V. Abhinav* et al.
(IJITR) INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY AND RESEARCH
Volume No.4, Issue No.5, August – September 2016, 3776 – 3779.

Seismic Analysis of Multi Story RC Building with Shear Wall Using STAAD PRO

V.ABHINAV
M.Tech Student
Guru Nanak Institute of Technology
Hyderabad, TS, India.

Dr. S.SREENATHA REDDY
Principal & Professor
Guru Nanak Institute of Technology
Hyderabad, TS, India.

M.VASUDEVA NAIDU
Associate Prof.
Guru Nanak Institute of Technology
Hyderabad, TS, India.

Prof. S.MADAN MOHAN
Hod, Civil Engineering
Guru Nanak Institute of Technology
Hyderabad, TS, India.

Abstract: **Shear wall systems are among the most generally used lateral load fighting off systems in high-rise structures. Shear walls 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. The shear wall is going to be introduced within the presented structure at appropriate locations and also the analysis is done for static loads caused because of earthquakes. An RCC building of 11 floors placed exposed to earthquake loading in Zone -V is considered in this case. An earthquake load is calculated by seismic coefficient method using IS 1893(PART-I):2002. The 3 different instalments of shear wall position for 11 floor building happen to be examined later. The outcomes of the aforementioned four analysis is going to be in comparison and optimize the shear wall frame structure is going to be recommended for that building considered for that analysis. This analysis can help in achieving safety against earthquakes in addition to maintaining your versatility from the frame structure intact. It's came to the conclusion that incorporation of shear wall is becoming inevitable in multi-storey structures to face up to lateral forces. The kind II shear wall suggested within this analysis turns out to be more effective and can achieve maximum safety towards earthquakes in Zone -V**

Key words: **Multi-Storey; RC Structure; Seismic Analysis; RC Shear Wall; STAAD Pro;**

I. INTRODUCTION

Reinforced concrete (RC) buildings often have vertical plate-like RC walls called Shear Walls in addition to slabs, beams and columns. These walls generally start at foundation level and are continuous throughout the building height. Their thickness can be as low as 150mm, or as high as 400mm in high rise buildings. Shear walls are usually provided along both length and width of buildings. Shear walls are like vertically-oriented wide beams that carryearthquake loads downwards to the foundation.The main purpose of all types of structural systems utilized in your building kind of structures would be to support gravity loads. The most typical loads caused by the result of gravity are dead load, live load and snow load. Besides these vertical loads, structures will also be exposed to lateral loads brought on by wind, raging or earthquake. Lateral loads can be cultivated high stresses, produce sway movement or cause vibration. Therefore, it is crucial for that structure to possess sufficient strength against vertical loads along with sufficient stiffness to face up to lateral forces.The usefulness of walls in the structuralplanning of multi-story buildings haslong been recognized. When walls are situated in advantageous positions in abuilding. They can be very efficient in resisting lateral loads originating fromwind or earthquakes. Because a large portion of the lateral load on a building,if not the whole amount, and the horizontal shear force resulting from the load, are often assigned to such structural elements, they have been calledshear walls.Shear walls in buildings must be symmetricallylocated in plan to reduceill-effects of twist in buildings. They could be placed symmetrically alongone or bothdirections in plan. Shear walls are moreeffective when located along exterior perimeter ofthebuilding – such a layout increases resistance of thebuilding to twisting. Within this present study, primary focus is to look for the solution for shear wall location in multi-floor building. The item from the study would be to model and evaluate shear wall presented structures and also to suggest appropriate locations of shear walls for those structures considered for analysis. The use of shear walls or their equivalent becomes imperative in certain high-rise buildings if inter story deflections caused by lateral loading, are to be controlled. Well-designed shear walls in seismic areas have a very good record. Not only, can they provide adequate structural safety, but they also give a great measure of protection against costly non-structural damage during moderate seismic disturbances.

(IJITR) INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY AND RESEARCH
Volume No.4, Issue No.5, August – September 2016, 3776 – 3779.

