



STUDY OF LATERAL LOAD RESISTING SYSTEMS BY CONSIDERING HIGH SEISMIC ZONE

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ABSTRACT

From the traditional time we all know earthquake could be a disaster inflicting event. Recent days structures have become additional and additional slender and additional at risk of sway and then dangerous with in the earthquake. Researchers and engineers have discovered within the past to form the structures as earthquake resistant. Once several sensible studies it's shown that use of lateral load resisting systems within the building configuration has enormously improved performance of the structure in earthquake. In present research we've used plan of 15Mx12m. software package used is ETABS 9.7.4, the work has been applied for the various cases exploitation shear wall, bracings and dampers for the various heights, Most height thought off or the current study is 39.3m The modeling is completed to look at the result completely different of various cases on seismic parameters like base shear, lateral displacements and lateral drifts. The study has been applied for the Zone V and a medium form of soils as laid out in IS 1893-2002.

Keywords: *clean Frame, Bracings, Shear Walls, dampers, Lateral Load Resisting Systems, Lateral Displacements, Drifts, Base Shear, Seismic Zone Etc.,*

I.INTRODUCTION

Tremors are one of nature's most noteworthy dangers to life on this planet and have decimated innumerable urban areas and towns on for all intents and purposes each landmass. They are one of man's most dreaded normal marvels because of significant tremors delivering practically momentary decimation of structures and different structures. Furthermore, the harm caused by seismic tremors is totally connected with synthetic structures. As in the instances of avalanches, seismic tremors additionally cause demise by the harm they instigate in structures, for example, structures, dams, spans and different works of man. Shockingly a significant number of seismic tremors give next to no or no notice before happening and this is one reason why quake designing is mind boggling.

A portion of the significant issues identifying with tremor configuration are made by the first outline idea picked by the engineer. No designer can genuinely change a severely imagined incorporating with a seismic tremor safe



building. The harms which have happened amid seismic tremor occasions unmistakably exhibit that the state of a building is vital to how they react. The perfect parts of a building structure are straightforwardness, normality and symmetry in both height and plan. These properties all add to a more unsurprising and even appropriation of powers in a structure while any inconsistencies are probably going to prompt an expanded dynamic reaction, at any rate in specific areas of the structure.

OBJECTIVES OF WORK

Following are the main objectives of the present study:

- To analyze a G+12 story bare frame structure and three different lateral force resisting systems as per IS 1893-2002 part I.
- Determination of the base shear, maximum story displacement and story drift for bare frame structure and other three lateral force resisting systems for zone V.
- Obtain the best lateral force resisting system for zone V by comparing results.

II.LITERATURE REVIEW

Shaik Kamal Mohammed Azam, Vinod Hosur et al.,

The double basic framework comprising of unique minute opposing casing (SMRF) and solid shear divider has better seismic execution because of enhanced horizontal firmness and parallel quality. An all around outlined arrangement of shear dividers in a building outline enhances its seismic execution altogether. The designs of RC minute opposing confined building structure with various game plans of shear dividers are considered for assessment of seismic execution, to touch base at the reasonable course of action of shear divider in the auxiliary surrounding framework for better seismic protection. A correlation of auxiliary conduct as far as quality, firmness and damping attributes is finished by organizing shear dividers at various areas/setups in the basic surrounding framework. The flexible (reaction range investigation) and additionally in-versatile (nonlinear static weakling examination) examinations are completed for the assessment of seismic execution. The consequences of the investigation demonstrate that the arrangement of shear dividers symmetrically in the peripheral minute opposing casings of the building and ideally interconnected in commonly opposite ways framing a center will prompt better seismic execution.

Anuj Chandiwalla et al.,

From the past records of seismic tremor, there is increment in the request of quake opposing building which can be satisfied by giving the shear divider frameworks in the structures. For accomplishing economy in strengthened solid building structures, outline of basic segment is deliberately done to get sensible solid sizes and



ideal steel utilization in individuals. In the present paper the specialist, had attempted to get minute happen at a specific segment including the seismic load, by taking diverse parallel load opposing basic frameworks, distinctive number of floors, with different places of shear divider for quake zone III in India has been found. Among various area of shear divider (F-shear divider at end of "L" segment) gives best outcome. Principle reason is "END PORTION OF FLANGE ALWAYS OSCILLATE MORE DURING EARTHQUAKE". Here shear divider straightforwardly hinder this end wavering, thus lessen general twisting snapshot of building.

