Research Inventy: International Journal Of Engineering And Science
Vol.3, Issue 3 (June 2013), PP 42-44
Issn(e): 2278-4721, Issn(p):2319-6483, Www.Researchinventy.Com

Effective Height of Curtailed Shear Walls for High Rise Reinforced Concrete Buildings

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ABSTRACT :*The use of Shear walls for improving the performance of high rise concrete structures is very common now a day. It has been observed that the shear wall, if not used for full height of the structure, are also have same effectiveness in resisting the lateral loads. Here, an attempt is made to work out the height of Shear walls which will be just sufficient in resisting the lateral loads as good as the shear walls having full height equal to the height of the structure itself.*

KEYWORDS :*Shear walls, lateral loads, high rise structures*

I. INTRODUCTION

For the purpose of finding out the effective height of shear walls, three Symmetrical Structures G+15, G+18 and G+21 are analysed along with a live model of G+14 Structure. All four models are analysed by using shear walls upto full height and by reducing the height of shear wall upto the extent of half of the height of the structure. About 24 such models are analysed and the response of the structure against lateral loads is studied. It is kept in mind that by reducing the height of the shear wall, it shall not required to strengthen the other components like beams or columns. The lateral sway and drift is also compared with the models with full shear walls.

II. PERFORMANCE ANALYSIS

All four models with shear wall equal to the height of the structure are analysed and the other frame components (Beams and Columns) are designed by considering the local national code of practice. The performance in terms of lateral deflection and story drifts is also found. Shear wall height is reduced gradually floor by floor and again the above response of the structures is studied. The reduced height is considered as the height which will not force us to redesign the frame components as well the lateral deflection shall not differ by more than 2 % compared with the structures having full shear walls. The story drifts are also observed and compared with the requirement as per the local code of practice.

III. COMPARISON

The response against lateral loads for all above mentioned structure is compared in terms of lateral deflection, story drift, axial force, shear force and bending moments induced in the frame members. Shear walls in all the structures is reduced floor by floor and analysed for the same lateral loads. The reduction in height of shear wall is continued upto about half of the height of the structure.

IV. FIGURES AND TABLES

To response is presented in tabular format only for the structures with full height of shear walls and for the structure in which the height of shear wall is considered as optimized and effective.

Response of Columns for G+15 Structure.

Column Group	External Columns			Internal Columns		
	Axial Force	My	Mz	Axial Force	My	Mz
Shear wall for full height	4530	11.98	0.99	5330	9.24	3.62
Shear wall upto 11th floor	4540	11.84	1.002	5370	10.82	3.75

Response of Columns for G+18 Structure.

Column Group	External Columns			Internal Columns		
	Axial Force	My	Mz	Axial Force	My	Mz
Shear wall for full height	5560	14.09	0.99	6490	9.69	3.83
Shear wall upto 12th floor	5370	12.97	1.10	6240	10.6	3.75

Response of Columns for G+21 Structure.

Column Group	External Columns			Internal Columns		
	Axial Force	My	Mz	Axial Force	My	Mz
Shear wall for full height	7790	18.84	1.04	8830	10.76	3.46
Shear wall upto 14th floor	7820	18.07	1.04	8870	11.95	3.47

Response of Columns for Live Model G+14 Structure.

Column Group	External Columns			Internal Columns		
	Axial Force	My	Mz	Axial Force	My	Mz
Shear wall for full height	3590	15.45	9.56	5670	53.48	0.75
Shear wall upto 9th floor	3580	15.31	9.64	5670	53.45	0.65

Lateral deflection of Terrace floor for G+15 Structure.

Displacements in mm						
Shear wall upto						
Full Height	15th floor	14th Floor	13th floor	12th floor	11th floor	10th floor
43.626	43.732	43.885	44.040	44.223	44.416	44.58

Lateral deflection of Terrace floor for G+18 Structure.

Displacements in mm							
Shear wall upto							
Full Height	18th floor	17th Floor	16th floor	15th floor	14th floor	13th floor	12th floor
47.179	47.135	47.137	47.191	47.234	47.331	47.495	47.733

Lateral deflection of Terrace floor for G+21 Structure.

Displacements in mm								
Shear wall upto								
Full Height	21st floor	20th Floor	19th floor	18th floor	17th floor	16th floor	15th floor	14th floor
47.179	47.135	47.137	47.191	47.234	47.331	47.495	47.733	47.733

Lateral deflection of Terrace floor for G+14 Live Model Structure.

Displacements in mm						
Shear wall upto						
Full Height	14th floor	13th Floor	12th floor	11th floor	10th floor	9th floor
33.404	33.409	33.422	33.440	33.477	33.544	33.648

V. CONCLUSION

From the results observed it can be clearly concluded that the shear wall may not be required for full height of the structure even if it has to resist the full design loads. There is a possibility of reduction in the height of shear wall and hence reduction in the concrete cost. Instead of unnecessarily using the shear wall for full height, it can be curtailed at about two third of the height of the structures without reduction in its lateral load carrying capacity as well without loosing its stability.

REFERENCES

[1] Alexander J Salenikovich and J Daniel Dolan, " The Racking Performance of Shear Walls with various aspect rations", Forest Product Journal, Vol. 53 No. 10 , Oct. 2003, 65-73.

[2] Anshuman. S, Dipendu Bhunia, Bhavin Ramjiyani "Solution of Shear Wall Location in Multi Storey Building" International journal of civil & structural Engineering Volume 2, No 2, 2011

[3] Garret Richard Hagen, *Performance Based Analysis of A Reinforced Concrete Shear Wall Building*, Thesis Submitted for Masters degree, to Faculty of California Polytechnic State Univercity, San Luis Obispo, June 2012.

[4] D.L. Hutchison and T.J. Van Geldermalsen, *Optimum Design of Reinforced Concrete Shear Walls*: Third Pacific Regional Conference on Earthquake Engineering, Wellington, May 1983, 185-197.

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