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Comparative Study Of RC Building With And Without Dampers By Varying Heights Using E-Tabs

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Abstract

Due to the fast growth of the population, multi-story structures are becoming more important. The fundamental issue with multi-story constructions is that they are sensitive to ground motion. The earthquake causes vibrating forces at the structure's foundation; as a result of these vibrations, the building experiences oscillations, which may severely destroy the structure. These oscillations become more pronounced as the structure's height rises, causing serious damage to large-scale facilities. Structures are intended to resist and withstand dynamic forces using a mix of strength, deformability, and energy absorption to protect them from substantial damage. Dampers are employed in high-rise structures in seismic zones to minimise vibrations caused by lateral stresses, such as strong winds and earthquakes, in order to prevent such catastrophic damage. RCC constructions of 10m, 20m, and 30m storeys are investigated in this research. The buildings have a rectangular form and are 20x45 m2 in size, with a seismic zone of V. E-Tabs software is used to analyse structures. For modelling of RC framed structures, the loading calculations were done according to code regulations, namely IS:1893-2002, IS:875(Part-III)-1987, and IS:456-2000. With and without dampers, the parameters of base shear, storey drifts, storey forces, and storey stiffness are investigated.

Key Words: Dampers, Base shear, Dynamic forces, Seismic zone, ETABS Software.

I.INTRODUCTION

The inadequacy of the area has risen in metropolitan regions in recent years as a result of expansion. As a result, the desire for taller structures that are lighter and slenderer is increasing. The structure may produce the first vibrations as a result of this. These constructions are usually made of framed structures. Each vertical and lateral mass is applied to them. Wind and earthquakes have caused lateral masses.

Earthquake is described as the shaking and trembling of the earth's surface caused by subsurface movement along a fault line. Seismic waves are responsible for the vibrations caused by earthquakes. Seismic waves are the most dangerous in the design of any structure. Heavy huge buildings were previously constructed at the bottom to prevent earthquakes and resist the wind impact.

The most dangerous aspect of earthquakes is their unpredictability in terms of occurrence time and location. This offers a significant economic and structural issue. It necessitates that the building's components be built to expiate the energy acquired by earthquakes in order to reduce the damage inflicted. To lessen seismic effect on buildings and bridges, structural control devices are being developed. Seismic energy is injected into the building during an earthquake, causing greater vibrational response. Mechanical devices, such as dampers, are installed throughout the structure's height to enhance damping and hence minimise reaction by absorbing or dispersing energy.

DAMPING

It is defined as the amount of energy lost in the reaction over time. Materials, soil radiation, and other variables all contribute to energy dissipation. To include damping's influence into the construction, a thorough knowledge of the phenomenon is essential. Damping does not modify the form of the response curve, but it does lessen its amplitude.

IMPORTANCE OF DAMPING

When a structure's observation capacity is greater than the seismic energy, it can sustain structural damage. Equivalent viscous damping may be a viable option for reducing structural damage.

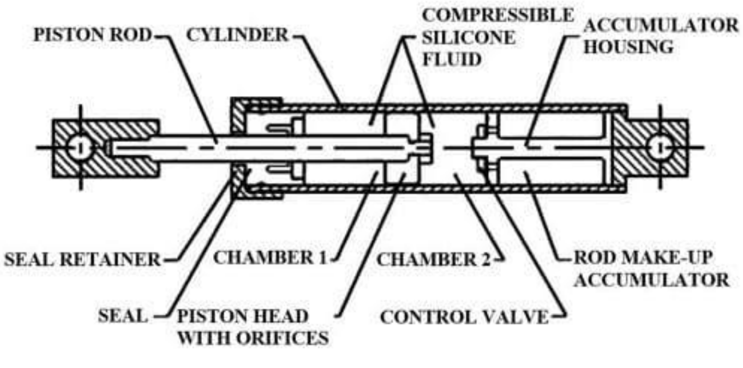
TYPES OF DAMPERS

Damper systems absorb seismic energy and reduce deformations in the structure, therefore protecting structural integrity, controlling structural damages, and preventing injuries to occupants.

Seismic dampers allow the structure to withstand high input energy and minimise structural and occupant deflections, forces, and accelerations. Viscous dampers, friction dampers, yielding dampers, magnetic dampers, and tunable mass dampers are all examples of seismic dampers.

1.VISCOUS DAMPER

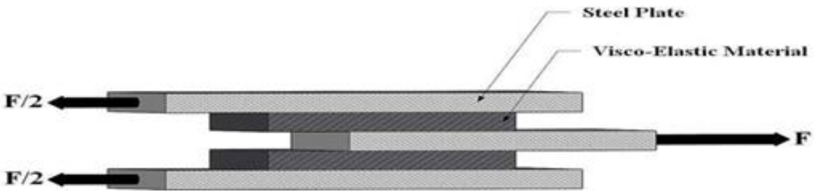
Seismic energy is absorbed by silicone-based fluid moving between piston-cylinder arrangements in viscous dampers. In seismic locations, viscous dampers are utilised in high-rise structures. It can work in temperatures ranging from 40 to 70 degrees Celsius. Vibrations caused by severe winds and earthquakes are reduced using a viscous damper.



2. VISCOELASTIC DAMPER

Viscoelastic dampers, which stretch an elastomer in conjunction with metal elements, are another form of damper. The mechanical energy of the structure is dissipated by this form of damper, which converts it into heat. Several parameters, such as ambient temperature and loading frequency, have an impact on the damper system's function and, as a result, its efficacy.

Viscoelastic dampers have been effectively implemented into a number of tall buildings as a practical energy dissipation mechanism to decrease wind- and earthquake-induced building motion.



3. FRICTION DAMPER

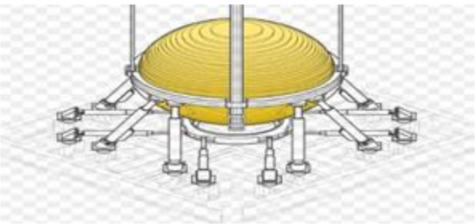
A friction damper is made up of many steel plates moving in opposing directions against one other. Shims of friction pad material separate the steel plates.

The energy is dissipated through friction between the surfaces that rub against each other in the damper. Surfaces made of materials other than steel may also be created.

4.TUNED MASS DAMPER

When a significant lateral force such as an earthquake or high winds strikes, a tuned mass damper (TMD), also known as vibration absorbers or vibration dampers, is placed to a specified point in a structure, it reduces the amplitude of vibration to an acceptable level.

The use of a tuned mass damper may help to reduce discomfort, damage, and even structural collapse. They're often seen in power transmission, cars, and towering structures.