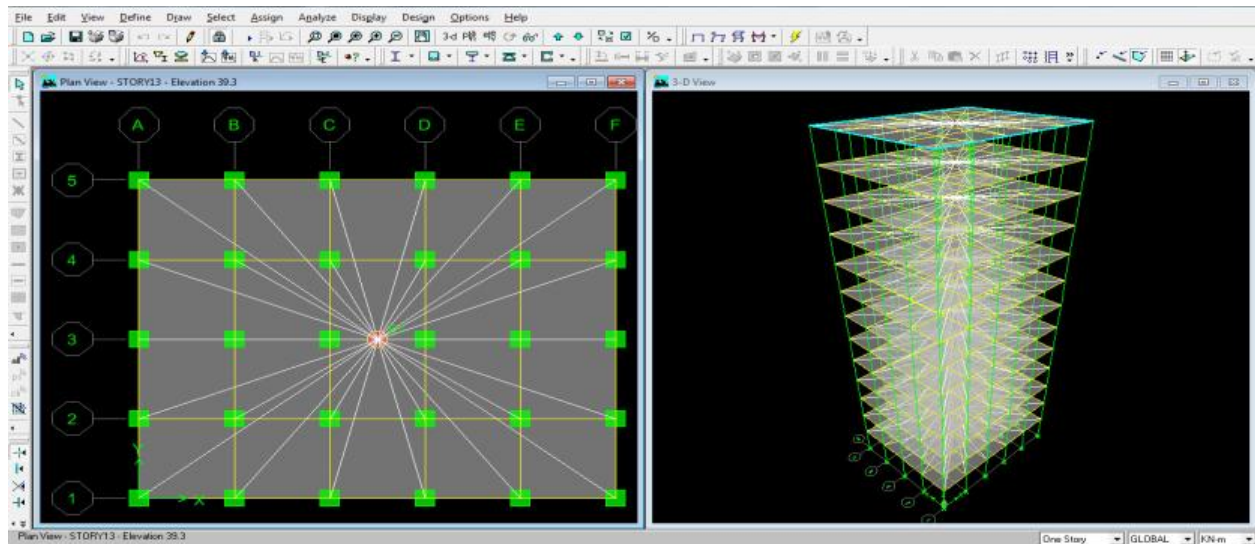
III. METHODOLOGY

MODELING DETAILS

In the present investigation, examination of G+12 multi-story working in many separates zone for earth shake powers is conveyed out. 3D show is set up for G+12 multi-story building is in ETABS. Building has a common size of Basic parameters considered for the analysis are

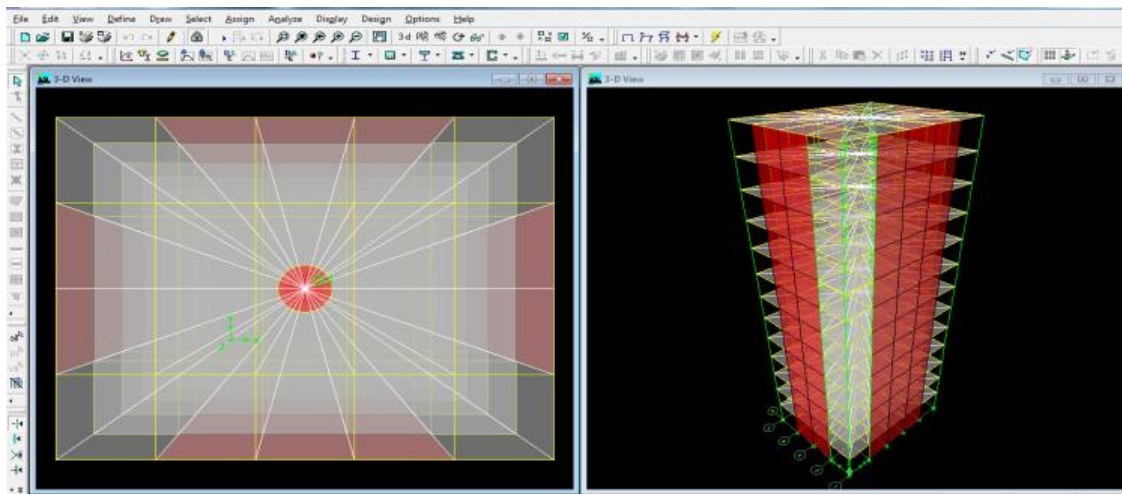
1. Utility of building : Residential building
2. Number of stories : G+12
3. Shape of building : Rectangular
4. Type of walls : Brick wall
5. Geometric details
 - a. Plan area : 15M X 12M
 - b. Ground floor : 3.3m
 - c. floor to floor height : 3m
6. Material details
 - a. Concrete Grade : M30
 - b. All Steel Grades : HYSD reinforcement of Grade Fe415
 - c. Bearing Capacity of Soil : 200 KN/m²
7. Type Of Construction : R.C.C FRAMED structure
8. Column : 0.6m X 0.6m
9. Beams : 0.4m X 0.6m
10. Slab : 0.150m
11. Live load : 3.5 KN/ m²
12. Floor load : 1.5 KN/m²
13. Special considerations
 - Shear wall : Thickness 150mm
 - Dampers : Friction dampers
 - Bracings : X Bracings

