A COMPARATIVE STUDY ON SEISMIC ANALYSIS OF A RCC FRAMED REGULAR AND IRREGULAR STRUCTURES BY USING FLUID VISCOUS AND METALLIC DAMPERS

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ABSTRACT

Among all the disastrous events, for example, flood, twisters, typhoons, earthquakes, and drought the least comprehended and the most damaging one is earthquake. They are typically affected when rock underground break down along a fault and these seismic events are the most important natural hazards and can cause dangerous destruction by increasing the energy inside the structure. Since the forces applied on a structure are dynamic in nature, they cause vibrations inside the composition and they also increase the energy within the structural system. The major job of a structure is to take the lateral loads and carrying them to the foundation

Such undesirable energy can be dissipated by presenting the few control systems, for example, active, hybrid, passive and semi active control systems. The current work incorporates one such dissipating device called dampers. Dampers are the energy dissipating devices which are utilized to resist lateral forces acting up on the structure. They also resist the displacement that occurred in reinforced Concrete buildings during an earthquake. Dampers are utilized to decrease the buckling of columns and deflection of beams and to expand the stiffness of structure and furthermore used to moderate the vibration and twisting of RCC framed structure during earthquakes. There are various kinds of dampers utilized in general. In this current study fluid viscous damper (FVD) and metallic damper are used to resist the energy from earthquakes. Regular and irregular Models will be created with two dampers .i.e. fluid viscous dampers and metallic dampers and to carry out results such as storey displacement, storey drift etc. Different types of analysis methods such as time history analysis and response spectrum method are adapted to study the storey displacement on a G+20 storey RCC framed structure with dampers by using ETABS software. Performance of structures will be found by comparing the reactions as storey displacement and storey drift for regular and irregular structures. The present study compares the performance and effects on RCC frame regular and irregular structural systems by using fluid viscous and metallic passive energy dissipating dampers. These dampers will be used for different regular and irregular modelled structures and at different locations in a building and also in seismic zone V.

I. INTRODUCTION

Natural disaster like earthquake means the sudden vibration of earth by waves evolving from the source of intrusion in the earth by morality of release of energy in the earth's crust by naturally or manually. For the reason that of this, structures can experience a more deflection, depending on type of structure, magnitude of earthquake, zones of earthquake, severity of the earthquake and the structural characteristics. The breakdown of structures can lead to loss of life and property damage therefore structures are designed to resist earthquakes. Structural features such as materials, sectional properties, and also the structural systems have a major effect on horizontal load resisting capability of the structure. However, numerous codes have certain design specifications for seismically secure structures, yet there is yet much need of some changed standards for energy degeneracy protecting systems. The use of these structural control systems is extremely limited in India.

Structures may be regular and also irregular. Regularity of the structure deals with the symmetrical and compact shape of the structure. The importance of regularity of the building is for preventing unpredictable stress intensity that can cause local failures and revision of the vibrant performance. We know that various types of vertical irregular buildings are used in modern infrastructure. The irregular building cannot be avoided during the construction due to space out requirement in the construction field so the tall structure has more requirement. Asymmetrical structures, like structures having an L-shaped plan, that can be defined irregular according to both insightful norms and irregularity of rules provided by strategies, show that, if the diaphragms are rigid and the columns are distributed according to the shape, size and also the irregularity is outward.

In the current study, an effort has been made for the different models with a RCC frame regular and irregular structural systems will be done by using fluid viscous and metallic passive energy dissipating dampers. These dampers will be used for different regular and irregular modelled structures and at different locations in a building and also in seismic zones like zone V.

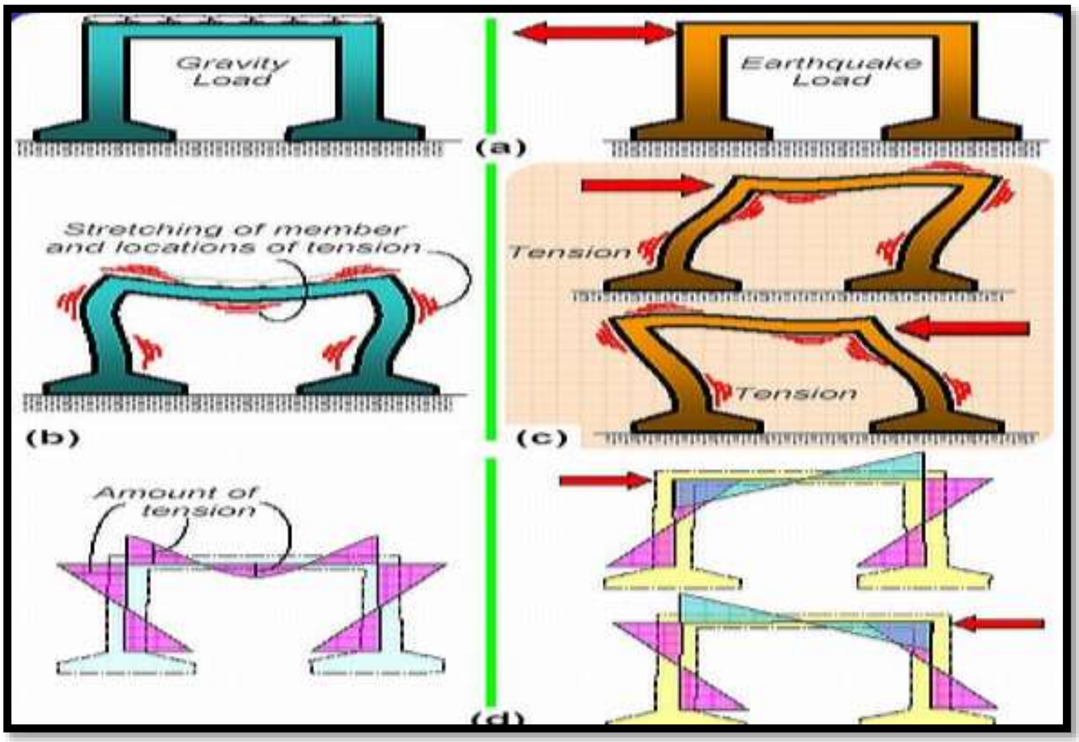


Figure 1.1 Types of earthquakes

1.1 FLUID VISCOUS DAMPERS:

Fluid viscous damper is one of the energy degeneracy devices, FVD have been considerably used in the vibration control of various structural and also mechanical systems. These dampers have been commonly used in the military and aerospace industry for several years and have lately been adopted for structural applications in civil engineering. It has the rare ability to instantaneously reduce both deflection and stresses within the structure. A modern-day fluid viscous damper works in significant amounts of fluid pressure, making the damper small, compact and also very easy to install. This type of damper is normally less expensive to obtain, install and maintain than other types of dampers. FVD has a stainless-steel piston rod and a self-contained piston displacement accumulator unit with a bronze shield head. A viscous fluid damper consists of a hollow cylinder filled with a fluid. As the damper piston rod and piston head are stroked, the fluid flows at high velocities, resultant in the progress of friction. A damper repels the dynamic motion and dissipates energy from a structure during wind or seismic events and allows it to withstand dangerous input energy and reduce harmful deflections, forces and accelerations to structures. The damping fluid is silicone oil, which is inert, non-flammable, non-toxic, and stable for enormously long periods of time. These dampers decrease the response of structure which reduces the reaction to several vibration.

