STUDY OF SEISMIC PERFORMANCE OF REGULAR PLAN BUILDING WITH DAMPERS, SHEAR WALLS AND INFILL WALLS

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Abstract*: With the tremendous death toll and property saw over the most recent few decades alone in India, because of disappointment of structures brought about by seismic tremors, consideration is presently being given to the assessment of the sufficiency of solidarity in confined RC structures to oppose solid ground movements. In this paper we contemplated the conduct of G+12 multi story working of ordinary and unpredictable setup with five unique structures, for example, exposed casing, center divider, shear divider, dampers, and infill divider under seismic burden. In this paper a G+12 multi story building is read for Seismic burden utilizing ETABS. Accepting the material properties, measurements of pillar and section for the examination and the investigation are completed by two distinct strategies, for example, Response Spectrum Analysis and Equivalent Static Analysis strategy. After investigation the outcomes, for example, Story dislodging, story float, story firmness, timeframe and base shear were contrasted and various models and furthermore the impacts of infill divider and dampers on the uncovered edge were considered. For the examination the various burdens are considered according to IS 875 code. The seismic Zone V was considered and properties of zone V were taken by IS: 1893-2002 section 1 code.
***Keywords* : About four key words or phrases in alphabetical order, separated by commas.**

I. INTRODUCTION

Human civilization required structures to live and their needs in all the aspects. But it is not only building structures but to build efficient structures so that it can fulfil the main purpose for what it was made for. Here comes the role of civil engineering and more precisely the role of analysis of structure. There are numerous old style techniques to take care of plan issue, and with time new programming's additionally becoming an integral factor. In present many number of structures or structures have sporadic setup in the arrangement and height. Structures or Buildings with sporadic dissemination in solidness, mass and quality declines because of which real harms happen during seismic tremors. Which are regularly observed in past seismic tremors which will be under torsional movement. A symmetric dispersion of mass and firmness ought to be given in plan just as in each account of the structure to oppose the parallel burdens applies by the tremor and the structures were viewed as torsionally adjusted structure. It is hard to get such a condition because of limitations such design prerequisite and practical needs. From the past research it is seen that torsional swaying cause numerous harms in the structure or structures. The torsional movement in the flexible range exists due to the out of the focal point of mass of the structure with non correspondent focuses of mass and unbending nature which is called as awry structure or may torsionally lopsided structures, and it might be instigated by asymmetry is called as characteristic torsion. In finding the focuses of mass and solidness, in impeccable in the estimation of measurement of structure or auxiliary component or absence of the right information on material properties, for example, the modulus of flexibility and it might exist because of the rotational movement of the ground towards the vertical hub. The incidental rotational exists due to the not finding the asymmetry and rotational movement of the ground.In for the most part heavier torsional impact is because of the separation between focal point of unbending nature to its mass. By keeping the impediments over inelastic curve the inelastic conduct can be controlled. The impact of torsional movement is to be considered as one of the significant thought in the structure of the structure. Such factors are essentially considered in the estimation of size of asymmetry, purpose of focal point of inflexibility and mass, assessment of coincidental and plan unconventionalities.

II. PROCEDURE FOR PAPER SUBMISSION

The Reinforced Concrete confined structure execution depend not just the specific explicit individuals it likewise relies upon the joints which are available in the casing. By and large, the joints which are available in Reinforced Concrete surrounded structures are exposed to completely serious loads under tremor burden condition. As of late the harmed caused because of quake in India and different nations are exceptionally extreme. This harm is relies upon the presentation or burden conveying limit of the structure, extraordinarily the exhibition of bar section joint. So as to build the heap conveying limit of Reinforced Concrete encircled structure many research are passing by utilizing various materials like dampers, shear divider, center divider, infill divider and so on.. Seismic codes give various strategies to do horizontal burden examination, while doing this investigation infill dividers present in the structure are ordinarily considered as non-auxiliary components and their essence is normally overlooked while investigation and plan. Most construction laws recommend the strategy for examination dependent on whether the structure is normal or unpredictable. Practically every one of the codes propose the utilization of static examination for symmetric and chose class of normal structures. For structures with unpredictable designs, the codes recommend the utilization of dynamic examination methodology, for example, reaction range technique or time history investigation. In the present examination the ordinary and sporadic structures are considered for the investigation and the examination were conveyed by various techniques like Response Spectrum strategy and Equivalent Static Method. At that point the different outcomes are contrasted and various models. In this investigation various models are taken for the examination, for example, uncovered casing, exposed edge with center divider, exposed casing with shear divider and uncovered casing with dampers.

