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"DYNAMIC ANALYSIS AND COMPARISON OF A RC COUPLED SHEAR WALL FRAME COMBINATION WITH X BRACING AT DIFFERENT LOCATION"

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Abstract: The presents research study is about the seismic analysis and comparison of G+12 storey high RC building with shear-wall combine with x bracings and compared it with the structure by providing the cross bracing at different location of building. The skyscraper is of square geometry of size 25m x 25m with five numbers of bay on each horizontal direction having 5m length of each bay. The proposed type of frame model of the structure used is the special RC moment resisting frame. For conducting the research analysis response spectrum analysis technique which is a linear dynamic analysis is used. The analysis are conducted by the help of Staad.pro series 5 v8i software program. In this study shear-wall combination with cross bracing systems are used to understand seismic responses of the proposed structure. All the structure are compared on the basis of results obtained in terms of base shear, and maximum storey displacement results are compared..

Index Terms **- Response spectrum analysis, dynamic analysis, earthquake evaluation, Story displacement, comparative analysis, Staad.Pro**

I. INTRODUCTION

The rapid growth in population is the main reason for increasing demands of high-rise buildings as space is limited over the earth. With the increment of height of the structure, lateral forces is also increases due to the reason of seismic activity or wind loads. As the overall height of structure in the vertical direction increases the main governing factor changes from gravity loads to lateral loads in designing of structure. To counteract the lateral loads due to seismic forces and wind forces the rigidity of the structure is increases by applying different system of resistance over the structure like shear wall, bracing system, infill walls, diagrid system, etc. At the time of seismic activity the trembling of building is mostly based on its characteristics like stiffness, strength, and dissipation of forces in both the direction of the structure. For the reduction of the impact of seismic activity shear-walls and steel braces elements are provided. These elements can enhanced the seismic response capability of the structure. The principal concern of structural design is to safeguard the structure at the time of a major earth tremor. In the present research it is find out that by the implementation of coupled shear wall in combination with x bracing in an ordinary bare frame improves its rigidity and the combine system make it more effective and efficient. In general only shear walls or bracing system are implemented one at a time over the bare frame while in our research we implemented both at the same time.

COMBINE SHEAR WALL AND X BRACING SYSTEM

Combine system is a new type of system which is introduce at the outer periphery of structure which having coupled shear wall at each corner with cross bracing at the remaining bays. The system have high rigidity to counteract the effect of lateral forces. The combine effect of both the system will greatly influence the lateral force effect over the structure and reduces it.

II.LITERATURE REVIEW

Prof. Prakash Sangave et. al. (2015) showed their research work on comparison of 3D prototype of steel & RCC structure and analyzed them with equivalent static load method of seismic analysis with reference provided by IS 1893: (2002) using software ETABS. Designing and cost estimation are done for the same models by using MS-Excel. They analysis structure having dimensions 22.5m X 12m with height G+6 and G+10 storey height. They take the seismic forces in zone V and hard soil condition.

Mohd Atif et. al. (2015) considered a G+15 building and researched on earthquake analysis by adding the bracing elements and shear wall. Both the frames are analyzed in the seismic zone II, III, IV, V which define in IS 1893-2002, all frames having same geometry for all cases. They consider their frame as Ordinary RC moment-resting frame (OMRF). The structure prototype is formed in staad pro. Software. Time period of the structure is calculated as per IS 1893(part 1):2002 seismic analysis has undergone. Seismic forces are evaluate by linear equivalent static method as per IS 1893(part 1): 2002. They concluded that the braced frames can distribute energy exerted by earthquake very efficiently. They also showed the performance results and the analysis graphically

Patil S. P, et. al. (2016) examine a 15- storied rc building with shear wall and without shear wall and with different types of bracing. The study done for zone V. They concluded the result of base shear, frequency, period and displacement for different story, and comparing the shear wall and with bracing. Analysis is done by using response spectrum method.

OBJECTIVES:

1. To understand the concept of combine effect of coupled shear wall with x bracing induced on a high rise structure.
2. To acknowledge the reduction of vibrational forces due to application of combine system of coupled shear wall with x bracing under seismic load.
3. Comparison of research result obtained of combine system of shear wall and x bracing at different location in terms of displacement of storey, base shear, time period.