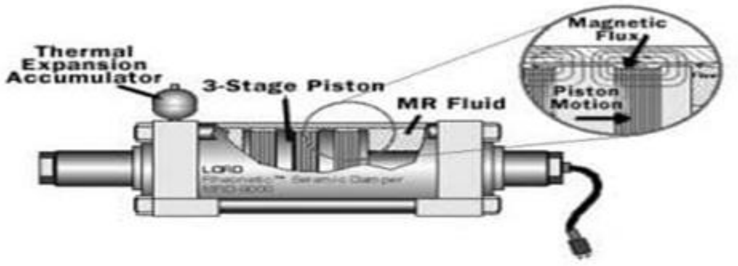


5.YEILDING DAMPER

Yielding dampers, also known as metallic yielding energy dissipation devices or passive energy dissipation devices, are made of readily yielded metal or alloy. It dissipates energy by converting vibratory energy into plastic deformation (yielding of the metallic device), which reduces damage to the key structural parts. Yielding dampers are cost-effective, effective, and have shown to be an efficient energy dissipator.

6. MAGNETIC DAMPER

Two racks, two pinions, a copper disc, and rare-earth magnets make up the Magnetic Damper. This sort of damper is neither costly nor temperature-dependent. Because magnetic damping is not a kind of strength, it works well in dynamic vibration absorbers that need less damping.



STATEMENT OF THE PROBLEM

A dynamic load is any load whose amplitude, direction, and/or location changes with time, as denoted by the word dynamic. The structural reaction to a dynamic load, i.e., the ensuing stresses and deflections, is similarly time changing, or dynamic. In a location with significant seismicity and heavy winds, a tall structure must be carefully built to attain the proper balance, stiffness, and strength. In order to lessen the dynamic response of a structure under wind loading, it is common practise to stiffen it. However, this has the consequence of raising the attracted seismic base shear. It is feasible to lower the building's flexural stiffness to minimise seismic base shear while also controlling the wind response by adding supplemental dampening to the structure.

OBJECTIVES

1. To investigate the seismic behaviour of G+10, G+20, and G+30 earthquakes.

2. Comparing the characteristics on structures without and with dampers in terms of displacement, storey drift, base responses, and storey stiffness

3. To determine how dampers affect a frame structure's deflections.

RESEARCH AIM

To reduce the response of the structure effectively using Fluid viscous dampers and providing it as most efficient in the stability of the structure.

II.LITERATURE REVIEW

They investigated “Analysis of construction utilising viscous Dampers in seismic zone V.” This research investigates multi-storey reinforced buildings' vibration characteristics. It compares the seismic response of a fixed base building without dampers to a proposed building with dampers at the middle and corners. This work investigates storey drift, storey displacement, and mode periods under dynamic loading of RC buildings using seismic analysis.

They examined “Seismic analysis and performance of high rise buildings with damper.” This research analyses a 25-story building and compares its seismic performance with and without a damper. Various fluid viscous dampers were incorporated to the construction. A damper reduces lateral drift by displacing the structure and minimising base shear. Adding damper to a building reduces displacement by 22% compared to a structure without damper. The damper efficiently minimises the base shear.

III.METHODOLOGY

To assess the structure's seismic reaction, a seismic study is required. Seismic analysis is based on external action, structural material behaviour, and structural model selection. Seismic analysis is subdivided into,

1. Linear static analysis

2. Non-linear static analysis

3. Linear dynamic analysis

4. Non-linear dynamic analysis

Linear static analysis

Linear static analysis (ESA) The design base shear for the whole structure is established first, then dispersed throughout its height.

i. Calculation of the design seismic base shear (VB)

ii. Vertical distribution of base shear along structural height

iii. Force distribution throughout the structure's width and length

iv. Determination of the drift and overturning moment.

Non-linear static analysis

Non-linear static analysis is known as pushover analysis. Pushover analysis can be used to evaluate the seismic capacity of existing structure.

Linear Dynamic analysis

It is a linear dynamic analysis approach. This approach calculates the peak reaction of a building during an earthquake straight from the seismic response. This method considers the building's many mode forms. Computer analysis can identify a structure's modes. Each mode's reaction is read from the design spectrum and combined to determine the structure's overall response using modal combination techniques. Calculate the magnitude of forces in all directions (x,y,z) and then observe the building's impacts.

Non-linear Dynamic analysis

It is sometimes called time series analysis. It is particularly useful when the structural response is nonlinear. This study requires an earthquake time history indicative of the building being analysed.

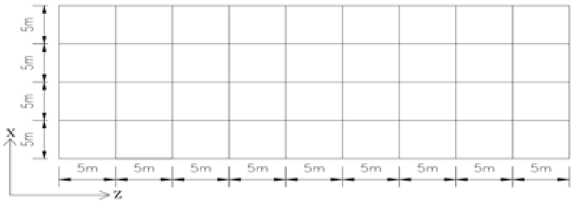
Time history analysis is performed to estimate a structure's seismic reaction to a representative earthquake. Analyses both elastic and inelastic.

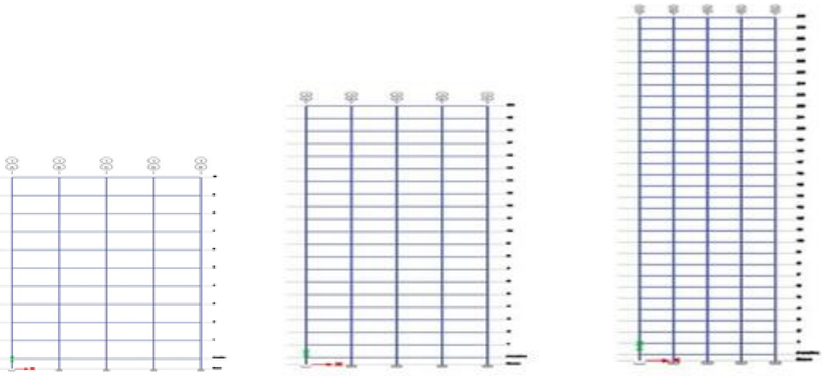
3.1 Software

The current research was analysed using E-tabs software. To generate 3D model using E-tabs programme we need plan and elevations. A 3D model of any complicated structure is simple to make. It offers visual input and customization for rapid and simple model development for any structure. This research used linear dynamic (response spectrum) analysis. E-tabs is a programme for multistory building research and design. E-tabs delivers precise results at every stage. It is an easy to use programme.

3.2 Generation of Model

The seismic response of a framed structure with dampers is calculated in E-tabs in this study. This research compares the effects of dampers with and without them. Structural reaction of storey displacements, storey drift, base shear, and stiffness are the outputs. The current project focuses on the high-rise structures G+10, G+20, and G+30. The multistory building design is 20mX45m, with a width of 20m and a length of 45m.