The most common factor on which effectiveness of viscous fluid damper dependent are defined as

$$F = CV\alpha$$

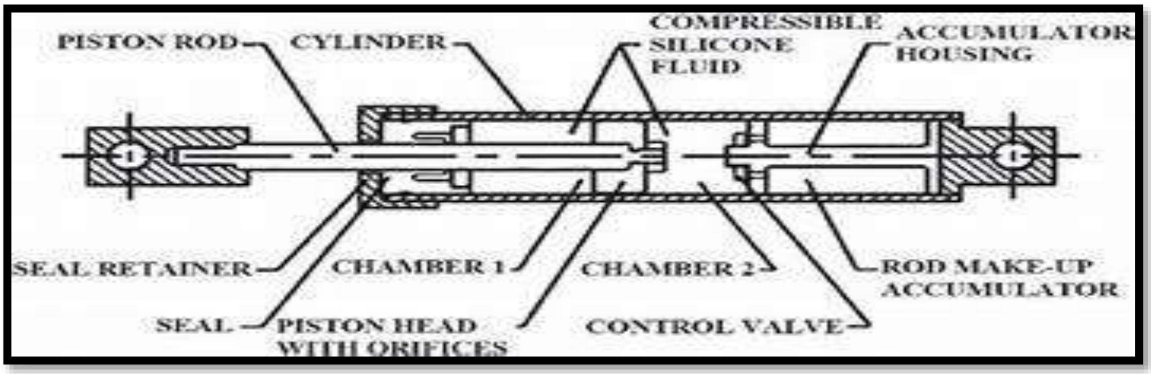


Figure 1.2 Fluid Viscous dampers

Figure 1.3 FVD fitted in structure

1.2 METALLIC DAMPERS:

Metallic dampers are typically produced using steel. They are intended to distort so much when the building vibrates during an earthquake that they can't come back to their unique shape. This lasting disfigurement is called inelastic deformation, and it utilizes a portion of the seismic earthquake intensity which goes into the building.

Figure 1.4 Metallic damper

Figure 1.5 Metallic damper fitted in a structure

1.3 REGULAR BUILDINGS:

In the last periods the problems of structural symmetry has been analysed in an exceedingly sizable amount of papers, which observed the undesirable effects of the dearth of regularity on the flexible and rigid seismic response of structures and suggested design methods ready to limit the risks associated to that. Almost all the seismic codes include common definitions of structural regularity and provisions take aim at regulating negative effects of irregularity. Nevertheless, in many the methodology appears to be generic and generalised, not taking into consideration the end result of research. The fundamental idea presented during this paper is that a building should be believed regular when its seismic response could also be predicted by means of normal geometric and mechanical models and standard methods of research. So as to debate regularity all the various problems connected to the definition of the model and to the choice of the tactic of research must be analysed. Every problem gives rise to specific criteria for regularity, which need to be encountered so as to permit a oversimplification of the model or of the tactic of research. Then it examines the methodologies used for estimating its elastic response, discussing the employment of static and modal analysis and therefore the use of restorative eccentricities for asymmetrical buildings. The third part tackles the matter of the inelastic response and also the effect of stiffness and strength allocation, both in plan and along the height of the building

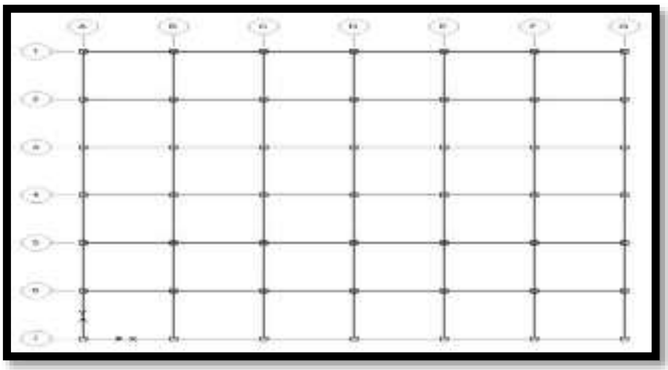


Figure 1.6 Regular plan

1.4 IRREGULAR BUILDINGS:

Irregular buildings represent an oversized part of the trendy metropolitan infrastructure. The alliance of individuals concerned in constructing the building accommodations, as well as owner, architect, structural engineer, contractor and native organizations, contribute to the general designing, choice of structural system, and to its structure. This could cause the structures with irregular allocations in their mass, stiffness and strength along the peak of the structure. When such buildings are located in an exceedingly high seismic zone, the structural engineer's role turn out to be tougher. Therefore, the structural engineer has to have an intensive knowledge of the seismic response of irregular structures. In the recent past, numerous studies are administered to gauge the response of irregular buildings work that has been previously done per the seismic response of vertically irregular building frames. Buildings with plan irregularities (e.g., individuals with re-entrant corners like L-shape plans on corner plots) and people with elevation irregularities (e.g., large vertical setbacks in elevation like a plaza-type pattern in commercial structures) are common within the impacted area. There are differing types of irregularities that are given in the code are mentioned below. Major disasters occurred because of irregularities like soft storey Failure, Mass Irregularity Failure, Plan Irregularity Failure, Shear Failure.

II. LITERATURE REVIEW

Prashanthi C Sudula and Dr. B. Shiva kumara Swamy (2014):In this undertaking they have examined and analysed the presentation and impacts on underlying frameworks with more metallic, friction, viscous and viscoelastic passive energy dampers for different earthquake zones. They have made an attempt to analyse the dynamic reaction of 2D RC bare frame and RC frame with dampers. Equivalent static examination is completed for all models and for all zones to acquire static base shear. Of all seismic zones considered (Zone II, Zone III and Zone IV), zone IV is the basic zone with most noteworthy base shear, displacements, and axial force. They have arrived at the resolution that when the dampers are added further to the structures base shear increments because of the addition of selfweight, however displacements decrease because of growth in stiffness when the dampers are added to the framework it rises the stiffness to the frame thereby increasing the strength. Displacements and axial forces for RC frame with dampers are less compared to RC bare frame of the whole dampers utilized viscous damper is noticed to be effective because they have they have lower displacement, lesser drift, lesser axial force and reduced story shear and it very well may be utilized.

Prafful S, Naveen Kumar S (2018):This investigation considers, Performance of working of rectangular and square arrangement in horizontal load and seismic loads in seismic zone V, in light of soil type II (medium soil) and reduction factor 5 is taken from code for special RC moment-resisting frame. It is assessed by Static and Response Spectrum analysis for different load combinations according to: 1893:2002. Analysis of these structural systems is processed utilizing E-TABS 2015 software. To check the performance of the building by considering, storey displacement of both building with and without Fluid viscous damper (FVD). The object of the research is to analyse the outcomes achieved from static and response spectrum analysis of rectangular structure with square and rectangular column cross section and square structure with square and rectangular column cross section with and without FVD. It is also seen that in a square frame it is symmetric in both the directions, the response quantities are likewise identical in both the directions. Fluid viscous dampers can dissipate the maximum portion of the seismic energy and hence reduce the energy input in the primary structure. The FVDs are fit for decreasing the two forces and displacements of the structure under seismic loads and shear decrease in the structure is acquired by giving FVD it makes structure practical. It very well may be reasoned that the fluid liquid dampers can be viably utilized as one of the better options for the typical ductility-based design methods of earthquake resistant design of buildings.

III. METHODOLOGY

The present study is conducted out to find out the behaviour of G+20 Storeyed Structures, Floor height provided as 3.5m for ground floor and others i.e. floor to floor height is taken as 3m and also then the properties are defined for the structure. The prototypical of buildings is created in ETABS computer software. The seismic zone taken as zone V and soil type is considered to be medium. Four prototypes of RC structures are prepared. Two varieties of geometry are adopted in this analysis: regular and irregular building. Two various structures are regular buildings such as square and rectangle. Two different vertical irregular buildings such as H shaped plan and L shaped vertical irregularity are modelled. The modelling of building is achieved for Indian standard Seismic Zone V, IS1893-2002.For certain structure, loads are applied which includes loads like live load, earthquake load, dead and wind load are corresponding to IS 875 part I, part II and IS1893-2002 respectively.