Description of models

1. Bare frame model
2. Bare frame with core wall.
3. Bare frame with L-Type Shear wall.
4. Bare frame with infill wall.
5. Bare frame with Fluid viscous dampers.

MULTISTORY BUILDING (G+12)

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Modelling different models in etabs software

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1. Conventional building with beams and columns for regular plan (Bareframe model)
2. Bareframe model with corewall for regular plan
3. Bareframe model with L - Type Shearwall for regular plan
4. Bareframe model with Infillwall for regular plan
5. Bareframe model with fluidviscous dampers for regular plan

EQUIVALENT STATIC AND RESPONS SPECTRUMANALYSIS(RSA)

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RESULTS AND COMPARISON

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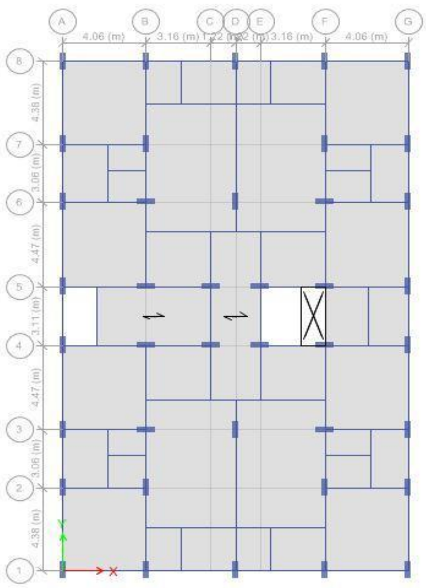
CONCLUSION

The layout of the plan for all the model is shown in figure below



Plan of the building

III. BUILDING DETAILS

Type of building	Residential Building (regular)
Type of frame	Moment Resisting Frame
No of stories Total height of building	12 stories 44.8m
Thickness of walls	230mm (main wall) and 115mm (inner wall)
Live load	3KN/m2 – Balcony , Corridor 2KN/m2 – All rooms
Grade of Concrete	M35
Grade of reinforcing Steel	HYSD500
Density of brick masonry	20KN/m3
Sizes of columns	C1=300mmX900mm
Sizes of beams Thickness of slab	B1=300X375mm 150mm
Zone	V
Soil type	III
Importance factor	1
Response reduction	5
Seismic zone factor	0.36 for zone V
Damping ratio	5%
Thickness of shear wall and infill wall	230mm
Type of damper	Fluid Viscous damper 250

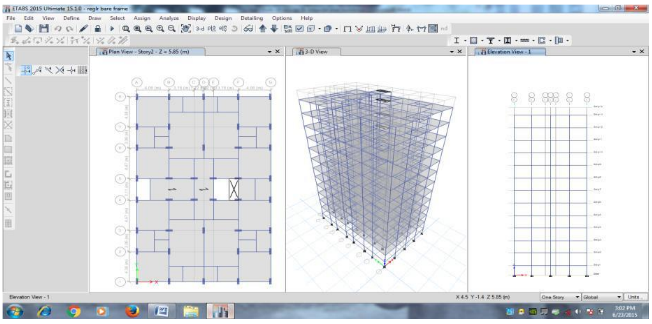
Factors considered for analysis

- Live load (As per IS 875 part I) - 3KN/m^2
- Floor finish (FF) load - 1KN/m^2
- Concrete grade - 35N/mm^2
- Steel grade - 500 N/mm^2
- Clear cover (CC) for beam and column - 30mm
- Concrete density - 25 KN/m^3
- Brick wall density - 19KN/m^3