3.3 Structural Parameters

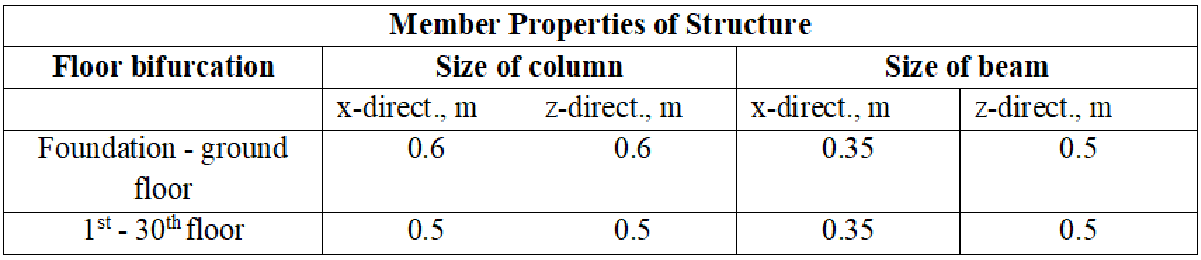
3.3.1 Grade of concrete

Grade of concrete defines as the minimum strength of the concrete that must possess after 28 days of curing. Present study we considered grade of concrete is M35

3.3.2 Grade of steel

Grade of steel defined as the yield strength of steel. According to IS 456:2000, specified yield strength is defined as characteristic strength(fy). In this project we have considered grade of steel considered as Fe550.

3.4. Member properties:



Member Properties of Structure				
Floor bifurcation	**Size of column**		**Size of beam**	
	x-direct., m	z-direct., m	x-direct., m	z-direct., m
Foundation - ground floor	0.6	0.6	0.35	0.5
1st - 30th floor	0.5	0.5	0.35	0.5

Thickness of slab = 0.15m

3.5 Supports:

The supports were generated using the ETABS software. In present study we considered as fixed supports.

3.6 Load cases:

The load cases were calculated partially manually and rest was generated using ETABS load generator. The loading cases were categorized as:

1.Dead load

2.Live load

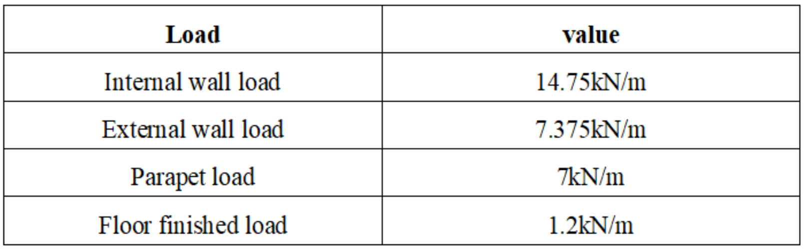
3.Wind load

4.Seismic load

5.Load combinations

Dead Load Considerations:

The material's unit weight determines the dead loads. The self-weight of walls, beams, columns, the floor, and any permanent furniture in the building are all considered dead loads. For dead loads, IS 875(Part-I) is used. The other load estimates were carried out in accordance with the codal requirements.



Load	value
Internal wall load	14.75kN/m
External wall load	7.375kN/m
Parapet load	7kN/m
Floor finished load	1.2kN/m

LiveLoadConsiderations:

Live load refers to a load that can change over a time. Live load is a variable load means it can shifts various locations, for example people walking around building. IS 875(Part II) is considered for live load

load	value
Wall load	3kN/m
Parapet load	2kN/m

Wind Load Considerations:

Under the define load command section, in the wind category, the definition of wind load was supplied in accordance with IS 875(Part III). As height increases wind intensities also increases.

3.7 Fluid viscous dampers

In this experiment, viscous dampers were employed. Fluid viscous dampers are made up of an oil cylinder and a piston. It is used to decrease wind-induced motion at the top of tall buildings. It may also be used to defend against earthquakes.

3.8 Analysis

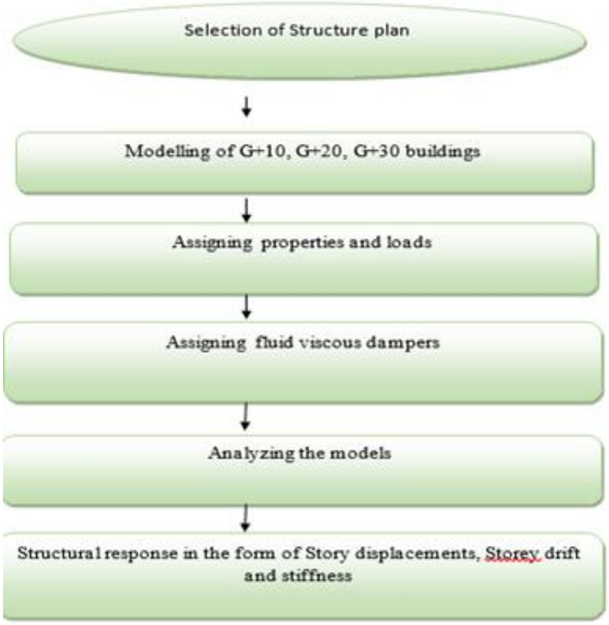
After modelling, E-tabs software may be used to do the structural analysis. The first study of the G+10, G+20, and G+30 constructions was conducted to determine responses, displacements, storey drifts, and stiffness. After that, dampers were added to constructions of G+10, G+20, and G+30, and responses, displacements, storey drifts, and stiffness were recorded. The two outcomes were compared.

Load combinations:

The structure has been analysed for load combinations considering all the previous loads in proper ratio. The critical load combination is considered under combined loading.

1.2(DL+LL+SRSSX)

FLOW CHART:



IV.RESULTS AND DISCUSSIONS

General

G+10, G+20, and G+30 structures with and without dampers were subjected to response spectrum analysis. The structural reaction was evaluated in detail by comparing metrics including storey displacements, storey drift, storey stiffness, storey shear, and overturning moments, among others. Various metrics are used to assess the seismic behaviour of reinforced concrete structures of G+10, G+20, and G+30. Figure 1 depicts the bending moment, shear forces, and deflection diagrams. The graphs and tables below compare the seismic response of structures with and without dampers.