Table 3.1 Dimensional Details for the Regular Buildings

Properties of structure	Model 1	Model 2
Type of model	Square	rectangle
Type of building	Special moment resisting frames	Special moment resisting frames
Soil type	Medium Type II	Medium Type II
Plan dimension	25m x 25m	27.7m x 12.3m
Number of stories	G+20	G+20
Ground Storey height	3.5m	3.5m
Storey height	3m	3m
Grade of the Concrete	M30	M30
Grade of the steel	FE415	FE415
Beam dimension	230 x 300mm	230 x 300mm
Column dimension	230 x 425mm	230 x 425mm
Slap depth	150mm	150mm

Seismic Zone	V	V

Table 3.2 Dimensional Details for the Irregular Buildings

Properties of structure	**Model 3**	**Model 4**
Type of model	H - plan irregularity	L - vertical irregularity
Plan dimension	25m x 25m	19m x 20.5m
Type of the building	Special moment resisting frame	Special moment resisting frame
Soil type	Medium	Medium
Number of stories	G+20	G+20
Ground Floor height	3.5m	3.5m
Floor to Floor height	3m	3m
Grade of Concrete	M30	M30
Grade of steel	FE415	FE415
Beam dimension	230x230mm	230x230mm
Column dimension	280x280mm	280x280mm
Slap depth	125mm	125mm
Zone	V	V

Table 3.3 Details of loads

Live Loads on floors	2KN/M2
Live Loads on roof	1.5KN/M2
Floor Finish loads(FF)	1.5KN/M2
Wall load on beams (outer wall)	12.13KN/M
Wall load on beams (inner wall)	8.02KN/M

Table 3.4 Details of Fluid viscous dampers

Type of Damper	Fluid viscous damper
Weight	3500 kg
Mass	500 KN

Table 3.5 Details of Metallic dampers

Type of Damper	Metallic damper
Weight	2500 kg
Mass	250 KN

3.1 METHODS OF ANALYSIS FOR STRUCTURE:

The seismic analysis will be carried out for the structures that have absence of resistance to tremor forces. Seismic analysis will be considered for the dynamic effects hence the precise study sometimes become complex. Though for easy regular structures the equivalent linear static analysis is sufficient one. This kind of research is allocated for normal and low rise buildings and this method will give good quality results for this kind of buildings. Dynamic analysis is allotted for the building as specified by code IS 1893-2002 (part1). Dynamic analysis is distributed either by Response spectrum method or site particular Time history method. Subsequent methods are adopted to hold away the analysis procedure. Approaches of study of structure: The seismic analysis must be allotted for the buildings that have shortage of resistance to earthquake forces. Seismic analysis will consider seismic effects hence the detailed analysis sometimes become complex. Dynamic analyses are going to be meted out either by Response spectrum method or site specific Time history method. Following methods are adopted to hold away the analysis method.

A. Linear Equivalent Static Analysis
B. Linear Dynamic Analysis
C. Response Spectrum Method
D. Time History Analysis
E. Pushover Analysis
F. Non Linear Static Analysis
G. Nonlinear Dynamic Analysis

In present study the method of analysis is linear equivalent static analysis and also Response spectrum analysis are considered.

3.1.1 LINEAR EQUIVALENT STATIC ANALYSIS:

The seismic design of structures follows the dynamic nature of loads. But equivalent static analysis would become enough for easier, regular in plan configuration and it will give more effective results. This analysis will emerge during a approach with the computation of design base shear and its distribution to all or any storeys by applying the formula as given in code.

As per IS-1893 (part-I) 2002, the equivalent static analysis will be performed as per the subsequent stages,

Base shear: The design base shear (VB) along the height of the building.

$$VB=AhW$$

Where Ah = Horizontal seismic coefficient

W = Seismic weight of the building

Fundamental Natural Time Period:

The fundamental natural time period (Ta) will be calculated from the following formula:

$$Ta = 0.09h/ \sqrt{d}$$

Distribution of Design Force: The designing of base shear, VB will be considered from above shall be reduced along the height of the building as per the following formula.

$$Q_i = V_B \frac{W_i h_i^2}{\sum_{i=1}^{n} W_i h_i^2}$$

3.1.2 STATIC RESPONSE SPECTRUM METHOD:

The interpretation of extreme response of an ideal single degree freedom systems having a certain period of damping, during seismic activity ground motions. This study is administered in step with the code IS 1893-2002 (part1). Now the kind of soil, seismic zone factor should be taken from IS code. The quality response spectra for the form of soil studied is applied to putting together for the analysis in ETABS software. The quality response spectrum for medium soil type which are often given within the style of period versus spectral acceleration coefficient (Sa/g)

3.2 MODELLING:

It includes modelling of RCC framed buildings of regular and irregular structures four models using ETABS software. Material properties which are used in the models are M30 (fck=30N/mm2) grade concrete and HYSD415 (fy=415N/mm2) grade of steel. Beams of section used are 230mm x 300mm and column of section are 230mm x 425mm used for modelling of Regular models and Beams of section 230mm x 230mm and column of section 280mm x 280mm are used for modelling of Irregular models the Frame sections. The methods considered in the present project are equivalent linear static analysis and response spectrum analysis for the regular and irregular buildings with fluid viscous damper and metallic dampers for different locations in structure. The numerous structural systems used for the current study are four models and to determine the storey displacement, storey drift, storey stiffness and base reactions in zone V.