METHODOLOGY:

STEP-1.Modelling of bare frame structure with couple shear wall and X bracing by the use of Staad.pro.

STEP-2.General loading is applied as per different part of IS 875 and Indian standard 1893-part-1 is used for seismic load application.

STEP-3.Relative comparative analysis carried out over the structure by providing x bracing at different location in the structure. The position of coupled shear wall is same for all the structure.

STEP-4.All the results are plotted on the graph obtained from the research using MS word.

TABLE-1. GEOMETRY & LOAD CONSIDERATION

TYPE OF STRUCTURE	RESIDENTIAL BUILDING
PLAN DIMENSION	25m X 25m
TOTAL HEIGHT OF BUILDING	39m
HEIGHT OF EACH STOREY	3m
COLUMN SIZE	700mm X 700mm
BEAM SIZE	400mm X 400mm
ANGLE SIZE	100mm X 100mm X 10mm
DEAD LOAD	IS 875 PART 1
LIVE LOAD	IS 875 PART 2
LOAD COMBINATION	IS 875 PART 5
EARTHQUAKE LOAD	IS 1893 (PART-1):2002

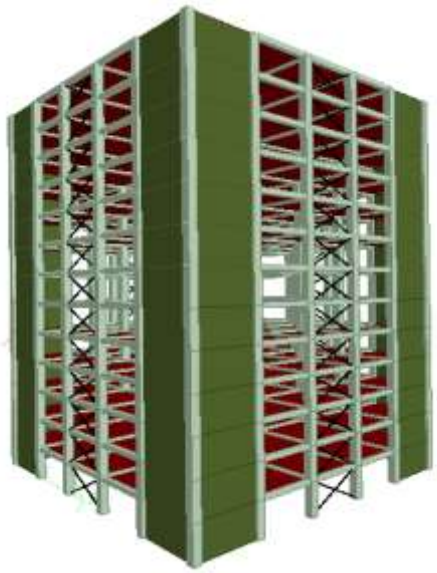


Fig 1: coupled shear wall frame with x bracing at single bay (MODEL 1)

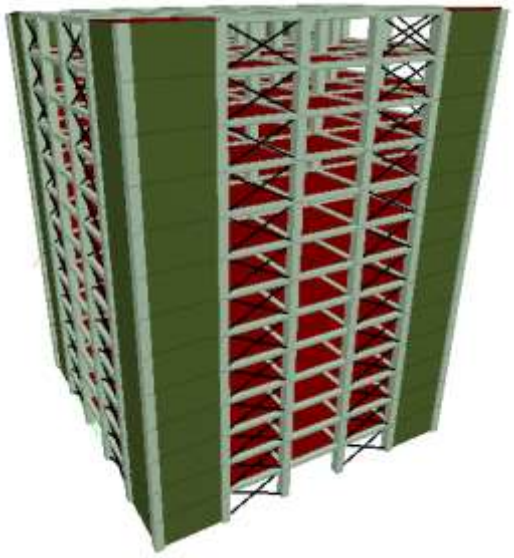
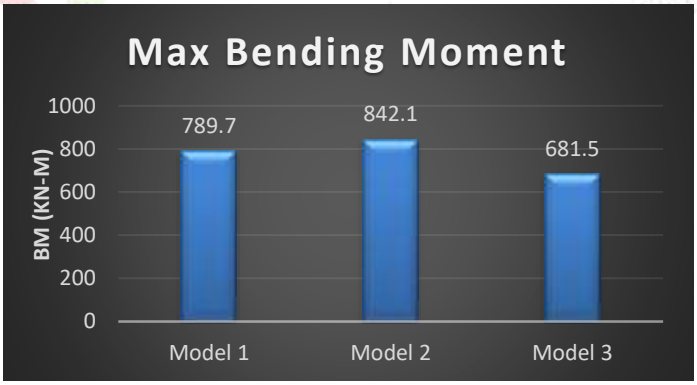


Fig 2: coupled shear wall frame with x bracing at double bay (MODEL 2)