II. PROPOSED STAAD.PRO

The RCC building that is G+10 considered within the analysis is 16m×16m in plan. The ground story height is 3.5m from foundation and floor to floor height is 3m. The spacing from the frame in lateral direction is 4m. Concrete used is M20 and structural steel used is Fe415. The preliminary size of column is suggested as 450mm×600mm and the beam within the longitudinal direction is taken as 300mm×450mm. Within the transverse direction the beams will also be suggested with same size i.e. 300mm×450mm. The slab thickness for all slabs in the model is considered as 120mm. The exterior wall thickness for the building is 250mm including plaster. The interior wall thickness is 150mm including plaster. In this analysis shear walls suggested are with 150mm thick for the shear walls within the locations suggested. The zone factor Z is considered as .36, the importance factor is considered as 1 and the response reduction factor R is recognized as 5 for that earthquake resistant analysis (lateral load analysis). The nomenclature for the building frame is A B C D E within the longitudinal direction and 1 2 3 4 5 within the lateral direction. Dead Load (DL) and Live load (LL) have been taken as per IS 875 (Part 1) (1987) and IS 875 (Part 2) (1987), respectively. Seismic load calculation has been done based on the IS 1893 (Part 1) (2002)‟s method. The loads considered are dead, live and earthquake loads in X&Z directions. The load combinations considered in this analysis are 1.5 (DL+EQ), 1.2 (DL+LL+EQ) and 0.9DL+1.5EQ were considered within the study. The Structural analysis software package used in this study is STAAD.Pro V8i. The shear walls used in this analysis were inserted as surface models. The floor loads have been calculated manually and assigned to respective floors using staad input generator.

III. MODELS OF BUILDING WITH AND WITHOUT SHEAR WALL

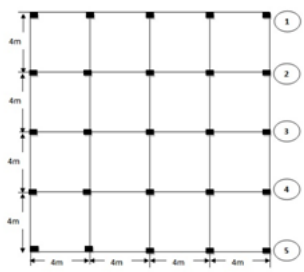

Fig.1 MODEL OF BUILDING WITHOUT SHEAR WALL

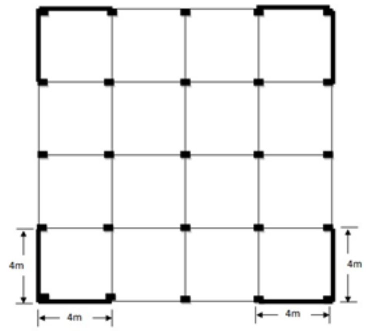

Fig.2TYPEI (SHEAR WALL AT CORNERS)

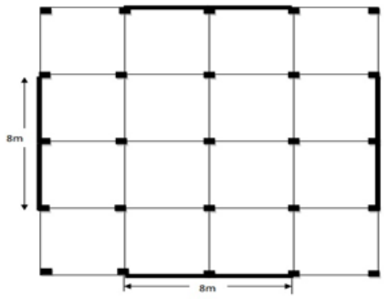

Fig.3 TYPEII (SHEAR WALL ALONG PERIPHERY)

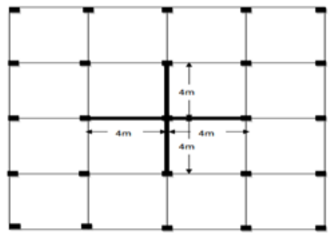

Fig.4 TYPEIII (SHEAR WALL IN MIDDLE)

IV. RESULTS AND DISCUSSIONS:

For that study suggested in multi-storeyed building of 11 storeys with four bays in longitudinal direction and 4 bays in lateral direction was considered for analysis. Like an initial step, case study will be performed with no shear walls (presented structure) for lateral loads including earthquakes. Shear walls are introduced at three locations and also the study is carried out using STAAD PRO V8i.

It has been seen from Table 1 that the top deflection (in X Direction) has been exceeded the permissible deflection, i.e. 0.004 times the total height of the building [IS 1893 (Part 1) (2002)] in STAAD PRO. It has been exceeded for the load combinations 1.5(DL+EQ) and 0.9DL+1.5EQ respectively.