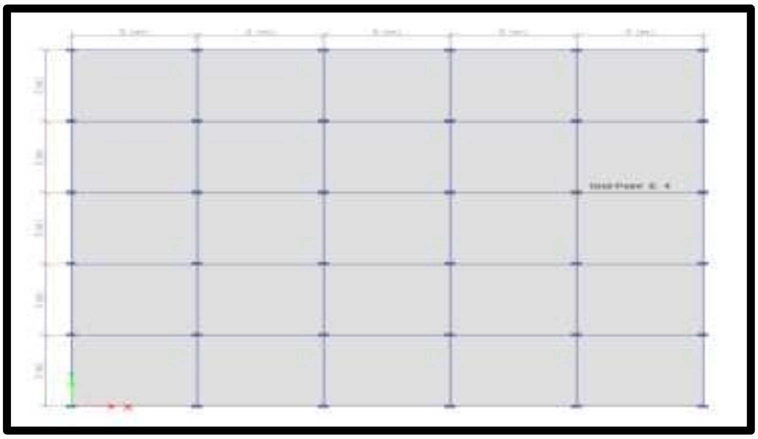


Figure 3.1 Model 01 Plan

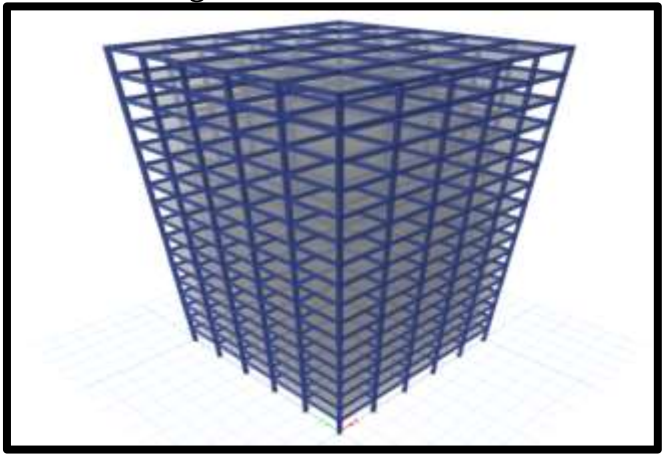


Figure 3.2 Model 01 Plan & 3D view

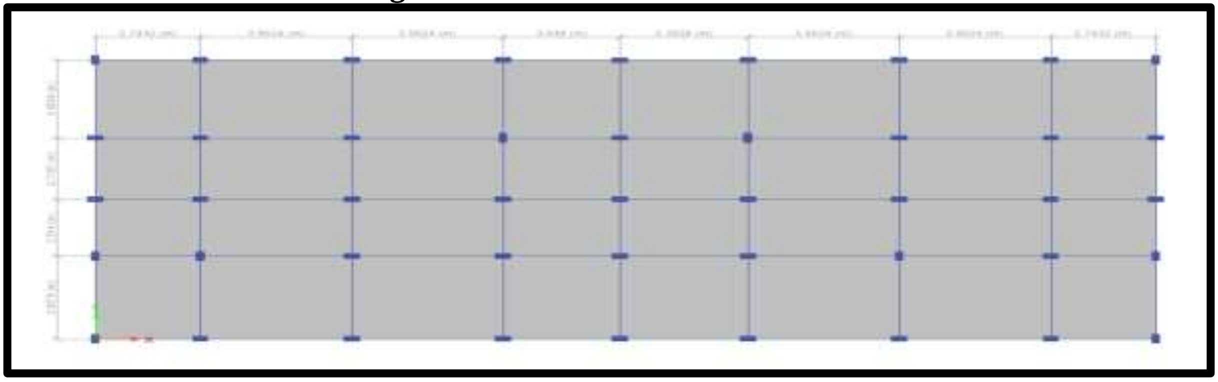


Figure 3.3 Model 02 plan

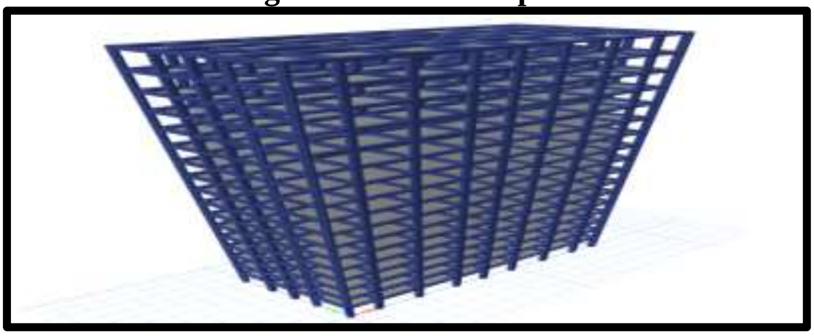


Fig 3.4 model 02 3D view

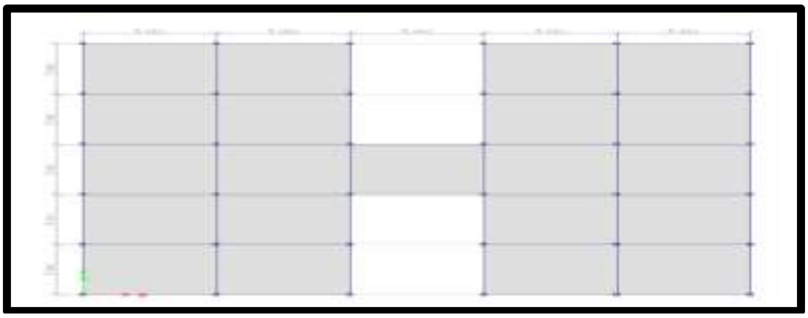


Figure 3.5 Model 03 Plan

Figure 3.6 model 03 3D view

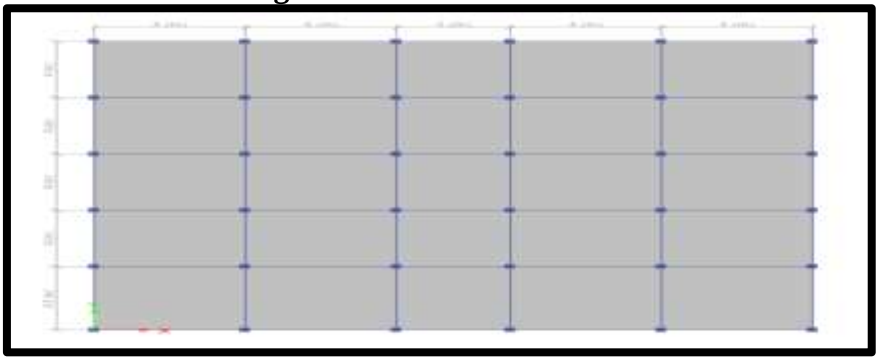


Figure 3.7 Model 04 Plan

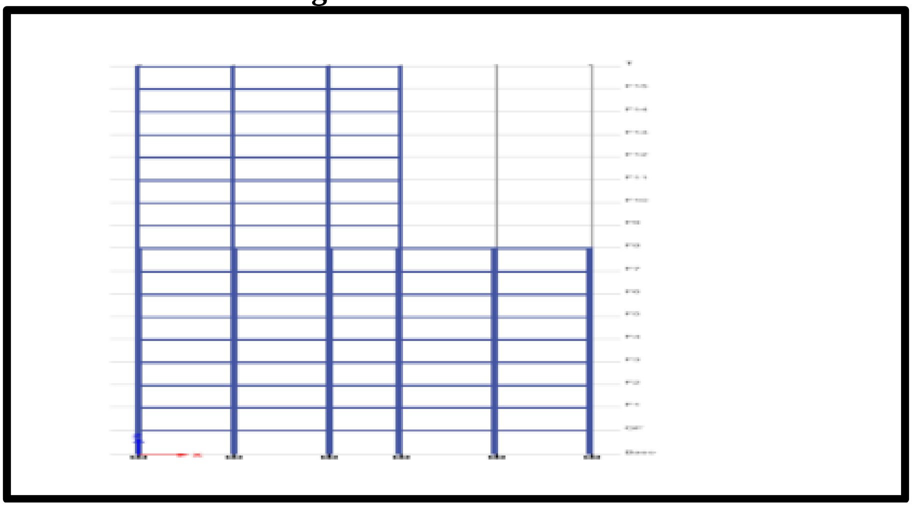


Figure 3.8 Model 04 Elevation view

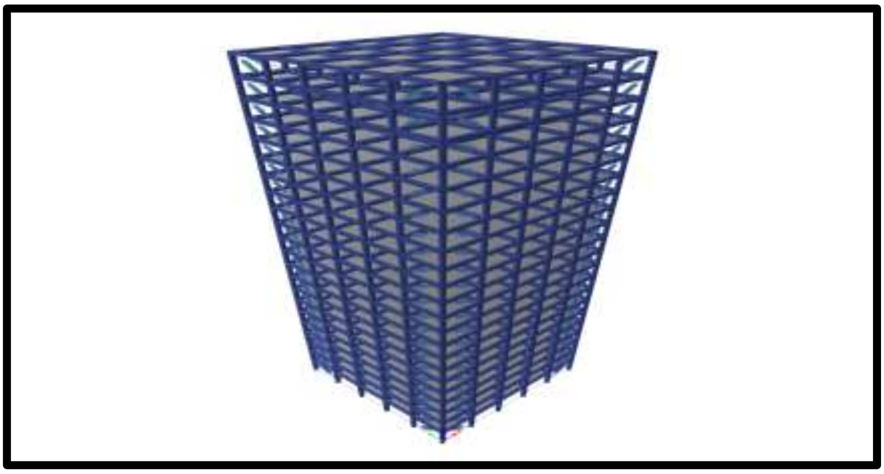


Figure 3.11 3D view of model 01 with Damper

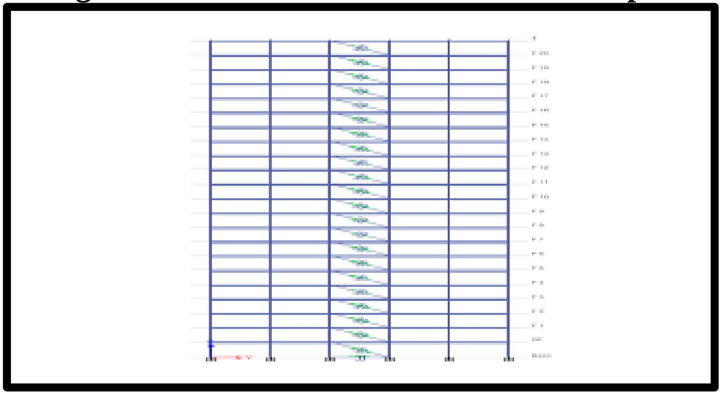


Figure 3.12 Model 01 with damper at different location

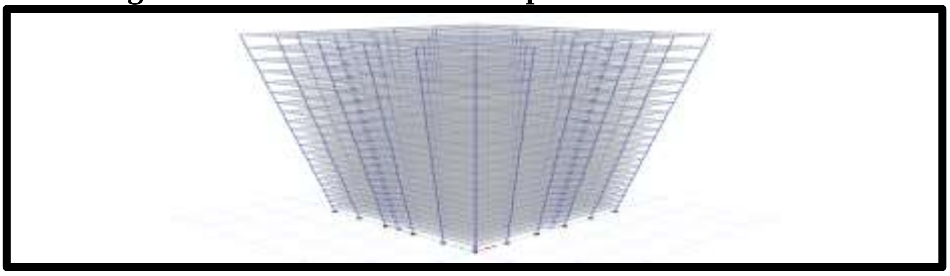


Figure 3.13 Model 01 3D with damper at different location

Table 3.6 Storey Displacements for model 01 with zone V

Storey	Elevation	Without damper mm	FVD in corners mm	FVD in middle mm	Metallic damper at corners mm	Metallic dampers in middle mm
20	60.5`	602.723	743.676	27.525	299.555	233.881
19	57.5	509.782	557.463	27.127	206.511	175.696
18	54.5	484.822	519.978	26.654	189.732	163.812
17	51.5	457.929	479.886	26.099	172.667	240.729
16	48.5	346.661	437.701	292.74	155.414	182.827
15	45.5	288.799	437.701	222.346	216.579	170.876
14	42.5	273.981	393.955	207.595	153.606	158.282
13	39.5	258.098	349.176	192.02	141.819	145.125
12	36.5	241.306	303.781	175.728	129.707	131.502
11	33.5	223.75	274.072	158.846	117.341	117.525

10	30.5	205.568	245.559	141.521	104.81	110.964
9	27.5	186.89	215.956	123.916	92.222	103.32
8	24.5	167.835	258.378	106.218	79.697	89.032
7	21.5	148.514	213.592	88.641	67.376	74.823
6	18.5	129.03	170.155	71.433	55.415	60.883
5	15.5	109.475	129.059	54.894	43.989	47.442
4	12.5	89.934	91.479	39.392	33.296	34.777
3	9.5	70.482	58.606	25.388	23.563	23.239
2	6.5	51.193	31.377	13.477	15.046	13.277
1	3.5	32.186	11.331	4.435	8.041	5.477
G.F	0	13.959	743.676	1.408	2.892	0.617

Table 3.7 Storey Drifts for model 01 with zone V

Storey	Elevation	Without damper mm	FVD in corners mm	FVD in middle mm	Metallic damper at corners mm	Metallic dampers in middle mm
20	60.5`	0.002338	0.009598	0.003501	0.00326	0.00284
19	57.5	0.002955	0.00994	0.003742	0.003301	0.002893
18	54.5	0.003539	0.010421	0.004034	0.003413	0.003068
17	51.5	0.004064	0.01101	0.00435	0.00355	0.003288
16	48.5	0.00453	0.01174	0.004658	0.003695	0.00353
15	45.5	0.004939	0.012495	0.004924	0.003834	0.003772
14	42.5	0.005294	0.013364	0.005192	0.003929	0.003984
13	39.5	0.005597	0.014062	0.005431	0.004037	0.004198
12	36.5	0.005852	0.014582	0.005627	0.004122	0.004386
11	33.5	0.006061	0.014926	0.005775	0.004177	0.004541
10	30.5	0.006226	0.015132	0.005868	0.004196	0.004659
9	27.5	0.006352	0.015134	0.005899	0.004175	0.004735
8	24.5	0.00644	0.014929	0.005859	0.004107	0.004763
7	21.5	0.006495	0.014479	0.005736	0.003987	0.004736
6	18.5	0.006518	0.013699	0.005513	0.003809	0.004646
5	15.5	0.006514	0.012527	0.005168	0.003564	0.004481
4	12.5	0.006484	0.010957	0.004668	0.003244	0.004222
3	9.5	0.00643	0.009076	0.00397	0.002839	0.003846
2	6.5	0.006336	0.006682	0.003014	0.002335	0.003321
1	3.5	0.006075	0.003777	0.001712	0.001716	0.0026
G.F	0	0.004295	0.009598	0.001636	0.000964	0.000936

Table 3.8 Storey Stiffness for model 01 with zone V

Storey	Elevation	Without damper mm	FVD in corners mm	FVD in middle mm	Metallic damper at corners mm	Metallic dampers in middle mm