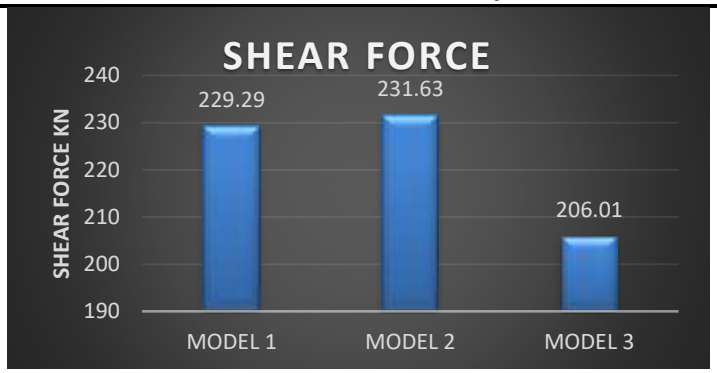
Fig 2. RC frame with coupled shear wall and x bracing (MODEL 3)

RESULTS & ANALYSIS:



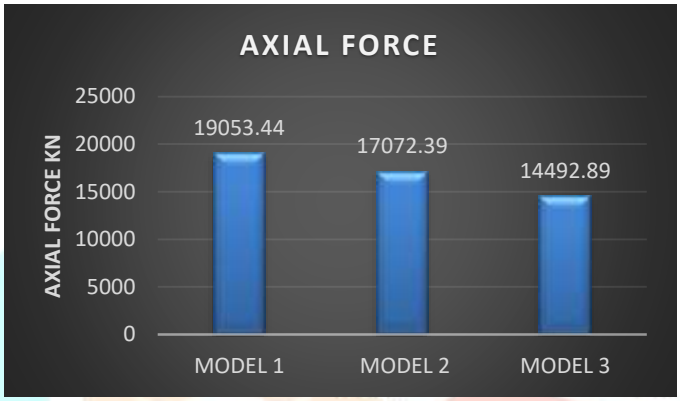
Graph 1: bending moment comparison

The bending moment is decreasing in model 3 thus the model 3 are more stable in nature than model 1&2



Graph 2: Shear force comparison

There is large decrement in the shear force in model 3 thus it is more effective in stabilizing the lateral forces.

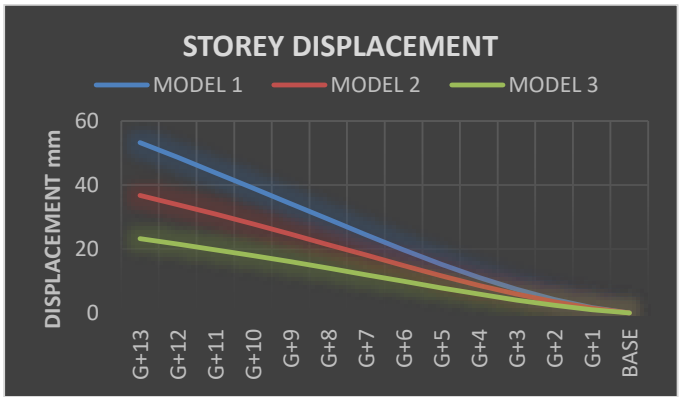


Graph 3: axial force comparison

The axial force is reduced since the member is increases to dissipate the forces effectively and make the structure more stable.

Graph 4: base shear comparison

Base shear over the model 2 is increases and make it more stiff and stable.



Graph 5: storey displacement comparison

The displacement in all the storey is tremendously reduced in model 2 in comparison to model 1 which clearly depicts that the model 2 is more stable and efficient in reducing the lateral forces

CONCLUSION:

The coupled shear wall in addition of x bracing is provided in bare frame and analyzed in the present research work which help us to understand that the lateral forces over structure can tremendously reduce by the proper arrangement of the bracing. The obtained results provides a vast idea about the shear force, bending moment, axial forces, storey displacement. the model 1 which have only bracing at single bay and compare it to the other two model saw that the bending moment is increasing in model 2 while it reduce in model 3, then if we consider shear force the SF is increasing in model 2 while decreasing in model 3. Axial force comparison graph made us clear that the forces is decreasing in model 2 & 3 in comparison to model 1 similar condition for the result of base shear and storey displacement. Thus it is concluded that the forces are effectively managed in the model 3 and make it stable during the time of seismic activity.

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