GENERAL BUILDING :



SHEAR WALL

In current tall houses, shear dividers are generally utilized as a vertical basic detail for opposing the parallel masses that might be incited through the impact of wind and seismic tremors which cause the disappointment of shape as analyzed in figure Shear dividers of several pass areas. . Arrangement of parcels empowers to isolate an encase put, while of centers to contain and pass on administrations all things considered with lift. Divider openings are always required for windows in outside allotments and for entryways or passageways in internal dividers or in raise centers. The length and place of openings can likewise go from building and helpful detail of view. [6] discussed about E-plane and H-plane patterns which forms the basis of Microwave Engineering principles.



PLAN VIEW IN ETABS

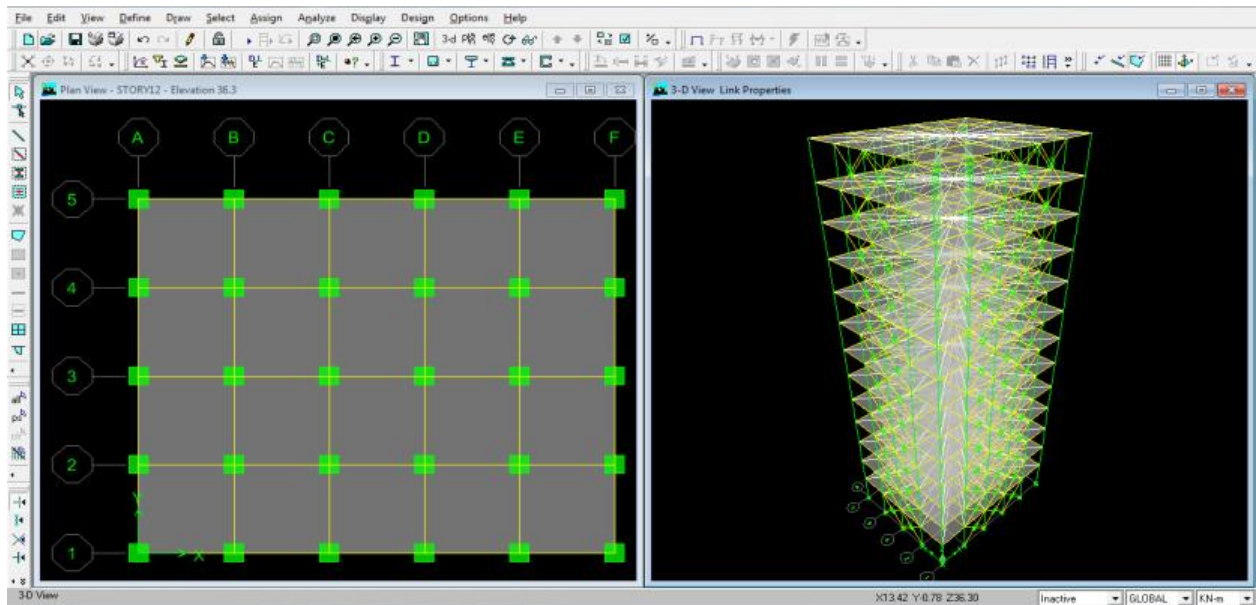
3 D VIEW OF SHEAR WALLS IN ETABS

DAMPERS

In seismic structures overhauling, one of the horizontal power rebate because of the quake is find of dampers. Amid a seismic tremor, unnecessary power is executed to the structure. This power is connected in assortments of dynamic and limit (worry) to structure and it's far consumed or amortized. On the off chance that structure is free of damping, its vibration can be consistently, however because of the material damping, and vibration is lessened. Info vitality caused by seismic tremor to shape is exhibited in the accompanying condition:

$$E = E_k + E_s + E_n + E_d$$

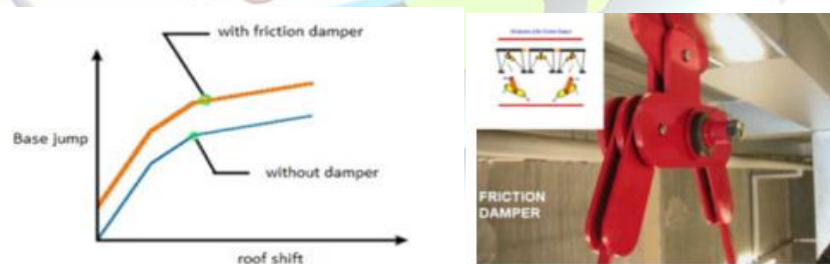
In this condition, E is quake enters power, E_k is dynamic vitality, E_s is reversible anxiety power in the versatile range and E_n is the measure of squandered vitality because of inelastic miss happening and E_d is the amount of amortized quality by utilizing additional damper.



FRICTION DAMPERS IN PLAN VIEW, MODELLING IN 3 D VIEW IN ETABS

FRICTION DAMPERS

In this kind of damper, seismic power is spent in conquering grinding inside the touch surfaces. Among various elements of those dampers might be delegated avoiding exhaustion in served loads (on account of the non-exuberant dampers beneath stack) and their execution fair-minded to stacking speed and surrounding temperature. These dampers are introduced in parallel to supporting.



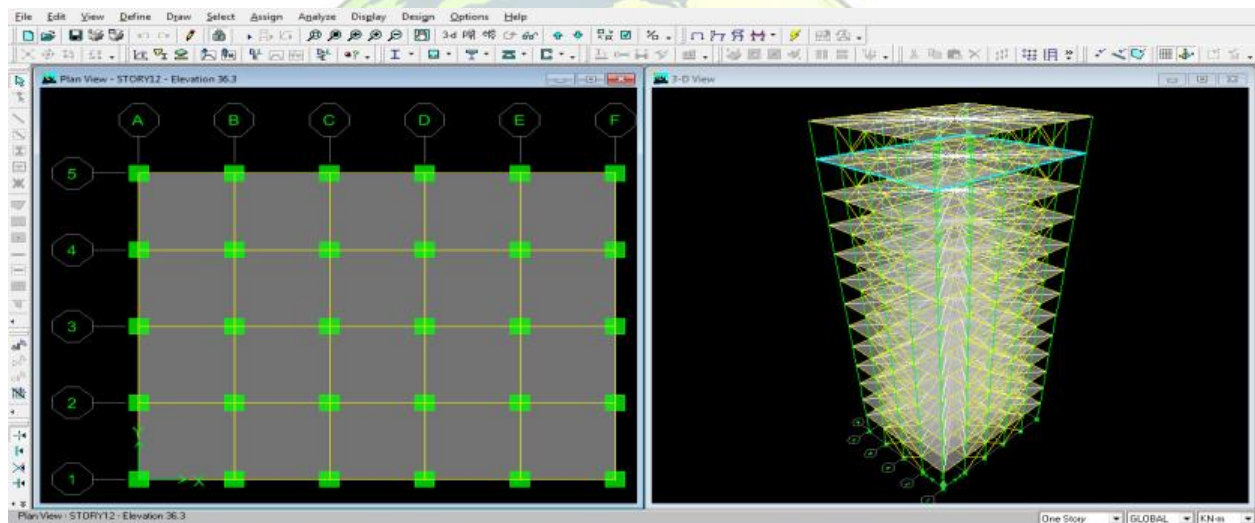
The effect of using friction dampers on structure capacity curve , Using rotational friction dampers in retrofitting

X-BRACING

Cross-bracing (or X-bracing) makes use of diagonal contributors crossing every different. This handiest need to be proof against tension, one brace acting to face up to sideways forces at a time depending at the course of loading. As a end result, metallic cables also can be used for pass-bracing. However, this offers the least available area within the façade for openings and outcomes within the best bending in ground beams.