20	60.5`	123308.283	131034.98	146671.102	121553.959	147164.343
19	57.5	142475.729	136802.06	150306.11	139845.202	150622.249
18	54.5	152868.627	144153.21	155107.06	140765.33	155310.84
17	51.5	159612.598	152075.33	159651.121	143246.953	159752.599
16	48.5	164427.274	159921.99	163460.708	145729.92	163563.297
15	45.5	168035.09	165145.18	166012.472	148854.281	166003.419

14	42.5	170927.484	171643.52	169230.852	148844.869	169206.056
13	39.5	173338.774	176809.44	171741.577	151360.175	171694.955
12	36.5	175435.704	132502.379	174033.573	153034.193	173974.554
11	33.5	177333.347	136056.66	176120.081	154696.114	176053.539
10	30.5	179115.798	139465.524	178067.029	156251.358	177996.738
9	27.5	180848.03	142837.135	179923.062	157733.673	179851.715
8	24.5	182583.056	146305.024	181732.129	159160.162	181661.687
7	21.5	184366.472	149978.4	183535.416	160551.225	183467.297
6	18.5	186239.627	154009.603	185376.849	161928.656	185312.063
5	15.5	188242.241	158620.029	187312.847	163317.721	187252.088
4	12.5	190422.217	164135.267	189431.516	164759.152	189375.223
3	9.5	192881.419	171553.244	191924.92	166284.256	191873.31
2	6.5	196243.58	181800.868	195093.287	168253.682	195046.367
1	3.5	204888.667	222475.101	202080.792	169065.957	202038.215
G.F	0	267621.448	107886.62	190529.807	193088.6	190493.23

Table 3.9 Base reactions for model 01 with zone V

Structure	FX KN	FY KN	FZ KN	MX KN-m	MY KN-m	MZ KN-m
Without damper	-3733.303	0	146703.3126	1834116.2174	-2022319	46687.7467
FVD at corners	431.4586	-38.775	198286.5479	2489159.746	-2489916	-1860.3794
FVD at different position	808.0387	592.6768	182800.4062	2273120.3852	-2494261	-1791.2585
Metallic damper in corners	251.5852	0.0051	132325.3143	1654344.2672	-1729567	-3145.2746
Metallic damper in different position	264.0663	328.4681	143909.0612	1789139.0731	-1970940	1534.7225

IV. RESULTS AND DISCUSSIONS

The results for equivalent static were represented for the load combination for lateral load (0.9DL+1.5EQX) calculated according to IS1893(Part1):2002.This study work is conducted out to compare the Equivalent static response of RCC frames of regular and irregular models. Four models are considered for the equivalent static analysis with fluid viscous damper and metallic dampers. The results of storey displacement, storey drift and base reactions are calculated below.

Dampers can reduce the external loads that occurred from the Earthquake. This RC framed structure is designed by the Properties of the structure can be explained in this work. The seismic behaviour of RC framed structure is observing the Parameters such as absolute displacement, story drift, Base reactions.

A. Maximum Storey Displacement :

Displacement is a parameter which is subjected to a failure pattern of the building. In this current study, the displacement of the given building with and without damper and for regular and irregular structures is observed and the main objective is to arrange the dampers of the structure so that the displacement of the building is reduced. Displacement parameters are as shown in Tables.Comparison of displacement parameters as shown in below graphs.

B. **Storey Drift** :
Storey drift is defined as difference between the lateral displacements of two adjacent floors of the surface is called storey drift. In this analysis the Equivalent static linear analysis has been used. The storey Drift analysis values are shown in Table. Comparison of storey drift values as shown in below graphs.

