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Best Position of R.C. Shear Wall due to seismic loads

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ABSTRACT
A shear wall is a wall that is designed to resist shear, the lateral force that causes the bulk of damage in earthquakes. Many building codes mandate the use of such walls to make homes safer and more stable. In this work, a G+2 storey R.C. building frame has been considered and analyzed for seismic zone-lll(Jabalpur) using staad.prov8i (series4) package, special moment resisting frame (SMRF) and hard rock types used in work. Parameters are taken to compare and analyze for the results are Node displacement and Reactions for different arrangements
Keywords: Shear Wall, Staad Pro. V8i (Series 4), SMRF, Maximum node displacement & Maximum reactions.

I. INTRODUCTION

Shear walls are efficient, both in terms of construction cost and effectiveness in minimizing earthquake damage in structural elements. Shear walls are vertical elements of the horizontal force resisting system. Shear walls are constructed to counter the effects of lateral load acting on a structure also these walls provide large strength and stiffness to buildings in the direction of their orientation, which significantly reduces lateral sway of the building and thereby reduces damage to structure and its contents. The use of any software example, STAAD-PRO.will make it easier. Hence, this paper has been described to determine the proper location of shear wall.

II. LOADING CONSIDERATION

Loads Acting On The Structure Are:
Dead Load (DL) and Live load (LL) : As per IS 875 (Part 1) (1987) and IS 875 (Part 2) (1987), respectively.
Seismic load (SL): As per IS 1893 (Part 1) (2002) approach.

DL :Dead load
- Self weight of the structure,
- Floor load and
- Wall loads

LL :Live load
- 3 KN/sq.m is considered for floor load
- 1 KN/sq.m considered for floor finish

SL: Zone : III (Z=0.16)
Rock/ soil type : Hard
Rock and Soil site factor : 1
Response reduction factor : 5
Importance factor : 1
Damping : 5%
The preliminary data as is taken up for this study

Table 1: Preliminary Data

G+3	Number of storeys
12m x 12m (Each grid size 3m x 3m)	Plan size
300mm x 300mm	Size of ground floor- 3rd floor columns
300mm x 300mm	Size of beams
230mm	Wall thickness
120mm	Depth of slab
150mm	Shear wall thickness
3.0m	Ground storey height from foundation
12m	Total height
3m	Floor to floor height
Fixed	Support type

III. Literature Review

A lot of research work has been done in the direction of shearwall multistory building. Arvind Vinaya krao Achole, Dr.G.N. Rong he

studied the behavior of building frame with steel plate shearwalls. Dr.SudhirK.Jain and Dr.H.J.Shahgave notes on design examples of a six storey building. Alfa Rasikan (2013), M.G. Rajendran(2013) analyzed Wind behavior of buildings with and without shearwall. Ashis Debashis Behera, K.C. Biswalstudied3-D analysis of building frame using staadpro. Prashanth.P (2012), Anshuman.S (2012), Pandey.R.K(2012), ArpanHerbert(2012)Compareddesignresultsofa Structure designed using STAAD and ETABS Software. However the work on shearwall most efficient location has not been done much.

IV. OBJECTIVE OF STUDY

1) To analyze an R.C. building frame using staad pro. Software setup.
2) To understand the purpose of using shear walls using staad pro. for future purpose.
3) To compare the effect of an R.C. shear walls when provided at different locations. on an R.C. Building.
4) To study the results of node displacement and maximum reactions obtained.