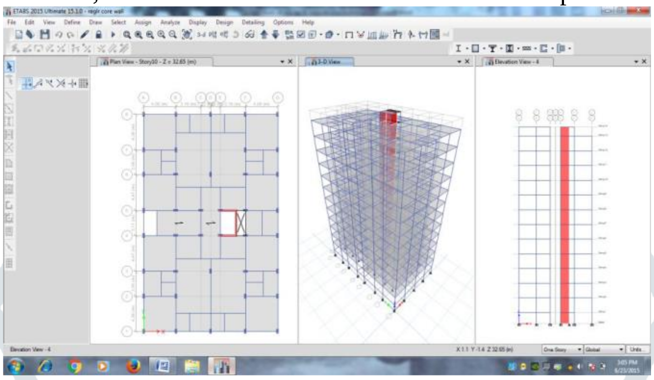
Geometrical Details

- Number of stories considered - 12
- Each height of storey - 3.35m
- Number of bays considered in x-direction - 7
- Number of bays considered in y-direction - 8
- Slab thickness considered - 150mm

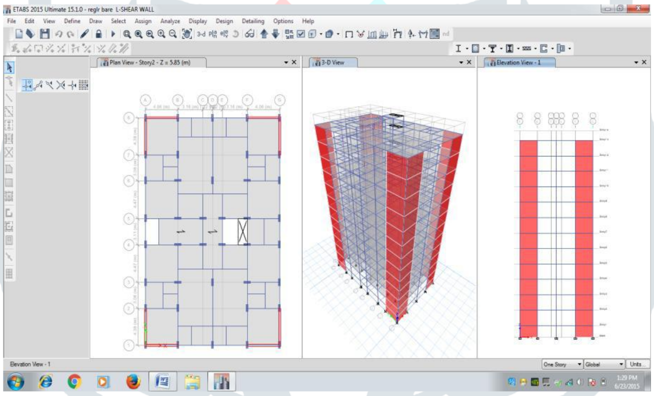
IV. MODELING DIFFERENT MODELS IN ETABS SOFTWARE



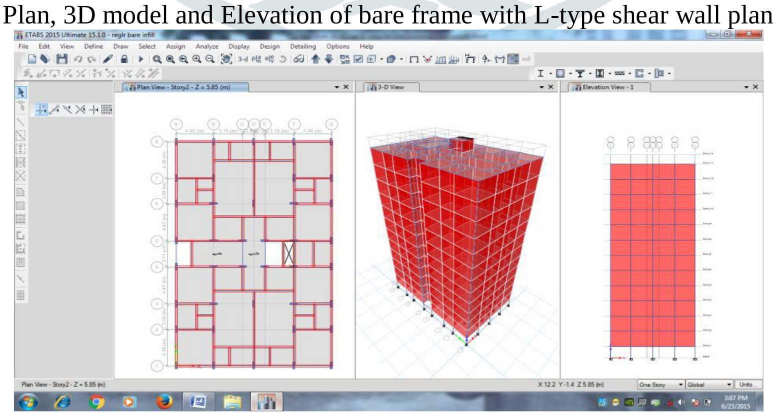
Plan, 3D model and Elevation of bare frame for plan



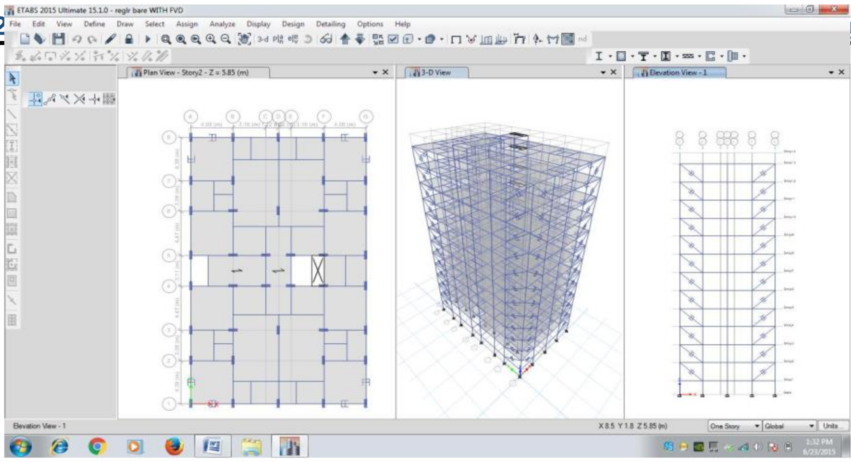
Plan, 3D model and Elevation of bare frame with core wall plan



Plan, 3D model and Elevation of bare frame with L-type shear wall plan



Plan, 3D model and Elevation of bare frame with fluid viscous dampers plan



V. ANALYSIS RESULTS AND DISCUSSION

Time Period

It is defined as the time required completing one cycle of vibration to pass in a given point.