4.1 Analysis of Static parameters

4.1.1 Axial Force

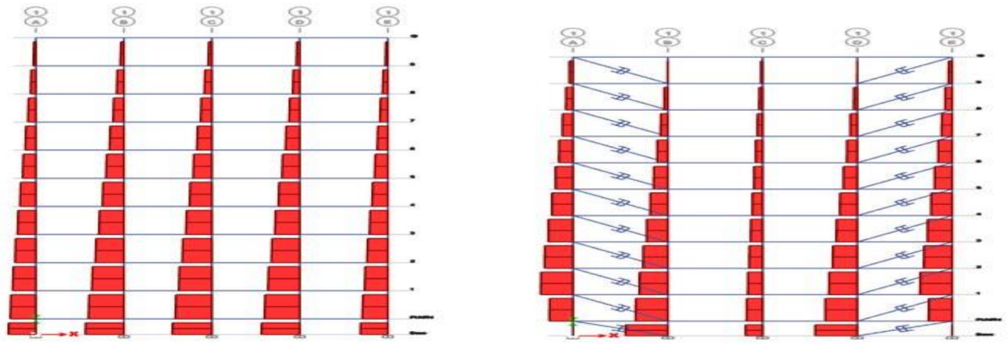


Fig.1 Axial displacement for G+10 without and with dampers

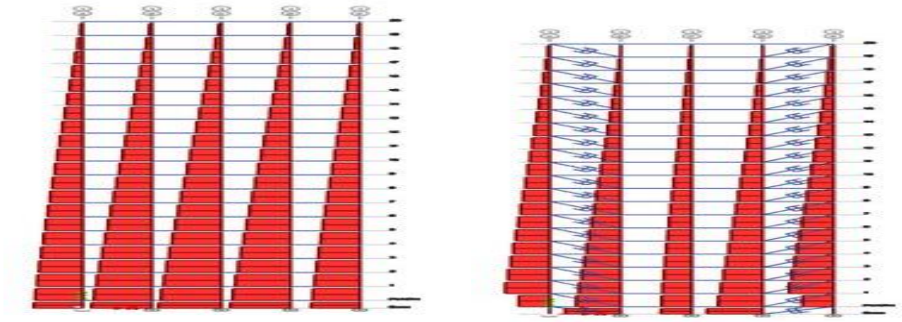


Fig.2 Axial displacement for G+20 building without and with dampers

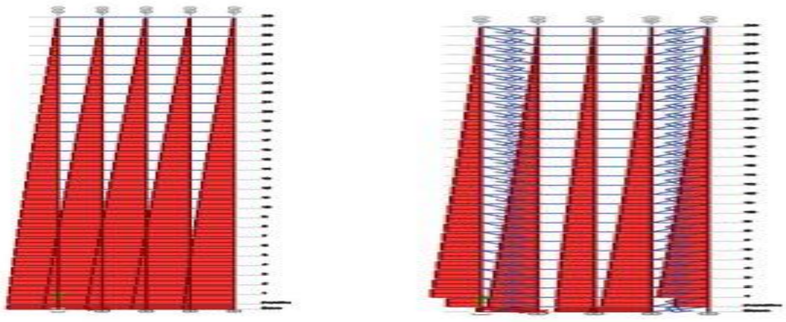


Fig.3 Axial displacement for G+30 building without and with dampers

Table.1 Axial displacements

Axial Displacement- without dampers V.s with dampers						
	G+10 building		**G+20 building**		**G+30 building**	
Nodes	**Without dampers**	**with dampers**	**without dampers**	**with dampers**	**without dampers**	**with dampers**
base	-1636.2	-2146.3	-4682.1	-5353.8	-7670.8	-7760.7
story 1	-1578.2	-1872.2	-4512	-4868.4	-7544.5	-7646.6
story 2	-1438.1	-1673.4	-4431.3	-4565.3	-7326.6	-7439.3
story 3	-1267.7	-1454.9	-4282.7	-4361.7	-6977.8	-7351.6
story 4	-1109.7	-1243.1	-3853.4	-3757.8	-6858.2	-6943.3
story 5	-972.1	-1065.8	-3473.3	-3573.1	-6437.6	-6544.5
story 6	-775.79	-857.31	-3372.5	-3455.1	-6354.2	-6435.2
story 7	-542.42	-675.66	-3161.5	-3275.8	-5762.1	-5895.5
story 8	-327.24	-453.21	-2731.7	-2840.2	-5541.1	-5645.3
story 9	-104.4	-250.73	-2670.7	-2727.2	-5277.5	-5354.6
story 10	0	0	-2158.8	-2253.7	-4957.2	-5233.7
story 11			-2096.2	-2157.9	-4531.1	-4769.6
story 12			-1832.8	-1987.6	-4348.1	-4645.2
story 13			-1574.6	-1664	-4184.4	-4430.3
story 14			-1327.8	-1454.4	-3850	-4244.9
story 15			-1726	-1254.9	-3755	-3949.1
story 16			-816.3	-978.06	-3622.3	-3733
story 17			-683.2	-732.97	-3433.1	-3546.6
story 18			-425.28	-465.87	-2846.3	-2959.8
story 19			-187.4	-254.02	-2728.9	-2842.6
story 20			0	0	-2651.7	-2725.5
story 21					-2436.6	-2575.1
story 22					-2218.4	-2334.1
story 23					-1753.6	-1962.8
story 24					-1546.2	-1681.2
story 25					-1358.4	-1569.4
story 26					-1150.5	-1437.6
story 27					-1012.1	-1357.4
story 28					-953.84	-1243.3
story 29					-724.05	-840.62
story 30					0	0