V. PROBLEM STATEMENT

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

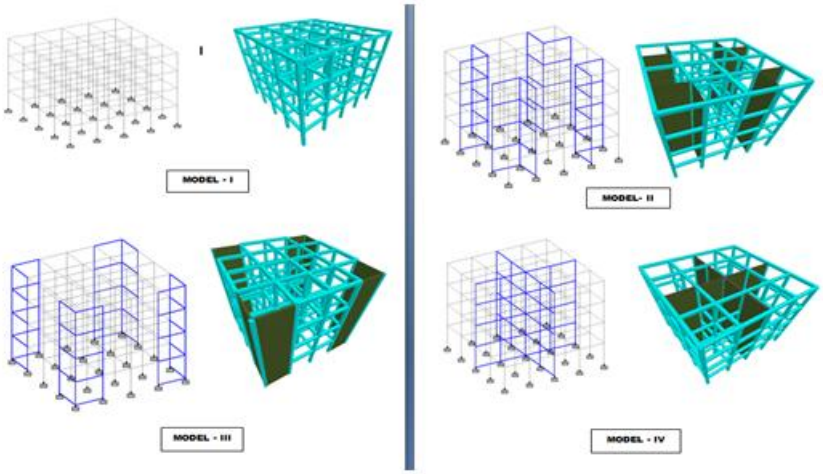

Fig .2. Figure Shows different model considered

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 below

➢ MODELING
- General
- Analysis

➢ POST - PROCESSING
- Results
- Reports

VII. RESULTS AND GRAPHS

DIRECTIONS		Models
Z(23)	X (71)	
2.222	2.222	**Model I**
0.406	0.406	**Model II**
0.882	0.882	**Model III**
0.119	0.119	**Model IV**

Table 2: Maximum Node Displacement

A) MAXIMUM NODE DISPLACEMENT:

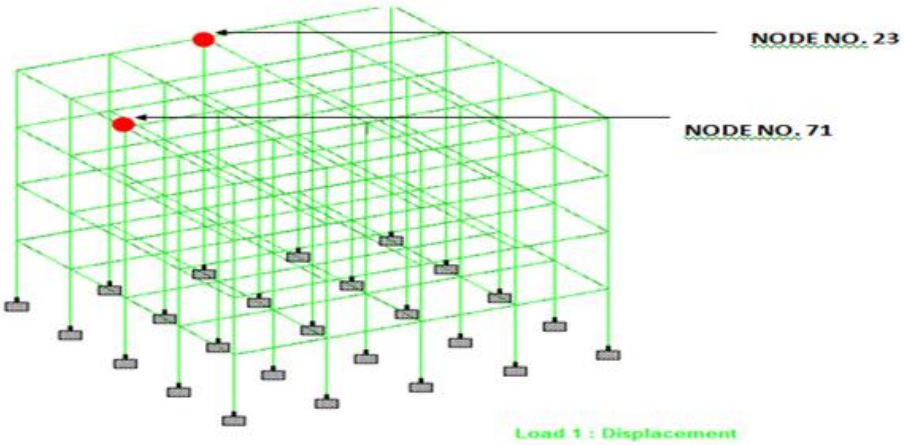

Fig .2. Figure Shows node no. 71&23

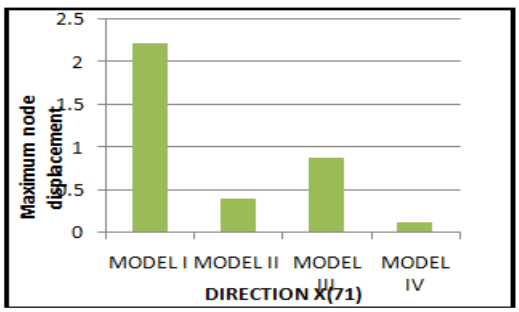

Fig.3. Max.node displacement in x- direction

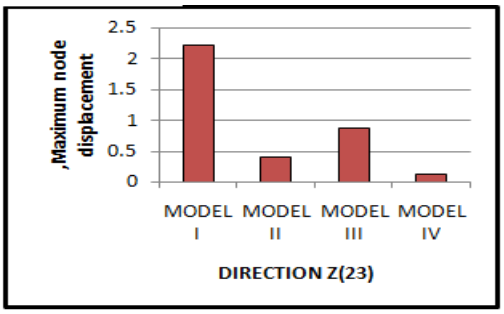

Fig.4. Max.node displacement in z-direction

A) MAXIMUM REACTION:

Table 3: Maximum Reaction

Directions		Models
Z(3)	**X(51)**	
2.668	2.668	**Model I**
1.560	1.560	**Model II**
2.629	2.629	**Model III**
68.234	68.234	**Model IV**

