COMPARATIVE STUDY BETWEEN DUAL SYSTEMS FOR LATERAL LOAD RESISTANCE IN BUILDINGS OF VARIABLE HEIGHTS

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ABSTRACT **-***This paper deals with the comparison between three dual lateral load resisting systems in the multistory buildings. Dual system which used in the multistory building to resist lateral loads (wind/ earthquake) are used in this study are 1. Moment resisting frame with shear wall (MRSW) 2. Moment resisting frame with bracing (MRBR) 3. Flat slab with shear wall (FSSW). The comparison shows the efficiency of dual system for lateral load resistance at variable heights of buildings. E-tab software is used for make this study done. The present study deals with analysis of these systems and their suitability against deformation at different heights.*

KEYWORD: Moment resisting frame, Shear wall, Flat slab, Dual system

1.INTRODUCTION

India at present is fast growing economy which brings about demands in increase of infrastructure facilities along with the growth of population. The demand of land in urban regions is increasing day by day. It is imperative that land available for farming and agriculture remains intact. To cater the land demand in these regions, vertical development is the only option. This type of development brings challenges to counteract additional lateral loads due to wind and earthquake. This demands changes in the current structural system which needs to be implemented to resist these forces. Many research has been carried which describes the suitability of various lateral load resisting system against deformation and shear exerted due to the earthquake and wind forces.

The concept behind the dual system is to resist lateral load by combining the two lateral load resisting systems. In these systems the shape of the deformation will differ from those in frames and wall systems, where effecting intelracted force occur and change the shape of shear and moment diagrams. One of the advantages of this combination is that the frames support the wall at the top and control their displacement. Beside, the wall supports the frame at the bottom and decreases their displacement.

Flat slab system is being adopted in many buildings presently due to the advantage of reduced floor heights to meet the economical and architectural demands. Generally, flat slab column system is designed in lower seismic zone areas for resisting gravity loading. Its performance reduces drastically as this system is introduced to lateral loadings of higher seismic zones. While analyzing these structures in such zones, we must have certain provisions to get rid of its poor performance. Thus, to resist this lateral loading, this system is provided with lateral load resisting elements such as shear walls. In an attempt to solve the difficult problem of the construction of residential buildings in Romania, taking into consideration the previously mentioned factors and requirements design team from the Design Institute of Hunedoara in Romania, led by Eusebiu Tripa, proposed a new all–precast concrete system of a dual flat-slab structure type. [2]

Make study in comparison between R.C.C. building and flat slab building for different floor height, found that the natural time period increases as the height of building (No. of stories) increases. Base shear & time period of conventional R.C.C building is less than the flat slab building. [6]

Strength, stiffness, ductility and energy absorption of reinforced concrete braced frames is studied and compared with moment resisting frames and frames with shear wall. According to this study it is concluded that besides effective lateral stiffness rising in reinforced concrete braced frames, there is a considerable amount of energy dissipation during earthquake loading.[3]

Compare R.C. and composite frame structure for use in earthquake prone regions, it concluded that composite frame may be used as viable alternative for R.C. building [7]

2. THE ANALYSIS WORK

Based on the literature and information available through the research articles, it was decided to make the model in the soft ware E- tabs. The models representing the three different dual systems(i.e. MRSW, MRBR,FSSW) for different heights of the building(i.e. 9m, 27m, 36m, 45m,54m,63m,72m)

TABLE: 1 Details of the model in E-tabs

Height of building	72m. max.
No. of storey	3, 6,9,12,15,18,21,24
No. of bay in x-direction	4
No. of bay in y-direction	4
Bay width	5m
Type of building	Symmetrical

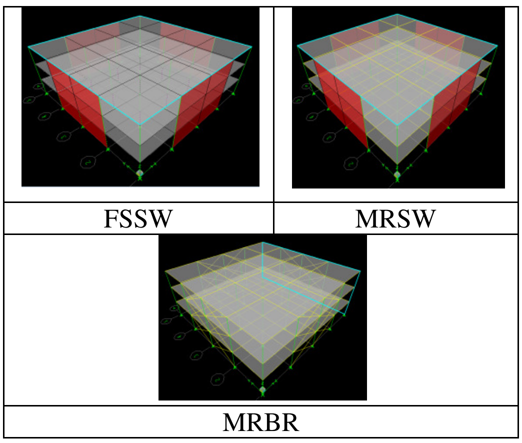


Figure: 1 9m. Height building for three different types of lateral load resisting systems