Table 1: Time period of various regular plan model.

MODEL NO.	NATURAL TIME PERIOD IN SEC (REGULAR)
1	2.409
2	2.071
3	1.298
4	0.692
5	1.82

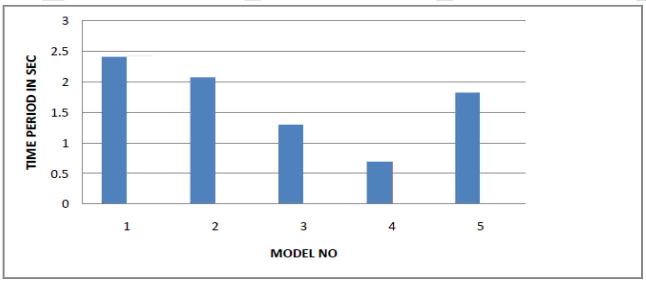


Chart 1: Time period of various plan model

Storey displacement.

Table 2:Max Storey Displacement in mm for regular plan models

MODEL NO	EQX	EQY	RSX	RSY
1	133.1	78.8	119.1	70.3
2	108.9	68.1	94.3	66.2
3	47.2	31.3	39.6	27.7
4	14.4	11.5	12.4	11.9
5	88.9	53.9	64.8	44.5

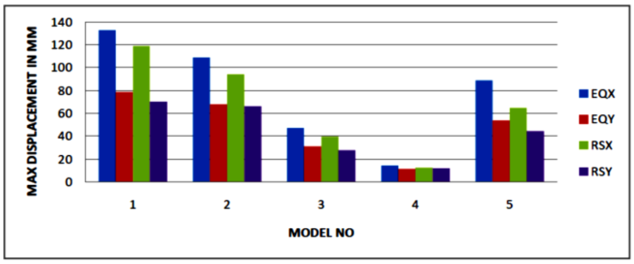


Chart 2:Max Storey Displacement in mm for various model plan for ESA and RSA along X and Y direction

Storey Drift.

Table 3: Max Storey Drift in m for regular plan models

MODEL NO	EQX	EQY	RSX	RSY
1	0.003689	0.00229	0.003603	0.002293
2	0.003014	0.001911	0.00271	0.001906
3	0.001359	0.000898	0.001181	0.000794
4	0.001098	0.000751	0.001193	0.000966
5	0.002626	0.001544	0.002778	0.001272

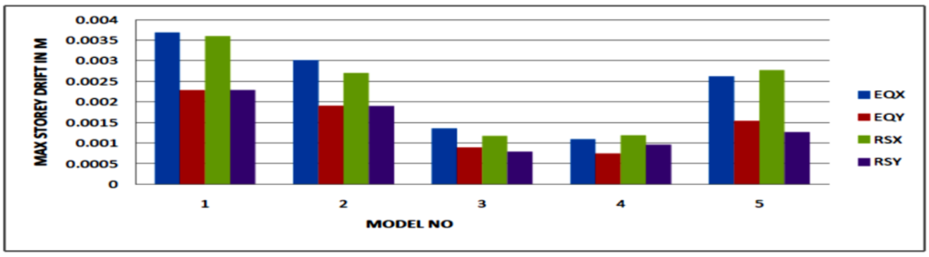


Chart 3:Max Storey Drift in m for various model plan for ESA and RSA along X and Y direction.

Storey stiffness

Table 4: Max Storey Stiffness in kN/m for regular plan models.