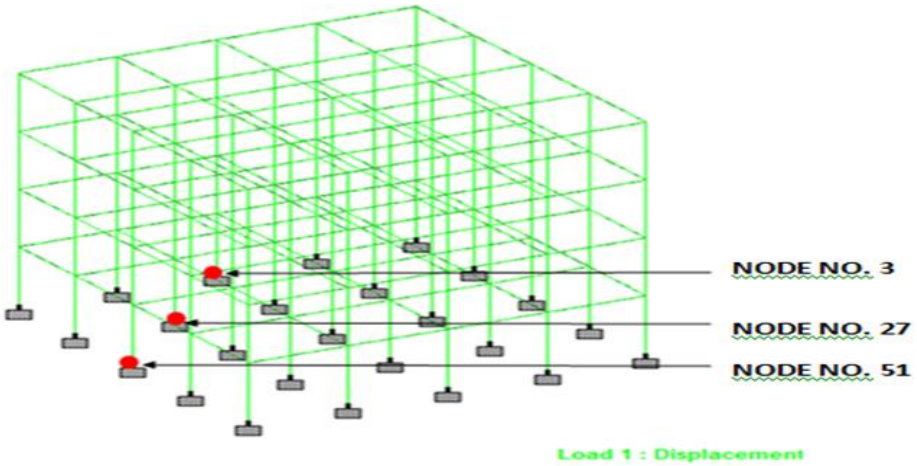

Fig.5. Figure shows node no. 3, 27& 51

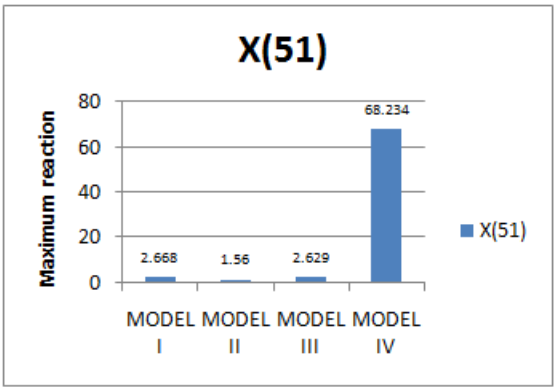

Fig.6. Max. Reaction in x- direction

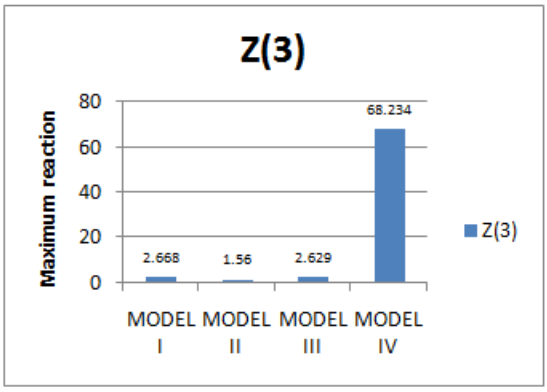

Fig.7. Max. Reaction in z- direction

VIII. DISCUSSION

A) Maximum Node Displacement- In this analysis the variation of maximum node displacement is found to be reduced when shear walls were provided. The least values of the same were found are 0.119& 0.119 in X-direction & Z- direction respectively for Model-IV w.r.t. Model-I.this work was done for X & Z direction at node no.7 & 23 respectively. These nodes are selected on the basis of maximum node displacement obtained w.r.t model-I.

B) Maximum Reaction-It is found that the model-IV is much effective than othermodels. For model-IV the reaction either in x& z direction are foundmaximum i.e. 68.234 KN,68.234KN respectively . For nodes 51&3, this work is done in x&z directionsrespectively. These nodes are selected on the basis of maximum reaction obtained w.r.t model-I.

IX. CONCLUSION

A) Node Displacement: Maximum node displacement was found on top floor of the structure at node no.71 & 23. Model- IV gives the minimum value of maximum node displacement in x & z direction hence **Model IV** is best position for the same .

B) Maximum Reaction: Model IV is much more effective than others, such thatthemaximum reaction values found for all x & z directions having node no. 51&3. Hence **model IV** is best position for the same.

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