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Optimization of the Location of Shear Wall in a Multistory Building

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Abstract: ***A Shear Wall Is An Upright Part Of A Seismic Strength Resisting System That Is Planned To Defend Against In-Plane Adjacent Forces, Characteristically Wind And Seismic Loads. In Many Ruled Buildings, Global Building Code And Intercontinental Residential Code Manages The Design Of Shear Walls. The Loads Of The Shear Walls Resists Loads Which Is Equal To The Plane Of The Walls. Collectors As Well Known As Drag Associates, Handover The Diaphragm Shear To Shear Walls And Other Vertical Features Of The Seismic Force Resisting Arrangement. In This Study, We Have Selected" Optimization Of The Location Shear Wall In A Multistory Building" Analysis Is Done On The Multistory Building. The Model Of Shear All N Building Is Design In The Staad Pro V8i (Series 4) Designing & Analysis Software. Then Giving It The Constrains Which Are Act On The Acting Earthquake Load And Wind Loads On Building Made Nodes Weak To Strengthen That Node We Provide The Shear Wall. After Adding Of Shear Wall On Building Into Model & Analysis It On Staad Pro In Std Format. After The Analysis Of The Location Of Shear Wall On Building It Analyzed That The Shear Wall Location In Multistory Building Providing The Strength To Weak Nodes Of Building And Helps The Building To Resist The Lateral Loads, Wind Loads And Earthquake Load Acting On Building.***

Keywords: Multistory Building, Staad Pro, Shear-Wall.

I. INTRODUCTION

Shear walls are well-organized in terms of structural cost as well as to minimize the damage of earthquake in structural elements/bodies. The vertical elements of shear walls are the plane resisting force arrangement. These walls are assembled to counter the adjacent load acting on structures and also offer great stiffness and strength to the building in the direction of its orientation. It might vary under same loading conditions because of building with shear wall building without shear wall by show the behavior of shear wall on building. Therefore the structure analysis is one of the techniques which verify the validity to study the performance of the Sear wall on building. Now we will find out the Max Node Displacement, Weak points of building by applying the loads in the old design of Multistory Building and then Analysis it & by adding shear wall in the multistory building the new optimization design Shear wall

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Increases the strength to building for resisting the lateral load under loading conditions.. Hence significantly reduces the lateral sway and damages to the building or structure and its associated components/parts, contents. The use of STAAD PRO is making it easier. Hence, this study is described to determine the shear wall location in appropriate manners.

II. BUILDING MODELING

For this study, the plan is modeled of an eight-storey building with height of 3-meters for each story. These buildings were planned in agreement to the Indian code of training for the optimization of the location of shear wall in the multistoried building these buildings are supposed to be static at the base 7 the floor acts as rigid parameters. The sections of structural elements are square & rectangular in their dimensions are changed for different building .story height of buildings are supposed to be continuous with the ground storey. The buildings are displayed by software STAAD PRO V8I (series 4).Three different models were studying by locating of shear wall & without on the building .models are studied optimizing the position of shear wall in the multistory building.

Table 1: Preliminary data of multistory building

No Of Storey's	G+8
Plan size	12m*12m Each Grid Size (3m*3m)
Size of Ground floor - 8th floor columns	300mm*300mm
Size of beams	300mm*300mm
Depth of slab	120mm
Shear wall thickness	150mm
Ground Storey height from foundation	3m
Total Height	24m
Floor to Floor Height	3m
Support Type	Fixed

III. LOADING CONSIDERATIONS

Loads Acting on the structure are:-
Dead load (DL) and Live Load (LL):- As per IS 1893 - 2002/2015Respectively; Seismic load (SL) : As per IS 1893 (Part–1) approach :

DL: Dead load	LL: Live load	SL: Zone: III (Z=0.16)
Self weight of the structure	3 KN/sq.m is considered	Rock/ soil type: Hard Rock
Floor load	for floor load	
Wall loads	1 KN/sq.m considered for floor finish	Soil site factor: 1
		Response reduction factor: 5 Damping: 5%

IV. OBJECTIVE OF STUDY

1. Study the effects of the loads acting on the RCC building under the considered loading conditions.
2. To get the optimum results.
3. Add a shear wall in RCC building and apply the load condition in STAAD pro and get the results by analysis.
4. To check that the increase in strength and effects of different position shear wall in the RCC Building

V. PROBLEM FORMULATION

The R.C buildings are analyzed with and without shear wall for study are shown in different modals

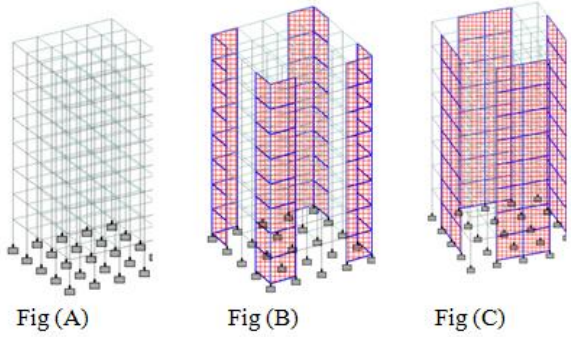

Fig .1.Figures shows different modals (A) without shear wall (b) shear wall on edges (C) shear wall on sides

VI. METHODOLOGY

Steps to model and analyze the R.C.C building frame. First of all we go to run structure wizard and select bay frame. Then following the given steps:-

- MODELING
- General
- Analysis

- POST PROCESSING
- Results
- Reports

VII. RESULTS AND GRAPHS

1.1 Node Displacement

Node displacement for all direction of all modals show in fig.