MODEL NO	EQX	EQY	RSX	RSY
1	3457.687	3457.687	3523.489	3523.489
2	3495.554	3495.554	3562.684	3561.829
3	3600.018	3600.018	3667.41	3667.73
4	6226.281	7871.112	6340.966	8015.838
5	4569.305	4569.305	4656.372	4656.81

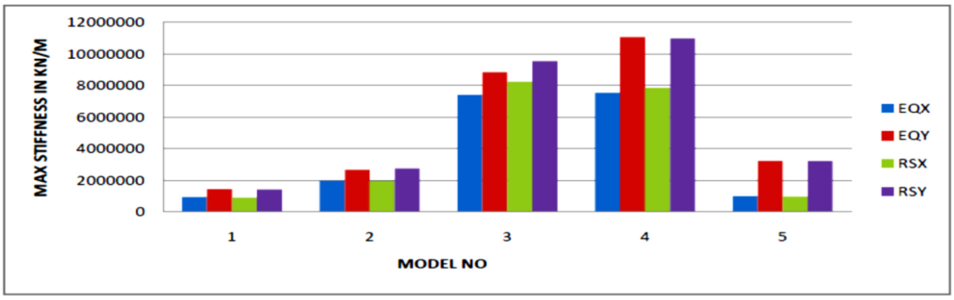


Chart 4:max storey stiffness in kn/m for various model of plan for ESA and RSA along x and y direction.

Base shear

Table 5: Base shear in kN for model.

MODEL NO	EQX	EQY	RSX	RSY
1	952586.656	1449612.503	923665.124	1442989.715
2	1975529.991	2687750.03	1960367.899	2763085.648
3	7413637.027	8848226.082	8245032.784	9538367.906
4	7550186.935	11070521	7857694.569	10987371
5	1012032.359	3241047.296	992018.305	3228265.679

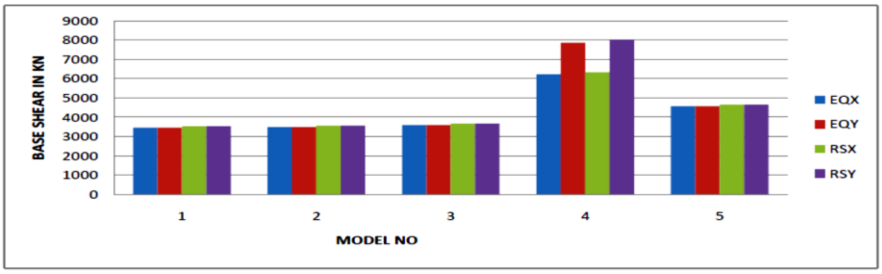


Chart 8:Base Shear in kN for various models of for ESA and RSA along X and Y direction

Observations The following observations were made from the present study.

1. The time period in model is get reduced by 71.27%
 and 71.33% respectively when compared to bare frame model.

2. When the shear wall is added to the bare frame the storey displacement is decreases by 66.75% and 60.59% in X-and Y-direction respectively, if infill wall is added then the displacement is reduced by 89.58% and 83.07% in X and Y-direction respectively for model.

3. When the damper is added to bare frame the drift is reduced by 22.89% and 44.52% in X and Y-direction respectively, if infill wall is added then the drift is reduced by 66.88% and 57.87 % in X and Y-direction respectively for model.

4. When the damper is added to bare frame the base shear is increased by 32.15% in X and Y-direction respectively for model.

5. The stiffness is increased by 88.24% and 86.86% in X and Y –direction respectively if infill wall is added to the bare frame for model.

6. The base shear is increased by 44.43% in X and 56.04% in Y- direction in the infill wall model.

CONCLUSIONS

The following conclusions were made from the present study.

- This study shows that the use of infill wall to bare frame will increases the strength and stiffness of the building and also the base shear will be increase by adding the infill wall to the bare frame model.
- From this study it is concluded that the use of dampers in bare frame will effectively decreases the time period, drift and displacement by increasing the stiffness in model. Hence viscous damper devices perform a vital role in reducing and controlling the seismic response of the structure.
- It is concluded that the use of shear wall in bare frame is performing very well by reducing the storey displacement and storey drift in model.
- From displacement point of view it is concluded that infill wall is having less displacement value as compared to the models with shear walls and dampers.
- From base shear point of view it is concluded that model with dampers is having greater base shear as compared to models with shear wall.
- Due to lesser area and mass models are having the lesser base shear and the regular models are having higher base shear indicating the greater stiffness.
- From the study it can be concluded model building performs well building under the seismic load.

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