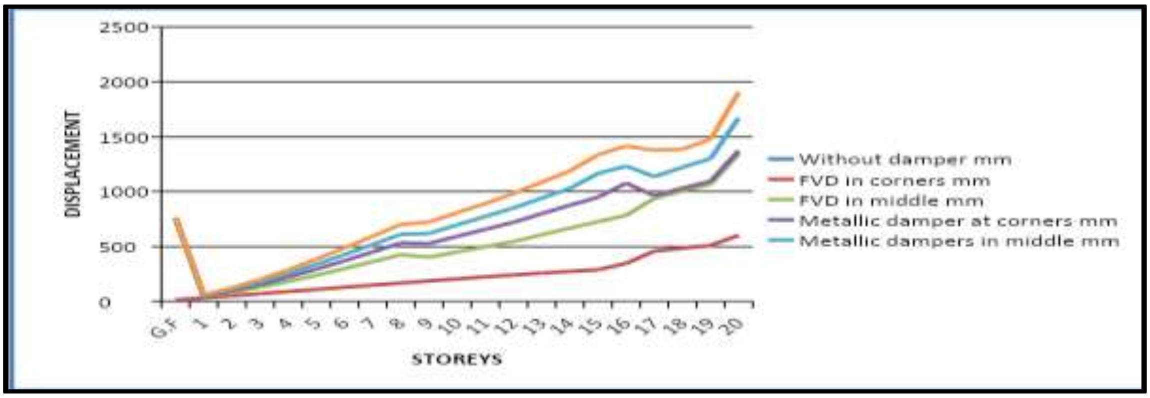
C. **Storey Stiffness:**
The lateral stiffness (Ks) of a storey is usually defined as the ratio of story shears to storey drifts and however, storey drift is defined as the variation within the lateral displacements of floors bounding a storey is plagued by vertical distribution of horizontal loads, i.e., there is a singular dislocated profile for every form of horizontal load distribution.

D. Base reactions:
Base shear reactions are the estimates of the maximum required lateral force on base of the structures due to seismic movement. The following are the values shown in the table.

4.1 Maximum Storey Displacements:

The comparison is been done for displacements for RC frame structures for different models such as regular and irregular structures with fluid viscous damper and metallic dampers are as shown in below graphs:

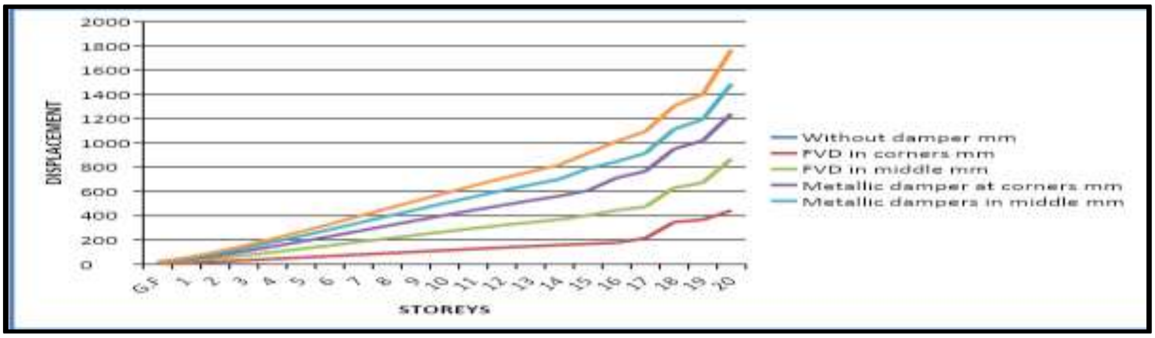
MODEL 01:



Graph 4.1 Maximum storey displacements for model 01

When above values are compared it is observed that the displacement was more in the metallic damper in the middle of the structure than with other dampers and also the metallic damper in other positions in structure.

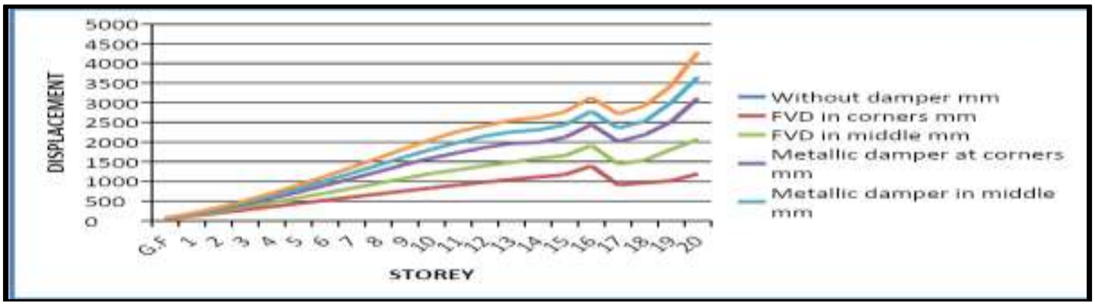
MODEL 02:



Graph 4.2 Maximum storey displacements for model 02

The values obtained from the different models are represented using graphical representation and it was observed that the displacement was more in metallic dampers in the middle of the structure than other structures which have other types of dampers.

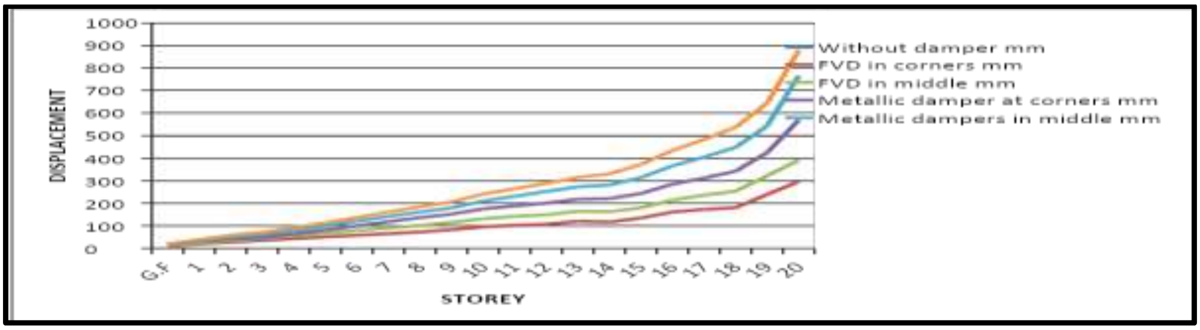
MODEL 03:



Graph 4.3 Maximum storey displacements for model 03

Model 03 values which different dampers are represented in graphical manner and it is observed that the displacement was more in metallic damper in the middle of the structure than others.

Model 04:



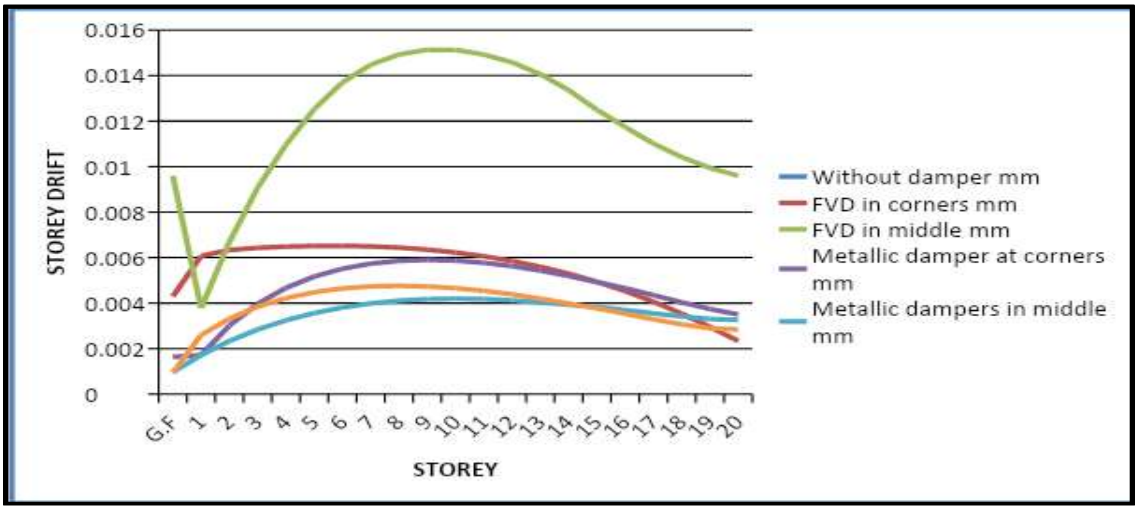
Graph 4.4 Maximum storey displacements for model 04