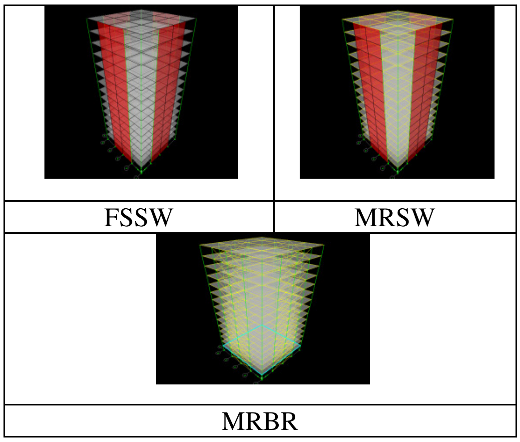


Figure: 2 54m height building for three different types of lateral load resisting system

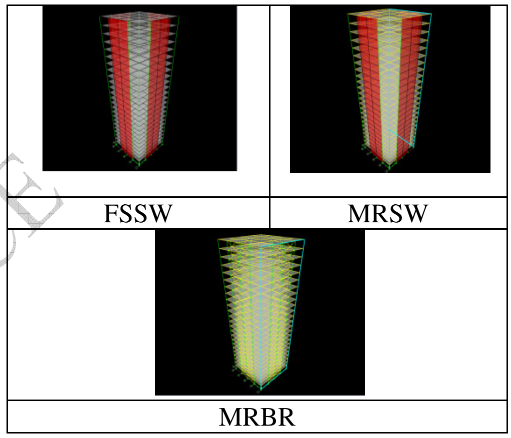


Figure: 3 72 m height building for three different types of lateral load resisting systems

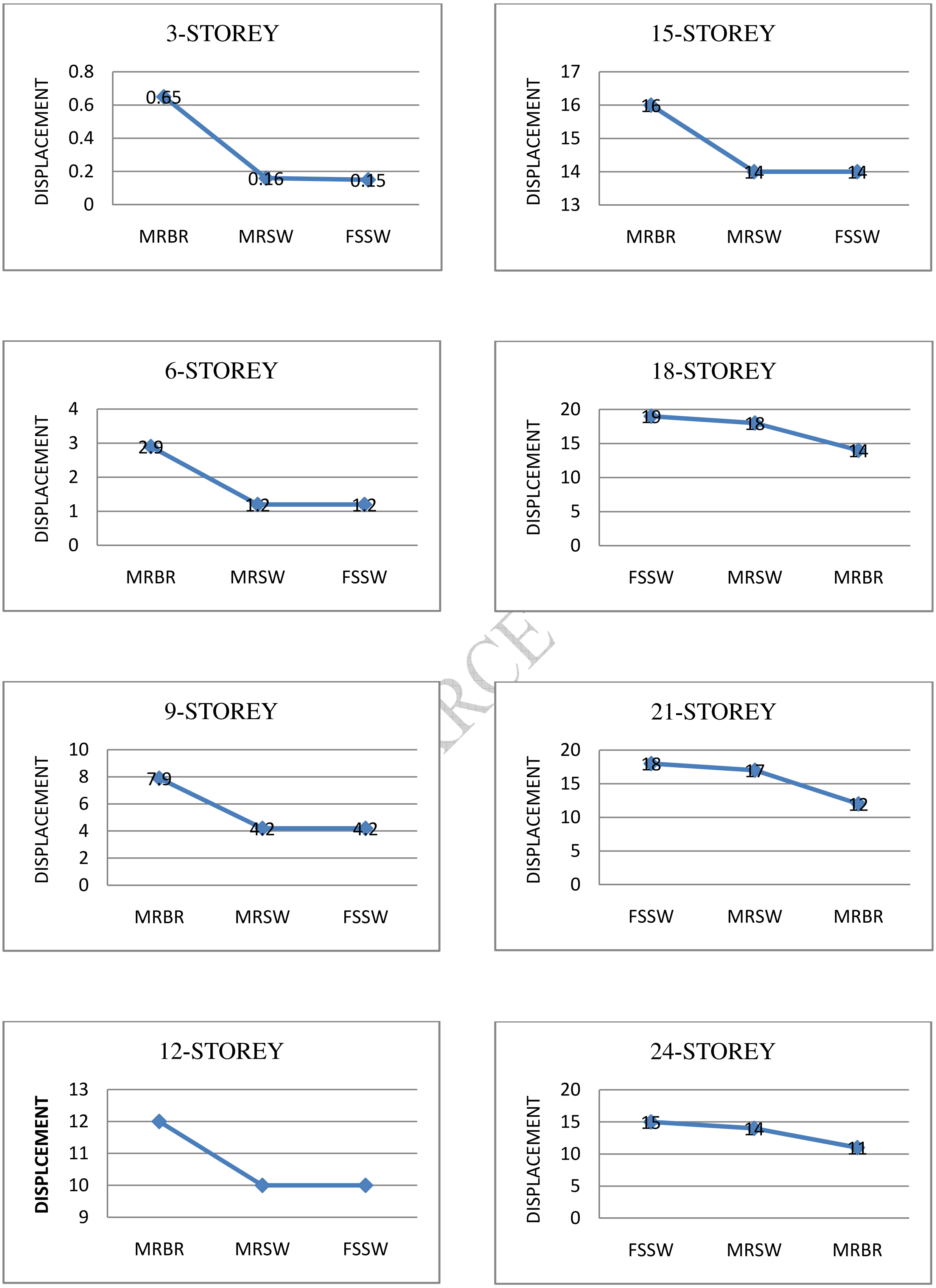
As shown in figure 1 ,2 & 3 the models of three different lateral load resisting system (i.e. MRBR,MRSW,FSSW) is made for the different heights (i.e. 9m, 27m, 36m, 45m,54m,63m,72m). Of building.