4.1.2 Shear Force

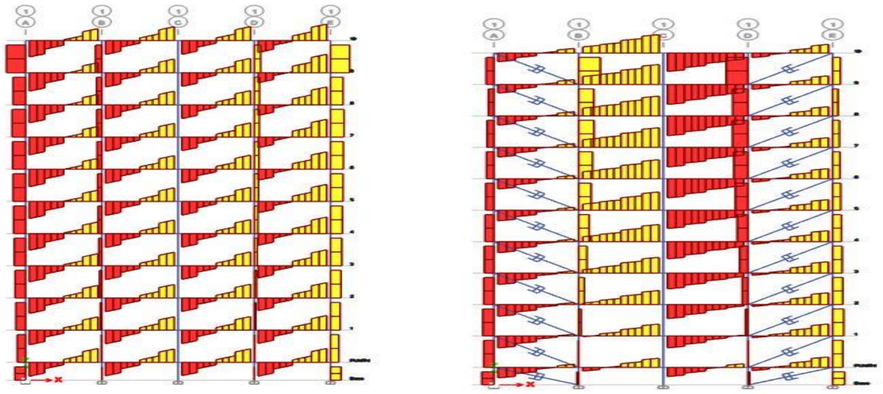


Fig 4 Shear force diagram for G+10 without and with dampers

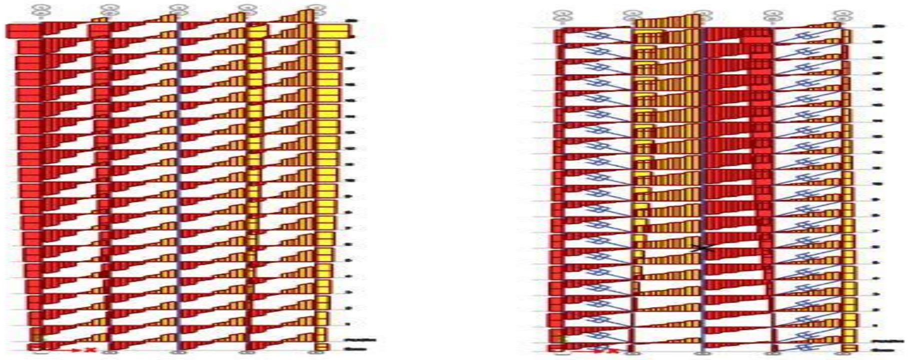


Fig 5 Shear force diagram for G+20 without and with dampers

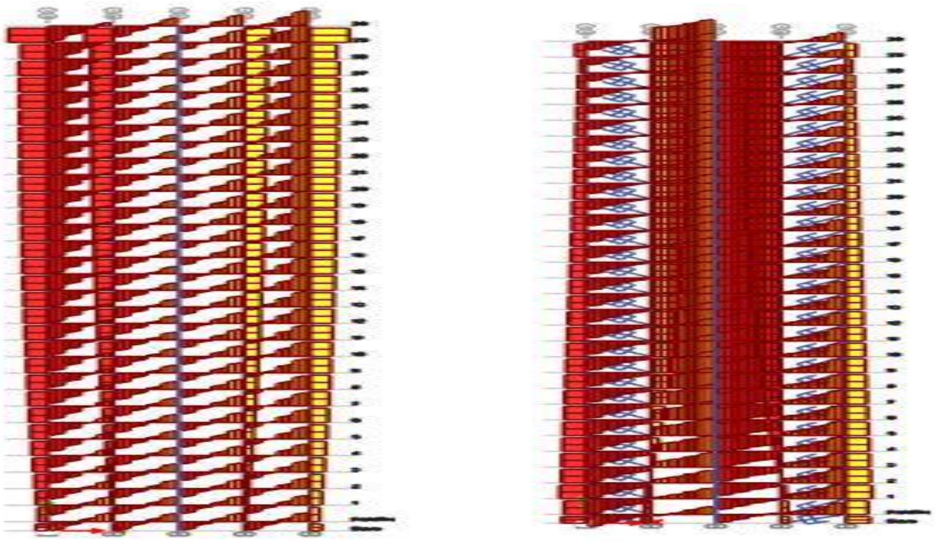


Fig 6 Shear force diagram for G+30 without and with dampers

Table.2 Shear Force

Shear force- without dampers Vs. with dampers						
	G+10 building		**G+20 building**		**G+30 building**	
Nodes	**without dampers**	**with dampers**	**without dampers**	**with dampers**	**without dampers**	**with dampers**
1	-14.34	-11.3	-24.37	-12.6	-29.63	-12.63
25	-9.78	-7.86	-16.48	-7.89	-20.23	-7.61
49	-10.63	-9.94	-17.81	-10.13	-21.87	-9.82
73	-9.87	-10.79	-17.37	-10.78	-21.46	-10.38
97	-9.73	-11.89	-17.21	-11.77	-21.41	-11.28
121	-8.54	-12.92	-16.95	-12.68	-21.26	-12.1
145	-8.2	-13.97	-16.65	-13.6	-21.11	-12.95
169	-7.6	-14.91	-16.3	-14.52	-20.93	-13.78
193	-6.7	-16.4	-15.9	-15.43	-20.73	-14.62
217	-5.3	-14.84	-15.45	-16.35	-20.51	-15.45
241			-14.94	-17.27	-20.25	-16.28
265			-14.37	-18.18	-19.97	-17.12
289			-13.74	-19.1	-19.66	-17.96
313			-13.05	-20.03	-19.31	-18.8
337			-12.29	-20.95	-18.94	-19.64
361			-11.45	-21.88	-18.53	-20.49
385			-10.53	-22.85	-18.08	-21.34
409			-9.52	-23.65	-17.59	-22.19
433			-8.49	-25.39	-17.06	-23.05
457			-7.03	-21.93	-16.48	-23.92
481					-15.85	-24.79
505					-15.17	-25.67
529					-14.44	-26.59
553					-13.64	-27.45
577					-12.78	-28.35
601					-11.85	-29.23
625					-10.84	-30.2
649					-9.7	-30.95
673					-8.6	-32.95
697					-7.01	-27.91