The displacement values are obtained from different structures with the dampers and the dampers orientation is placed different and it is observed that the displacement was more in metallic damper in middle of the structure than others

4.2 Maximum storey drifts:

The comparisons of maximum storey drifts for RC frame structures for different models such as regular and irregular structure with fluid viscous damper and metallic damper i.e. the models are created with each damper individually and also the damper are placed in different locations of the structure to obtain the maximum storey drifts are as shown below:

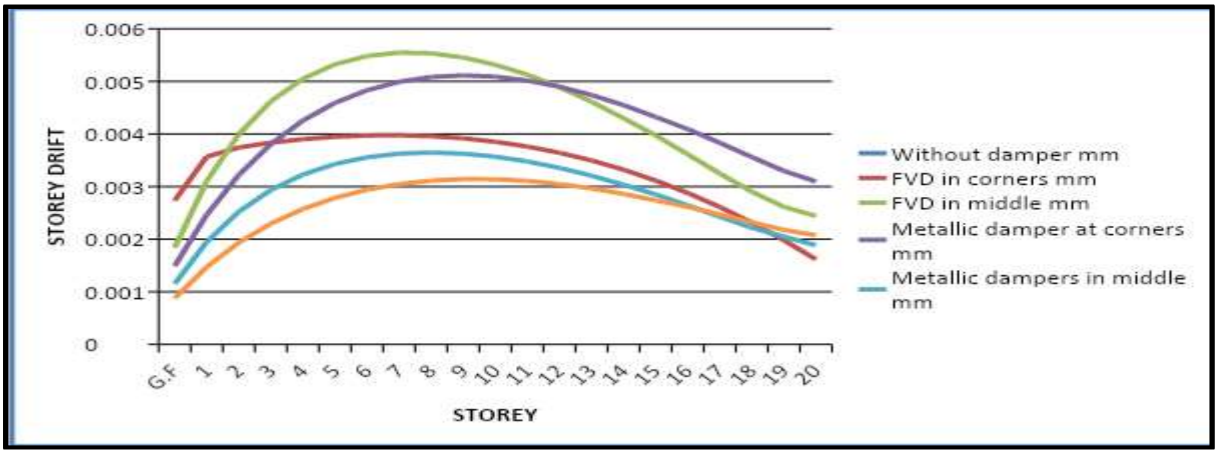
MODEL 1:



Graph 4.5 Maximum storey drifts for model 01

It is observed that the storey drifts was more in fluid viscous damper in corners of the structure than others

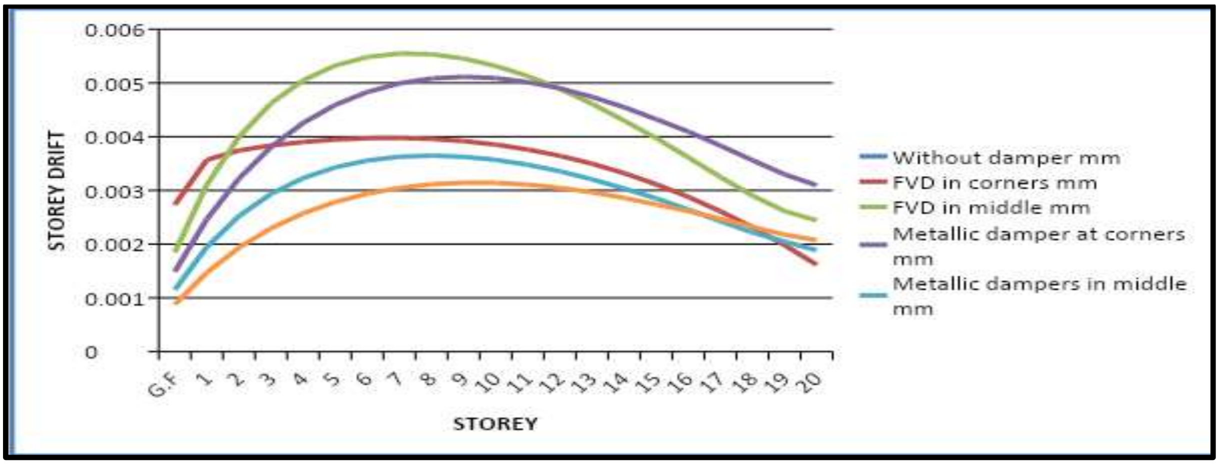
MODEL 2:



Graph 4.6: Maximum storey drifts for model 02

It is observed that the storey drifts was more in fluid viscous damper in corners of the structure than others

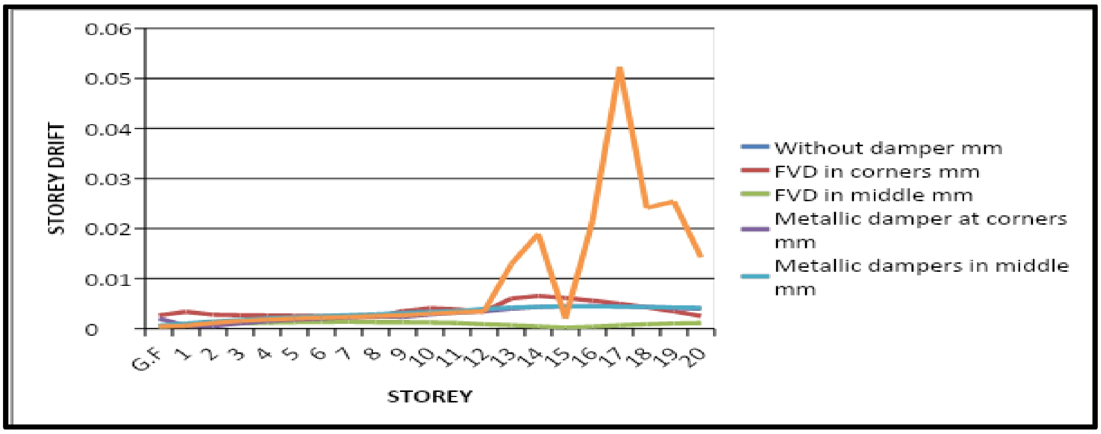
MODEL 3:



Graph 4.7 Maximum storey drifts for model 03

It is observed that the storey drifts was more in fluid viscous damper in corners of the structure than others

MODEL 4:



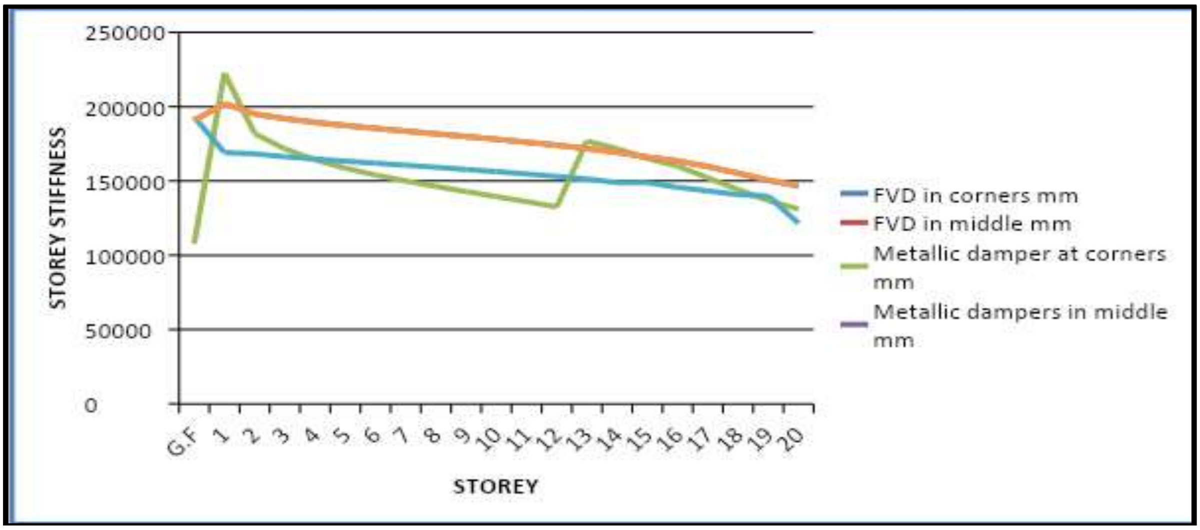
Graph 4.8 Maximum storey drifts for model 04

It is observed that the storey drifts more in metallic damper in the middle of the structure than others.