3. RESULTS AND DISCUSSION

Displacement values obtain for three different lateral load resisting systems at the different heights of the building. Results are shown in the table- 2.

TABLE: 2 Displacement values of different types of models

DISPLACEMENT VALUES IN METER							
TYPES OF BUILDIG	9M	27M	36M	45M	54M	63M	72M
FSSW	015	4.2	10	14	19	18	15
MRSW	1.2	4.2	10	14	18	17	14
MRBR	2.9	7.9	12	16	17	12	11



Above graph showing the displacement values for different types of lateral load resisting systems in building at the different heights of building.

4. CONCLUDING REMARKS

From the above study of the different types of lateral load resisting systems at the variable heights of the buildings. Following conclusions are found.

- Above 45m height of building, moment resisting frame with bracing (MRBR) show the better resistance against lateral load then other three systems.
- Between 18m to 45m height of building the displacement value of moment resisting frame with shear wall (MRSW) & flat slab with shear wall (FSSW) is same.
- Below 45m height of building, flat slab with shear wall (FSSW) show the better resistance against lateral load then the other three systems.

5. REFERENCES

[1] Dogngun A. , Topal U. & livaogiu R. "Comparision of moment resisting frame and frame –shear wall building" 6th international conference on Civil Engineering may 5-7, 2003

[2] Loani m. Adrian & Tripa Eusebia "Structural behavior of an innovative all-precast concrete duel system for residential building" PCI journal 2012

[3] Khaloo A.R. & M.mohaseni "Non –linear seismic behavior of R.C.frame with R.C.Braces" Asian journal of civil engineering, vol.9 2008 pg 577-592

[4] Ahuja vipul , Ahuja B.M. " Post tension flat slab- earthquake engineering & misc- aspects in high seismic zone in Indian environment"

[5] Ismail Najif " Comparative studies of IMRF & SMRF in moderated seismic zone"

[6] Sable K.S., Kandekar B.S. "Comparative Study of Seismic Behavior of Multistory Flat Slab and Conventional Reinforced Concrete Framed Structures" International Journal of Computer Technology and Electronics Engineering (IJCTEE) Volume 2, Issue 3, June 2012

[7] Bouwkamp jack g.,Fehling Ekkehar, "comparison of R.C and R.C. composite frame for earthquake resistance design"Earthquake enginnering tenth world conference 1992

[8] Hong-sik ryu,sang-hoon oh, moon-sung Lee, "Seismic Performance Evaluation of Moment Resisting Frames Using High Performance Steel" International journal of steel structure June 2011,vol 11,no 2, 235-246

[9] Godinez- Dominguez A.E.,Tena-colunga A."Behavior of moment resisting reinforced concert concentric braced frames (RC-MRCBFs) in seismic zones**"** 14th world conference on earthquake engineering October 12-17,2008, Beijing, china