BRACINGS

Propped outlines build up their protection from parallel powers by the supporting activity of corner to corner individuals. The props initiate powers in the related shafts and sections so all cooperate like a truss with all individuals subjected to stresses that are fundamentally pivotal.



X BRACINGS IN ELEVATION VIEW, AND MODELLING IN 3 D VIEW IN ETABS

LOADS COSIDERED AND MODELING OF BUILDING

LOADS ON THE STRUCTURE

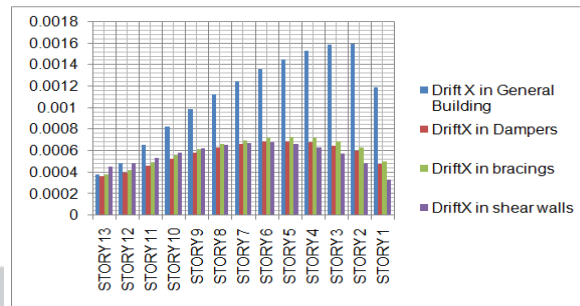
The types of masses appearing on systems for homes and other structures can be extensively categorized as vertical loads, horizontal hundreds and longitudinal hundreds. The vertical hundreds consist of dead loads, live load and effect load. The horizontal masses accommodates of wind load and earthquake load. The longitudinal loads i.e. Tractive and braking forces are taken into consideration in special case of layout of bridges, gantry girders and many others.



V.RESULTS AND ANALYSIS

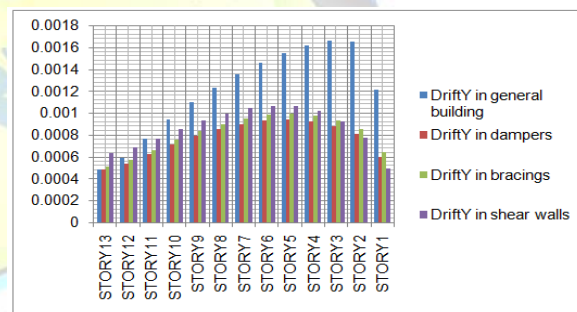
DRIFT IN X DIRECTION

Story	Drift X in General Building	DriftX in Dampers	DriftX in bracings	DriftX in shear walls
STORY13	0.00038	0.00036	0.00038	0.00046
STORY12	0.00048	0.0004	0.00042	0.00049
STORY11	0.00066	0.00047	0.00049	0.00054
STORY10	0.00083	0.00053	0.00056	0.00058
STORY9	0.00099	0.00059	0.00062	0.00062
STORY8	0.00113	0.00063	0.00067	0.00065
STORY7	0.00125	0.00067	0.0007	0.00067
STORY6	0.00136	0.00069	0.00072	0.00068
STORY5	0.00145	0.00069	0.00073	0.00067
STORY4	0.00153	0.00068	0.00072	0.00063
STORY3	0.00159	0.00065	0.00069	0.00057
STORY2	0.00159	0.0006	0.00064	0.00049
STORY1	0.00119	0.00048	0.0005	0.00033