4.3 Maximum storey Stiffness:

The comparisons of maximum storey stiffness for RC frame structures for different models such as regular and irregular structure with fluid viscous damper and metallic damper i.e. the models are created with each damper individually and also the damper are placed in the different locations of the structures i.e. regular and irregular structures to obtain the maximum storey stiffness in different models are as shown below:

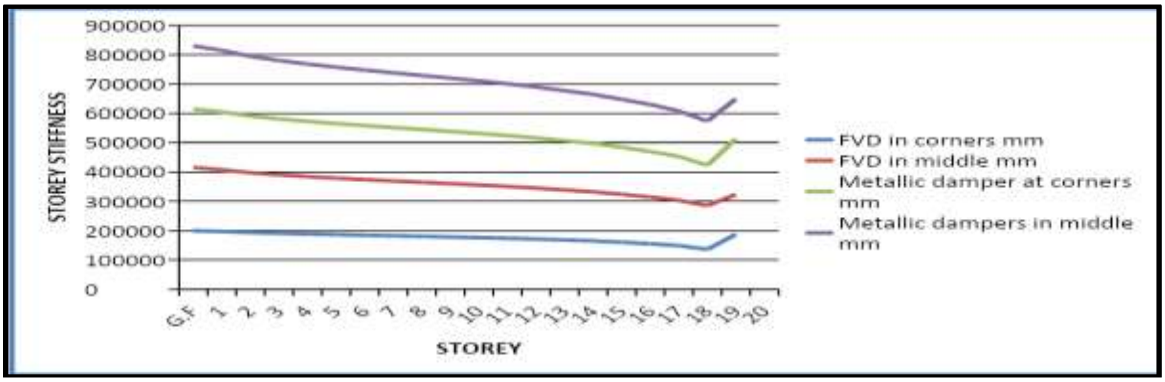
MODEL 01:



Graph 4.9 Maximum storey stiffness for model 01

The values tabulated above are represented graphically and by that we can come to the conclusion that the storey stiffness was more in fluid viscous dampers fitted in corners of the structure than the other structures and dampers.

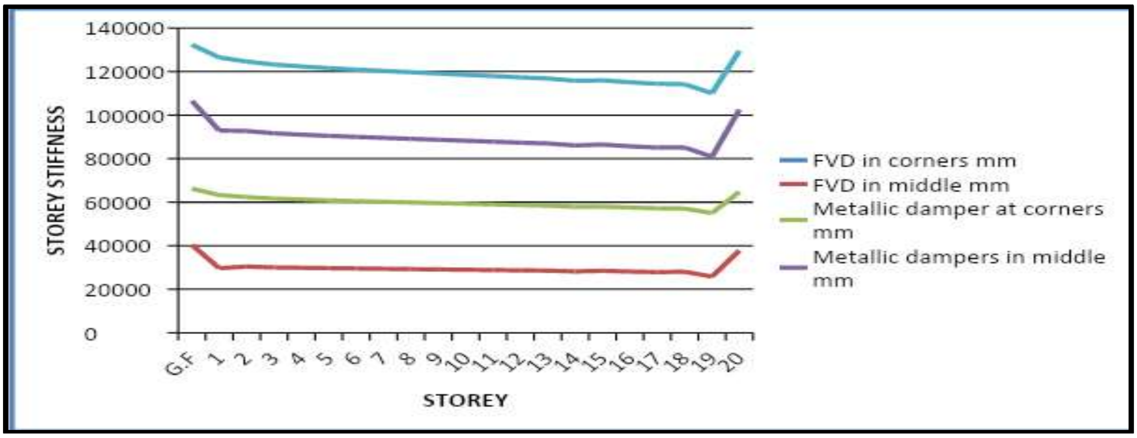
MODEL 02:



Graph 4.10 Maximum storey stiffness for model 02

The values tabulated above which represented graphically and by that it is observed that the storey stiffness was more in metallic dampers fitted in middle of the structure than the other structures and dampers.

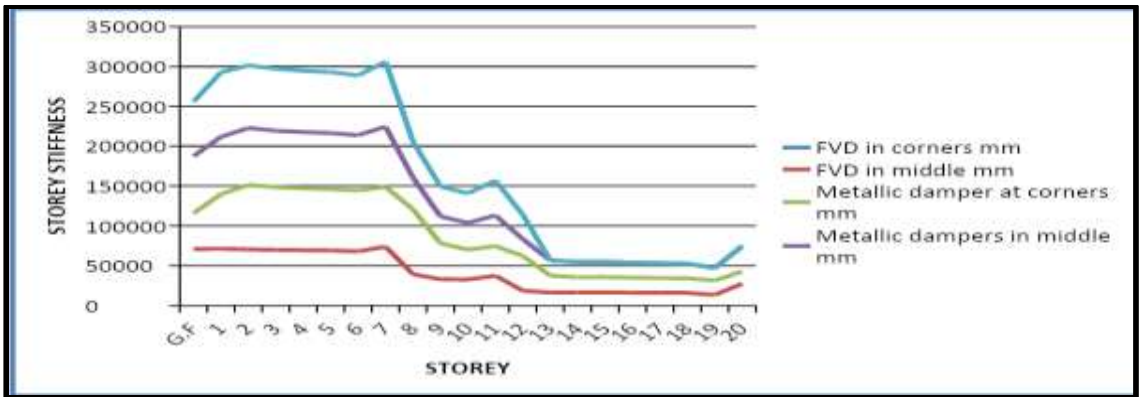
MODEL 03:



Graph 4.11Maximum storey stiffness for model 03

The values tabulated above are represented graphically and by that we can come to the conclusion that the storey stiffness was more in metallic dampers fitted in middle of the structure than the other structures with dampers.

MODEL 04:



Graph 4.12 Maximum storey stiffness for model 04

The values tabulated above are represented graphically and by that we can come to the conclusion that the storey stiffness was more in metallic damper which are fitted in middle of the structure than the other structures with other dampers and also damper locations.

V. CONCLUSION

In this analysis result are carried out by using ETABS software for RC framed structures in order to find out the various parameters like maximum displacement, storey drifts, storey stiffness which will be compared further.

1. Maximum storey displacements and storey stiffness was found to be more in metallic dampers which are placed in middle of structure than fluid viscous damper in zone V in H shaped plan irregular structure .
2. Maximum storey drifts are more in fluid viscous dampers which are placed in corners of the structures than metallic dampers which are placed in different positions in zone V.
3. Maximum storey displacements are more in H shape irregular plan model than the other three models.
4. Maximum storey drifts and storey stiffness are more in L shaped vertical irregular model than the other three models.
5. Fluid viscous dampers placed in middle effectively reduce lateral displacements and drifts of the RC building than the metallic dampers.
6. From the study it is proved that regular structures are more effective to sustain the seismic loads even with dampers.

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