Load Combination	Calculated Deflection(mm) (Without Shear Wall)	Permissible Deflection (mm) IS 1893(Part 1) 2002
1.2 (DL+LL+EQ)	119.66	134
1.5 (DL+EQ)	149.53	
0.9DL+1.5EQ	149.5	

Table 1:MAXIMUM DISPLACEMENT IN X-DIRECTION WITHOUT SHEAR WALL

It has been seen from Table 2 that the top deflection (when the seismic load direction is in Z Direction) has been exceeded the permissible deflection, i.e. 0.004 times the total height of the building [IS 1893 (Part 1) (2002)] in STAAD PRO. It has been exceeded for the load combinations 1.5(DL+EQ) and 0.9DL+1.5EQ respectively.

Load Combination	Calculated Deflection(mm) (Without Shear Wall)	Permissible Deflection (mm) IS 1893(Part 1) 2002
1.2 (DL+LL+EQ)	136.12	134
1.5 (DL+EQ)	170.1	
0.9DL+1.5EQ	170.07	

Table 2:MAXIMUM DISPLACEMENT IN Z-DIRECTION WITHOUT SHEAR WALL

Hence, for the above reason shear wall was provided at different locations in a building i.e. at corners, along the periphery of building, in the middle as Type I, Type II and Type III respectively.

A comparison of deflection of building with and without shear wall in X and Z direction is presented in Table 3 and Table 4.

Load Combination	Calculated Deflection(mm)				Permissible Deflection (mm) IS 1893(Part 1) 2002
	Without Shear Wall	Type I	Type II	Type III	
1.2 (DL+LL+EQ)	119.66	63.73	54.57	58.84	134
1.5 (DL+EQ)	149.53	79.61	68.14	73.53	
0.9DL+1.5EQ	149.5	79.57	68.09	73.48	

TABLE 3: MAXIMUM DEFLECTION AT ROOF IN X DIRECTION

Load Combination	Calculated Deflection(mm)				Permissible Deflection (mm) IS 1893(Part 1) 2002
	Without Shear Wall	Type I	Type II	Type III	
1.2 (DL+LL+EQ)	136.12	66.99	56.73	62.09	134
1.5 (DL+EQ)	170.1	83.69	70.84	77.59	
0.9DL+1.5EQ	170.07	83.65	70.8	77.54	

TABLE 4: MAXIMUM DEFLECTION AT ROOF IN Z DIRECTION

V. CONCLUSIONS

(i) Of all the load combinations, the combination of 1.5 (DL+EQ) is discovered to be more critical combination for the models.

(ii) The lateral deflection for building with TYPE-II shear wall is reduced as in comparison to any or all models. Hence, it may be stated that building with TYPE-II shear wall is much more efficient than all other modelswith shear wall.

VI. REFERENCES

[1] Bureau of Indian Standards: IS-875, part 1 (1987), dead loads on buildings and Structures, New Delhi, India.

[2] Bureau of Indian Standards: IS-875, part 2 (1987), live loads on buildings and Structures, New Delhi, India.

[3] Bureau of Indian Standards: IS-1893, part 1 (2002), “Criteria for Earthquake Resistant Design of Structures: Part 1 General provisions and Buildings”, New Delhi, India.

[4] “Effect of change in shear wall location on storey drift of multi-storey residential building subjected to lateral load”, Ashish S. Agrawal and S. D. Charkha, International journal of Engineering Research and Applications, Volume 2, Issue 3,may-june 2012, pp.1786-1793.

[5] Shrikhande Manish, Agrawal Pankaj (2010).” Earthquake Resistant Design of Structures.” PH I Learning Private Limited New Delhi.

[6] Paulay,T., and Priestley,M.J.N., (1992), “Seismic Design of Reinforced Concrete and Masonry Buildings,” John Wiley & Sons, USA.

(IJITR) INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY AND RESEARCH
Volume No.4, Issue No.5, August – September 2016, 3776 – 3779.