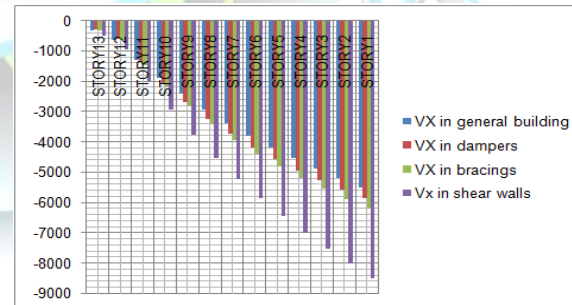
DRIFT IN Y DIRECTION

Story	DriftY in general building	DriftY in dampers	DriftY in bracings	DriftY in shear walls
STORY13	0.00048	0.00048	0.00051	0.00063
STORY12	0.00059	0.00054	0.00057	0.00069
STORY11	0.00076	0.00062	0.00066	0.00077
STORY10	0.00094	0.00071	0.00075	0.00085
STORY9	0.00109	0.00079	0.00083	0.00093
STORY8	0.00123	0.00085	0.0009	0.00099
STORY7	0.00135	0.0009	0.00095	0.00104
STORY6	0.00146	0.00093	0.00098	0.00107
STORY5	0.00154	0.00094	0.00099	0.00106
STORY4	0.00161	0.00092	0.00098	0.00102
STORY3	0.00166	0.00088	0.00093	0.00093
STORY2	0.00165	0.0008	0.00085	0.00077
STORY1	0.00121	0.0006	0.00064	0.0005



SHEAR FORCE (VX)

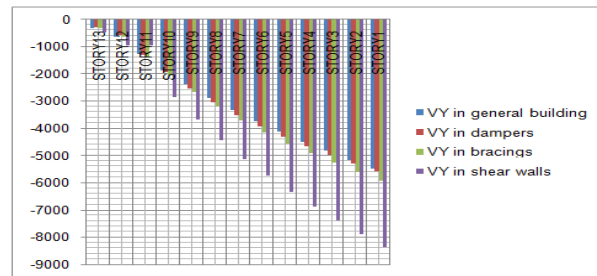
Story	VX in general building	VX in dampers	VX in bracings	Vx in shear walls
STORY13	-315	-288	-315	-472.5
STORY12	-630	-576	-630	-945
STORY11	-1284.2	-1366.8	-1447.8	-1977.8
STORY10	-1880	-2071.1	-2179.1	-2914.2
STORY9	-2423	-2697.1	-2832.1	-3763.3
STORY8	-2918.6	-3252.8	-3414.8	-4534.2
STORY7	-3372.3	-3746.6	-3935.6	-5236
STORY6	-3789.8	-4186.4	-4402.4	-5877.7
STORY5	-4176.4	-4580.6	-4823.6	-6468.5
STORY4	-4537.7	-4937.2	-5207.2	-7017.4
STORY3	-4879.1	-5264.4	-5561.4	-7533.6
STORY2	-5206.3	-5570.4	-5894.4	-8026.2
STORY1	-5524.6	-5863.4	-6214.4	-8520.1





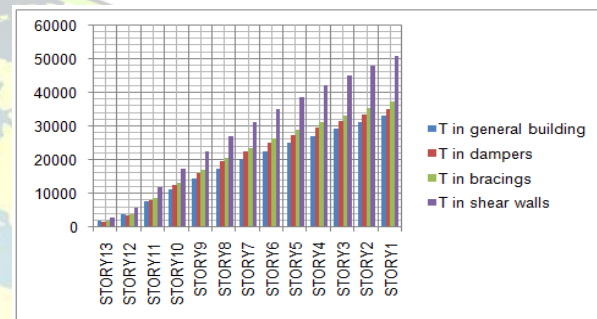
SHEAR FORCE (VY)

Story	VY in general building	VY in dampers	VY in bracings	VY in shear walls
STORY13	-315	-288	-315	-472.5
STORY12	-630	-576	-630	-945
STORY11	-1271.5	-1297.7	-1378.7	-945
STORY10	-1856.8	-1944.7	-2052.7	-2852.4
STORY9	-2391.3	-2524.2	-2659.2	-3678.7
STORY8	-2880.2	-3043.1	-3205.1	-4431.6
STORY7	-3328.7	-3508.5	-3697.5	-5119.5
STORY6	-3742.3	-3927.5	-4143.5	-5751
STORY5	-4126.3	-4307.1	-4550.1	-6334.7
STORY4	-4485.8	-4654.2	-4924.2	-6879
STORY3	-4826.3	-4976.1	-5273.1	-7392.5
STORY2	-5153	-5279.6	-5603.6	-7883.9
STORY1	-5471.2	-5571.9	-5922.9	-8377.4



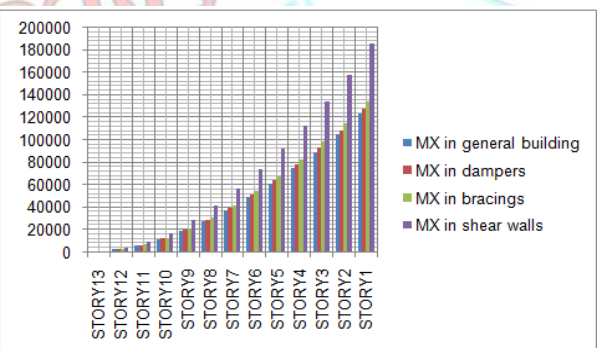
BUILDING TORQUE (T)

