building with and Without Shear Wall, International Journal of Modern Engineering Research (IJMER) www.ijmer.com Vol. 3, Issue. 3, May - June 2013 pp-1805-1810
3) Rishab Jain1, Prof. Siddhartha Deb2, Prof. Vedant Shrivastava3 Seismic Analysis of RCC Building without and With Shear Walls International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 09 Issue: 06 | Jun 2022 p-ISSN: 2395-0072
4) Akansha Dwivedi, B.S Tyagi, Seismic Analysis of Building with and Without Shear Wall for Building with RCC and Composite Column International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 IJERTV9IS060173
Vol. 9 Issue 06, June-2020
5) Aniket Sunil Kamble*1, Pratik Satish Kamat*2, Vishwajeet Laxman Mane*3, Amit Ashok Patil*4, Rohit Himmatrao Patil*5, K.G. Ghodake*6 Seismic Analysis of Rcc Building with And Without Shear Wall by Using Staad Pro, International Research Journal of Modernization in Engineering Technology and Science
6) Mr. Aditya Bagade, Ms. S Uma, Mr. Zainulabidin Tasgaonkar, Mr. Abhishek N K Seismic Analysis of Composite Rcc Shear Wall with Or Without Shear Wall, Considering Soil Structure Interaction
7) Sylviya B, P. Eswaramoorthi Analysis of RCC Building with Shear Walls at Various Locations and In Different Seismic Zones International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-2S December, 2018
8) P. Kalpana1, R.D. Prasad 2, B. Kranthi Kumar3 Analysis of Building with and without Shear Wall at Various Heights and Variation of Zone III and Zone V P. Kalpana et al. Int. Journal of Engineering Research and Application www.ijera.com ISSN: 2248-9622, Vol. 6, Issue 12, (Part -2) December 2016, pp.05-11.