AUTHOR's PROFILE

V.Abhinav received his Bachelor of Engineering in Civil Engineering from MVSR Engineering College, Nadergul in 2014. He is currently a Final year student of Master of technology in Structural Engineering from Gurunanak Institute of Technology. His research interests cover structural designs, earthquake engineering.

Dr. S.SREENATHA REDDY, Principal & Professor at **Guru Nanak Institute of Technology under JNTUH, Hyderabad. Dr. S.SREENATHA REDDY** obtained **B.Tech, Mechanical Engineering** from JNTU, Hyderabad, **M.Tech.- Heat power, Refrigeration & Air conditioning** from JNTU, Hyderabad and **Ph.D**. Faculty of Mechanical Engineering from JNTUA . **Dr. S.SREENATHA REDDY** held various administrative posts and developed the Institution with his projects and developmental activities. Notable among his awards i.e **National award** like **Jawaharlal Nehru memorial prize** for best research publication, issued Institution of Engineers on the occasion of **Inauguration 27 th Indian Engineering Congress at New Delhi in the year 2012** and **"Bharat Vidya Shiromani Award"** and a "Certificate of Education Excellence" for Outstanding Achievements in the field of Education given by International Institute of Education & management on 22 nd December 2014 at **New Delhi & Glory of Education of Excellence Award is issued by IIEM on 4 th March 2015 at New Delhi. Dr. S. Sreenatha Reddy received award as Best Academic Administrator from Centre for Advanced Research and Design under Venus International Foundation on 5 th July 1972.**

Dr. S. Sreenatha Reddy is well known internationally for his outstanding research in .Mechanical Engineering. He has also proposed a model using first principles of Thermodynamics to predict the complex Diesel Engine. In particular, he has made important contributions to the analysis and design of Internal Combustion Engine. In his work, **Dr. S. Sreenatha Reddy** combines modern process modeling concepts with advanced experimental techniques. He has also developed new technologies like **Exhaust Gas Recirculation (EGR) and Magnetic Fuel Conditioning system** for reducing harm emissions**.** It promotes the exchange and mutual enrichment of knowledge in international dialogue via conferences, like the Frontiers of Research Symposia and other meetings.

Dr. S. Sreenatha Reddy Earlier worked as Principal, Head of both the Aeronautical & Mechanical department, coordinating R&D cell for Mechanical Research and Development Board (MRDB) & Aeronautical Research and Development Board (ARDB) projects, TPO, NSS Coordinator, developing courseware and implementing ISO 2001 and NBA Accreditation.

Dr. S.SREENATHA REDDY published 79 International & National reputed Journals & 12 International & National Conference papers. **Dr. S.SREENATHA REDDY** is a member of governing body in prestigious institution of GNIT. He also served as Expert Committee Member of AICTE for scrutinizing project reports internally as well as the member in the Board of Reviewers for the Institution of Engineers journal. Also He is a Editorial Board Member of International Journal of Sciences and Engineering Technology. He is the member fellow of as many professional bodies in the field of Mechanical Engineering and Technical Education.

Associate Prof. M.Vasudeva Naidu was born in 1978 in Srikakulam District, Andhra Pradesh. He received his Bachelor of Technology degree in Civil Engineering from Nagarjuna Universityin 2001. In 2003 he received his Master's Degree in Structural Engineering from RGPVV, Madhya Pradesh. He joined in Gurunanak Institute of Technology as a faculty where he is an Associate Professor of Civil Engineering Department with a total experience of 10 years in field of Research, Designing and education. He is guiding M.tech Thesis work in field of Structural Engineering.

Prof. S.Madan Mohan received his Bachelor of Technology degree in Civil Engineering from JNTUCE Hyderabad in 1998. In 2001 he received his Master's Degree in Structural Engineering from University College of Engineering Osmania University, Hyderabad. He joined Gurunanak Institute of Technology as a faculty where he is a Professor and Head of the Civil Engineering Department with a total experience of 17 years in field of Research, Designing and education. He is guiding M.tech Thesis work in field of Civil/ Structural Engineering. He has papers published in National Conferences and International Journals.