4.1.3 Bending Moment

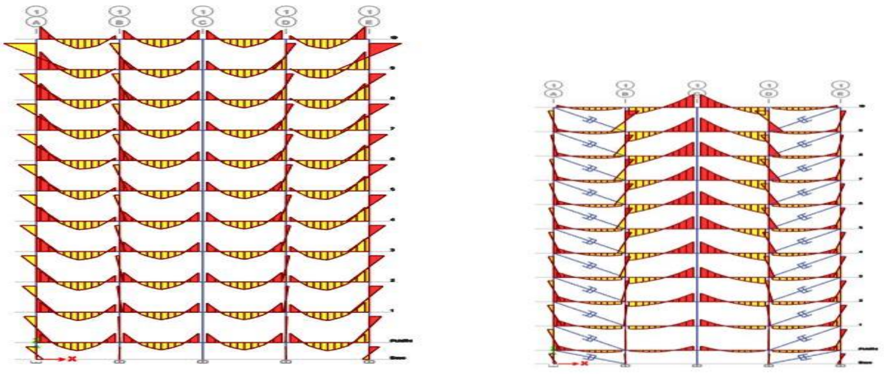


Fig 7 Bending moment diagram for G+10 without and with dampers

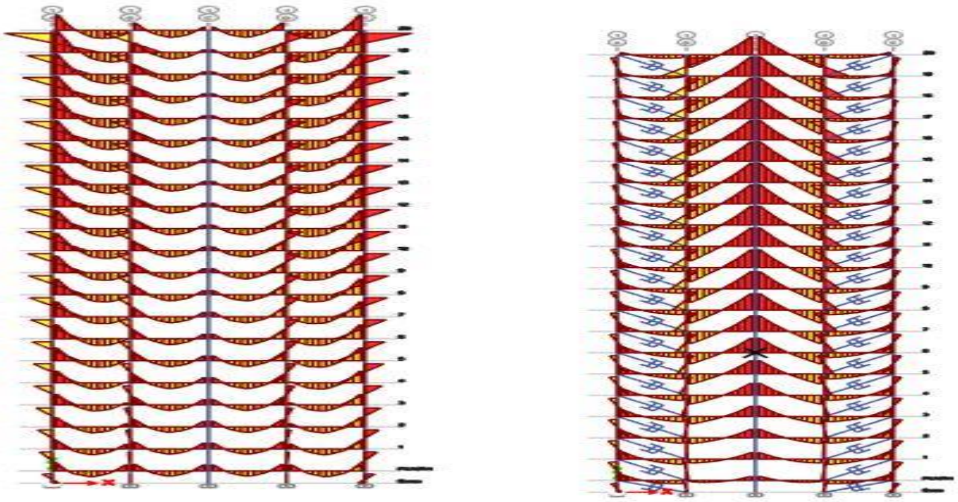


Fig 8 Bending moment diagram for G+20 without and with dampers

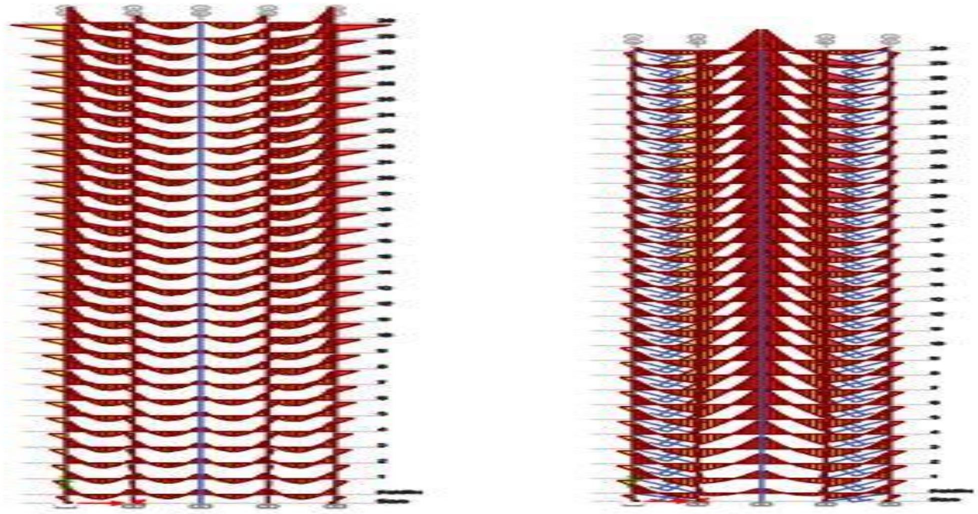


Fig 9 Bending moment diagram for G+30 without and with dampers

Table.3 Bending Moment

Bending Moment- without dampers Vs. with dampers								
G+10 building			G+20 building			G+30 building		
Nodes	without dampers	with dampers	Nodes	without dampers	with dampers	Nodes	without dampers	with dampers
1	13.75	18.03	401	37.75	20.71	515	45.8	20.97
2	11.56	9.07	402	20.32	8.91	516	24.98	8.53
3	11.75	12.76	403	23.41	13.1	517	28.71	12.74
4	11.74	13.68	404	22.6	13.68	518	27.89	13.18
5	11.77	15.13	405	22.48	15.02	519	27.88	14.41
6	11.39	16.47	406	22.12	16.19	520	27.69	15.48
7	11.97	17.82	407	21.75	17.4	521	27.5	16.57

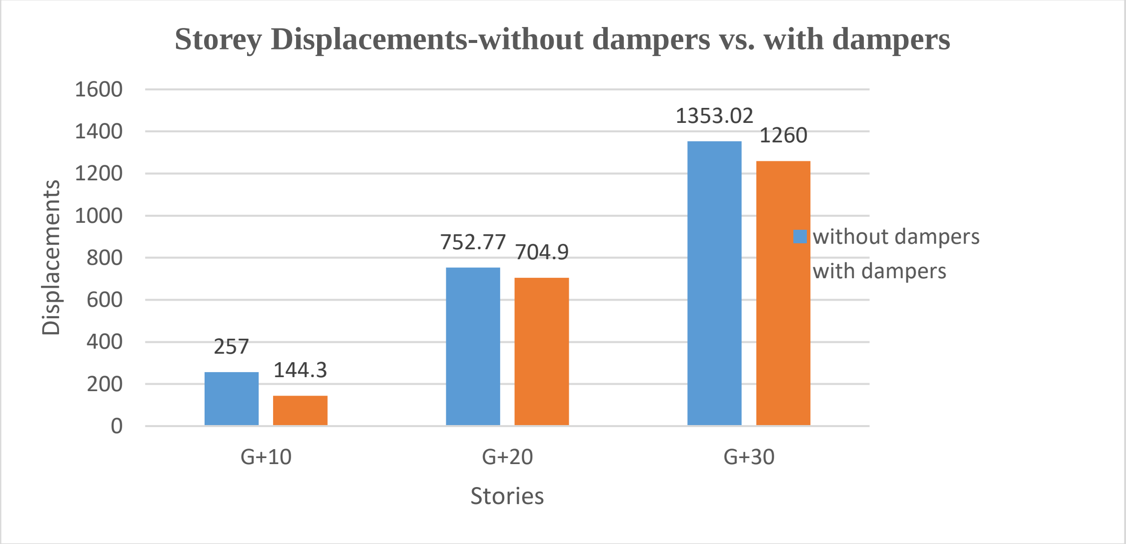
8	11.47	19.13	408	21.31	18.59	522	27.27	17.66
9	11.82	20.64	409	20.8	19.78	523	27.05	18.74
10	11.29	20.96	410	20.23	20.97	524	26.73	19.82
			411	19.59	22.16	525	26.41	20.91
			412	18.87	23.35	526	26.05	21.99
			413	18.08	24.54	527	25.66	23.08
			414	17.19	25.74	528	25.23	24.17
			415	16.23	26.95	529	24.74	25.27
			416	15.16	28.16	530	24.22	26.36
			417	14	29.38	531	23.65	27.47
			418	12.72	30.56	532	23.03	28.58
			419	11.36	32.1	533	22.35	29.7
			420	9.74	31.62	534	21.62	30.8
						535	20.82	31.95
						536	18	33.09
						537	16.9	34.24
						538	15.71	35.4
						539	14.43	36.57
						540	13.04	37.75
						541	11.54	38.95
						542	9.84	40.09
						543	7.85	41.72
						544	5.1	40.59