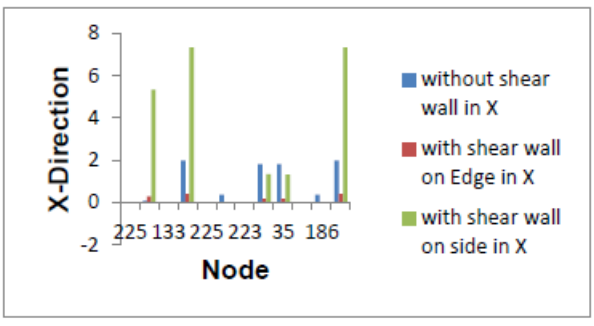

Figure 2: Comparison of node displacement in X-direction

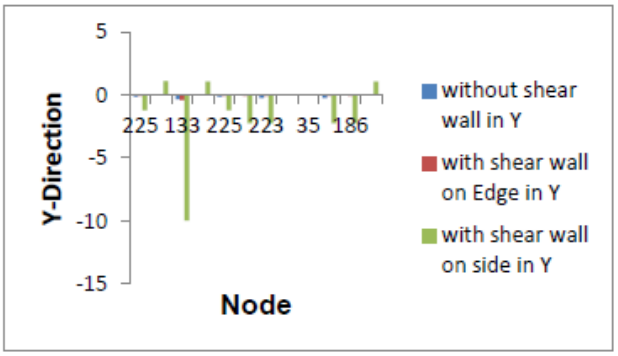

Figure 5.2: Comparison of node displacement in Y-direction

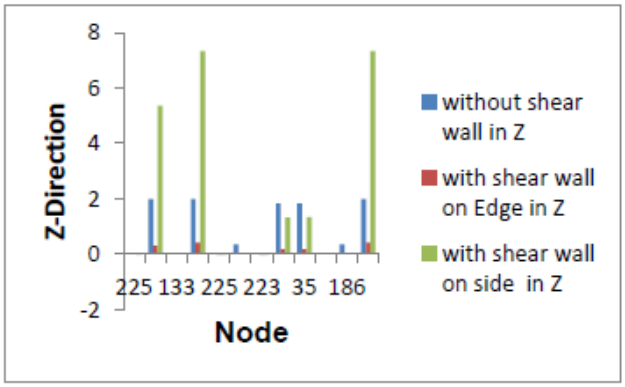

Figure 5.2: Comparison of node displacement in Z direction

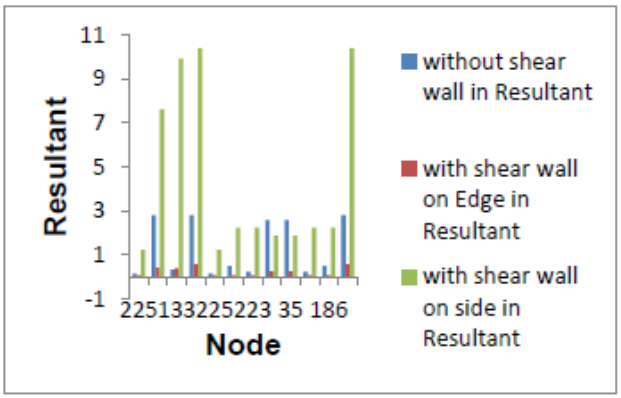

Figure 5.4: Comparison of node displacement in Resultant

From the above results it is seen that, Shear wall on the edge of multistory building has less node displacement a compare to shear wall on the sides & without shear wall in the multistory building. As per comparison in the building in the graph shows that building with shear wall on edges has less node displacement in the buildings rather the other buildings have the more displacement than the building with shear wall on edges. The building without shear wall had the more displacement than the building have shear wall on edges & the building with shear wall on the sides have the max displacement due to the position of shear wall.

VIII. CONCLUSION

In this the conclusion comes and shows that the building with shear wall on the edges had minimum load than the building without shear wall & building shear wall on the sides. Based on the results conclusions are given below:

- Load resisting capacity of the frame model increases considerably in case of shear wall addition, as it is clear from the node displacements in x, z& y directions.
- The location of shear wall had a major effect on the building which minimizes the effect of loading & displacement.
- Columns during earthquake axial force are reduced to 45% as addition of shear wall in the building. Major reduction is seen in building without shear wall.
- Shear walls are definitely good mechanism for lateral loads mitigation, the placement of shear walls should be made judiciously.
- Structure can be comparing and designed easily by using STAAD pro &it can be use to examine the structure strength & economy points of profit.

IX. FUTURE SCOPE

The present study has been done to predict Optimization of shear wall by taking the building with shear wall and building without shear wall by having loading and to know the effect of it by node displacement in structure. So this work can also be continuing by storey design by considering hydrostatic loads.

- Building can be dam by consider, hydrostatic.
- Other location can be center of the building.
- Other location also BE established effect at different grids of buildings.

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