Story	T in general building	T in dampers	T in bracings	T in shear walls
STORY13	1890	1728	1890	2835
STORY12	3780	3456	3780	5670
STORY11	7705.06	8200.92	8686.92	11866.9
STORY10	11280	12426.7	13074.7	17485.4
STORY9	14537.7	16182.4	16992.4	22580
STORY8	17511.4	19517	20489	27205.3
STORY7	20234	22479.3	23613.3	31415.8
STORY6	22738.6	25118.4	26414.4	35266.1
STORY5	25058.3	27483.3	28941.3	38810.8
STORY4	27225.9	29622.9	31242.9	42104.5
STORY3	29274.6	31586.2	33368.2	45201.7
STORY2	31237.5	33422.2	35366.2	48157
STORY1	33147.8	35180.4	37286.4	51120.3



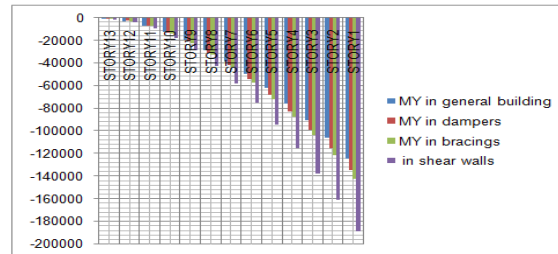
BENDING MOMENT (MX)

Story	MX in general building	MX in dampers	MX in bracings	MX in shear walls
STORY13	945	864	945	1181.25
STORY12	2835	2592	2835	3780
STORY11	6649.52	6484.998	6971	9375.71
STORY10	12220	12319.14	13129.1	17696.6
STORY9	19393.9	19891.69	21106.7	28496.6
STORY8	28034.3	29021.02	30722	41555.1
STORY7	38020.5	39546.65	41814.6	56677.4
STORY6	49247.5	51329.18	54245.2	73694.1
STORY5	61626.3	64250.36	67895.4	92461.8
STORY4	75083.7	78213.04	82668	112862
STORY3	89562.6	93141.19	98487.2	134804
STORY2	105021	108979.9	115298	158219
STORY1	123077	127367.2	134844	185579



BENDING MOMENT (MY)

Story	MY in general building	MY in dampers	MY in bracings	in shear walls
STORY13	-945	-864	-945	-1181.3
STORY12	-2835	-2592	-2835	-3780
STORY11	-6687.5	-6692.5	-7178.5	-9477.2
STORY10	-12328	-12906	-13716	-17984
STORY9	-19596	-20997	-22212	-29037
STORY8	-28352	-30756	-32457	-42404
STORY7	-38469	-41995	-44263	-57875
STORY6	-49838	-54554	-57470	-75272
STORY5	-62368	-68296	-71941	-94441
STORY4	-75981	-83107	-87562	-115257
STORY3	-90618	-98901	-104247	-137622
STORY2	-106237	-115612	-121930	-161464
STORY1	-124468	-134961	-142437	-189295



VI. CONCLUSIONS

The following are the conclusions are

1. The drifts of building with shear walls are less with comparison of Bracings and Dampers and general Building
2. Among the all the cases (i.e., general, bracing, shear wall and dampers) the general building shows the larger drifts .
3. From the study it is clear that building with shear walls is performing better and more efficient than all other cases.
4. The story shear for forces (V) and moment (M) is maximum for the building using shear walls among all the cases (i.e., general, bracing, shear wall and dampers).
5. The value of building twist (T) is also maximum for the shear wall case than other cases
6. The story shear values are increases from story 13 to story 1 (top story to bottom story) in all the cases
7. Compared to all the systems the shear wall systems are economical and the combination of shear wall and dampers will used for more seismic intensity regions.

SCOPE FOR FURTHER WORK

- The study can be extended for different plan size of the building.
- By locating systems at different positions and comparing the results.
- Further study can be done by using different types of systems and for different heights.



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