4.2 Analysis of Dynamic parameters

4.2.1 Storey Displacement

Comparision of Storey Displacements with and wthout dampers									
No. of Stories	**G+10 building**		**% decrease**	**G+20 building**		**% decrease**	**G+30 building**		**% decrease**
	without dampers	**with dampers**		**without dampers**	**with dampers**		**without dampers**	**with dampers**	
plinth	0	0		0	0		0	0	
Srotey 1	5.71	4.57	20%	48.42	8.5959	82%	49.05	9.44	81%
Srotey 2	38.1	14.54	62%	97.09	27.77	71%	98.91	30.6	69%
Srotey 3	75.29	28.24	62%	146.98	55.07	63%	150.94	61.06	60%
Srotey 4	111.66	44.32	60%	196.98	88.53	55%	204	98.9	52%
Srotey 5	145.78	61.66	58%	246.629	126.56	49%	257.92	142.59	45%

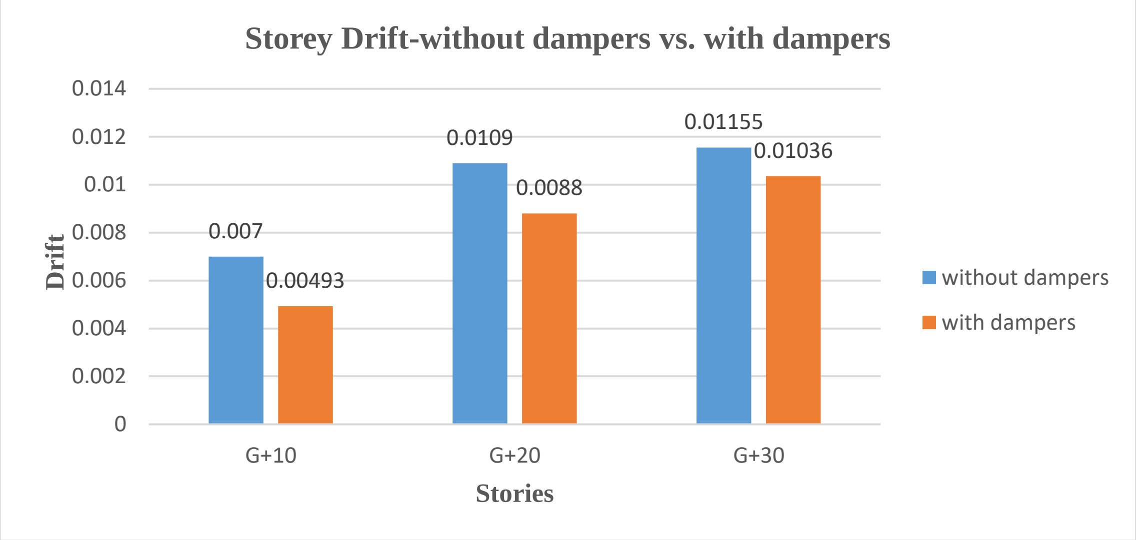
Srotey 6	176.8	79.37	55%	295.5771	167.73	43%	312.39	190.88	39%
Srotey 7	204	96.79	53%	343.506	211.058	39%	367.2	242.76	34%
Srotey 8	226.77	113.49	50%	390.11	255.58	34%	422.2	297.4	30%
Srotey 9	244.58	129.29	47%	435.09	300.53	31%	477.31	354.13	26%
Srotey 10	257	144.3	44%	478.18	345.25	28%	532.17	412.33	23%
Srotey 11				519.1	389.19	25%	586.67	471.51	20%
Srotey 12				557.59	431.9	23%	640.65	531.251	17%
Srotey 13				593.42	473	20%	693.93	591.15	15%
Srotey 14				626.36	512.2	18%	746.36	650.89	13%
Srotey 15				656.18	549.32	16%	797.77	710.17	11%
Srotey 16				682.69	584.26	14%	848	768.7	9%
Srotey 17				705.7	617.8	12%	896.91	826.28	8%
Srotey 18				725.05	647.8	11%	944.36	855	9%
Srotey 19				740.654	676.92	9%	990.19	889	10%
Srotey 20				752.77	704.9	6%	1034.27	899.36	13%
Srotey 21							1076.47	1005	7%
Srotey 22							1116.66	1025	8%
Srotey 23							1184.72	1099	7%
Srotey 24							1190.53	1100	8%
Srotey 25							1223.97	1155	6%
Srotey 26							1254.96	1173	7%
Srotey 27							1283.39	1199	7%
Srotey 28							1309.2	1210	8%
Srotey 29							1332.33	1246	6%
Srotey 30							1353.02	1260	7%


Storey Displacements-without dampers vs. with dampers

4.2.2 Storey Drift

comparision of storey drift with and without dampers									
No. of stories	G+10 building		% decrease	G+20 building		% decrease	G+30 building		% decrease
	without dampers	with dampers		without dampers	with dampers		without dampers	with dampers	
plinth	0	0		0	0		0	0	
Srotey 1	0.00899	0.0012	87%	0.0091	0.0019	79%	0.0092	0.002099	77%
Srotey 2	0.007	0.0027	61%	0.0102	0.0042	59%	0.01109	0.0047	58%
Srotey 3	0.01	0.0038	62%	0.011	0.006	45%	0.01155	0.00677	41%
Srotey 4	0.0095	0.0044	54%	0.011	0.0074	33%	0.0118	0.00841	29%
Srotey 5	0.0086	0.0048	44%	0.011	0.0084	24%	0.01199	0.00971	19%
Srotey 6	0.0076	0.00493	35%	0.0109	0.0083	24%	0.012	0.010735	11%
Srotey 7	0.0064	0.0048	25%	0.01069	0.009	16%	0.012	0.011	8%
Srotey 8	0.005	0.003	40%	0.0104	0.0091	13%	0.012	0.0121	-1%
Srotey 9	0.0035	0.0019	46%	0.01	0.009	10%	0.0121	0.012	1%
Srotey 10	0.002	0.001	50%	0.0096	0.0089	7%	0.0122	0.0121	1%
Srotey 11				0.0092	0.0088	4%	0.0121	0.01	17%
Srotey 12				0.0086	0.008	7%	0.012	0.011	8%
Srotey 13				0.0081	0.0079	2%	0.0119	0.001	92%
Srotey 14				0.0074	0.007	5%	0.0117	0.0114	3%
Srotey 15				0.0067	0.0063	6%	0.0115	0.01036	10%
Srotey 16				0.006	0.0056	7%	0.0112	0.0112	0%
Srotey 17				0.0052	0.0046	12%	0.011	0.01	9%
Srotey 18				0.0044	0.004	9%	0.01	0.01	0%
Srotey 19				0.0035	0.003	14%	0.0103	0.0101	2%
Srotey 20				0.0027	0.0019	30%	0.0099	0.0095	4%

Srotey 21							0.0095	0.0085	11%
Srotey 22							0.0091	0.008	12%
Srotey 23							0.0086	0.0078	9%
Srotey 24							0.0081	0.0077	5%
Srotey 25							0.0075	0.007	7%
Srotey 26							0.007	0.0068	3%
Srotey 27							0.0064	0.006	6%
Srotey 28							0.0058	0.0051	12%
Srotey 29							0.00519	0.0043	17%
Srotey 30							0.0046	0.0035	24%



4.2.4 Mode Shapes

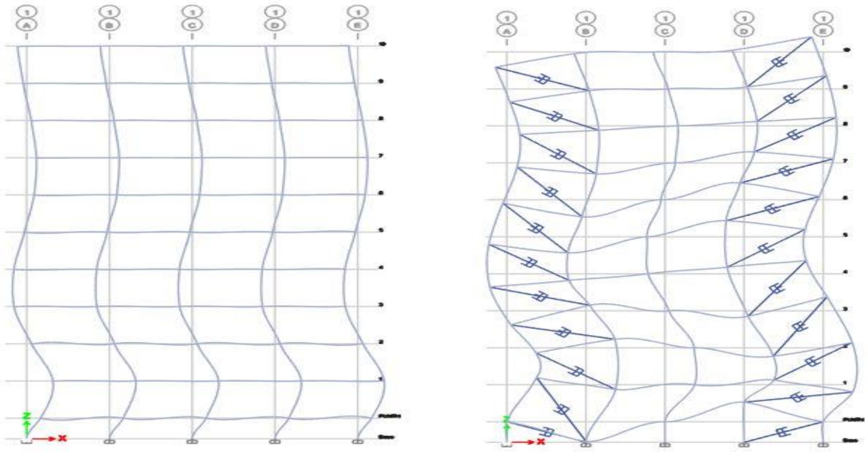


Fig 10 Mode shape diagram for G+10 without and with dampers

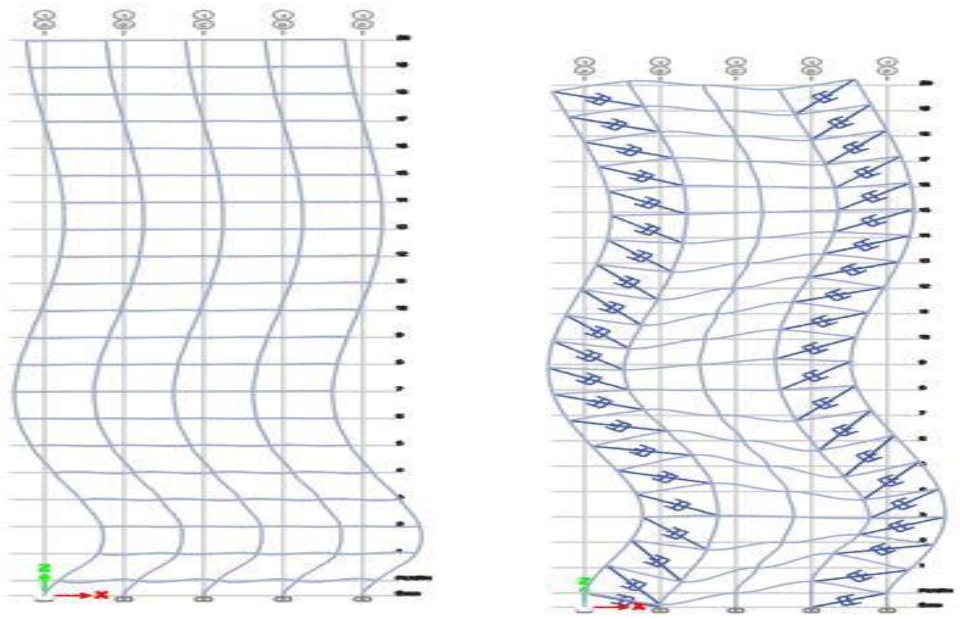


Fig 11 Mode shape diagram for G+20 without and with dampers

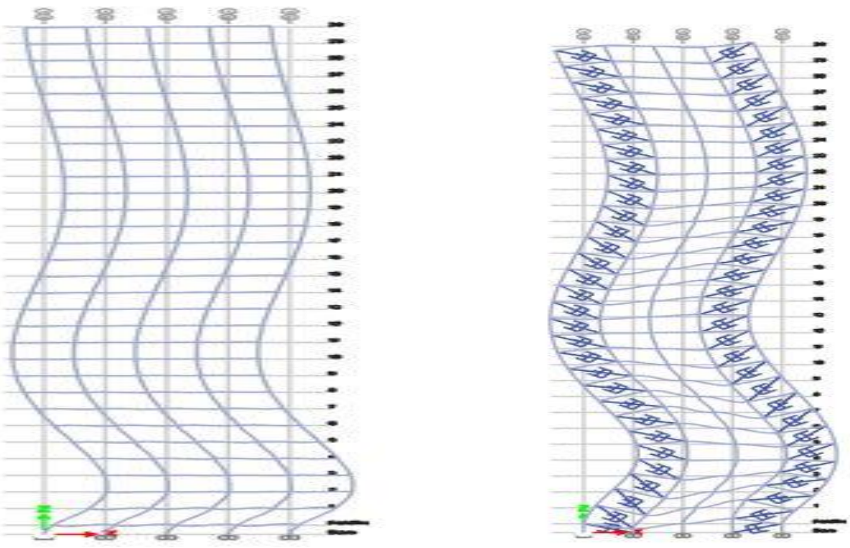


Fig 12 Mode shape diagram for G+30 without and with dampers

V.CONCLUSIONS

Fluid viscous dampers are helpful in lowering the seismic response of reinforced concrete buildings, according to this research. To get a better understanding of the damper's efficacy, a variety of analyses were conducted. The following are the study's findings.

1. By installing dampers, maximum storey displacements were reduced by up to 44%. With increasing height, storey displacement rises.

2. By installing dampers, maximum storey drift has been reduced by up to 50%. With increasing height, storey drift rises.

3. The use of dampers increased Storey stiffness by up to 13%. With increased height, overall stiffness diminishes.

5.1 Future Scope

- The analysis may be done for many shapes (square, I-shape, circle, H-shape, and so on).
- The investigation may be carried out while employing various kinds of dampers.
- Analysis may be performed by supplying a shear wall with dampers.
- By giving bracings, analysis may be performed as well.

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