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SEISMIC ANALYSIS OF NORMAL RCC MULTISTORIED BUILDING WITH DAMPER AND ISOLATORS USING SAP SOFTWEAR

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Abstract In day to day life, it is necessary to study the behavior of each multistory building structure undergoing ground movement, which is the common construction problem. The earthquake at the base of the structure creates the vibrating forces. To avoid such critical damage, structure engineering are working on various type of structural system that can help in without resistance, provide strength and withstand strong motion. Damper is one of the earth quack effective system. Damper are the energy- dissipating device used to resist the structure lateral forces. Damper are used to column buckling, beam deflection and improve the structures rigidity. During the earth quack, damper is used to reduce the vibration and deflection of the framed RC structure.

Key Words: **Damper system, Stresses, Isolator system, Eigen Value, Circular frequency, Dynamic mass, Displacement.**

1. INTRODUCTION

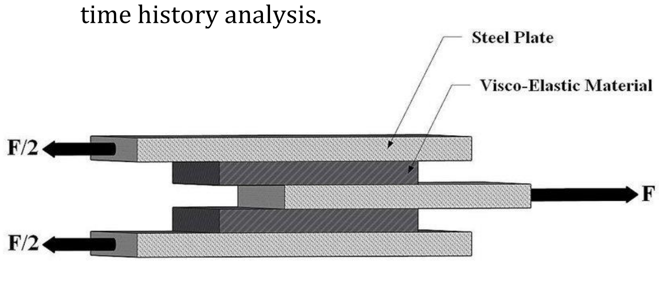
1.1GENERAL

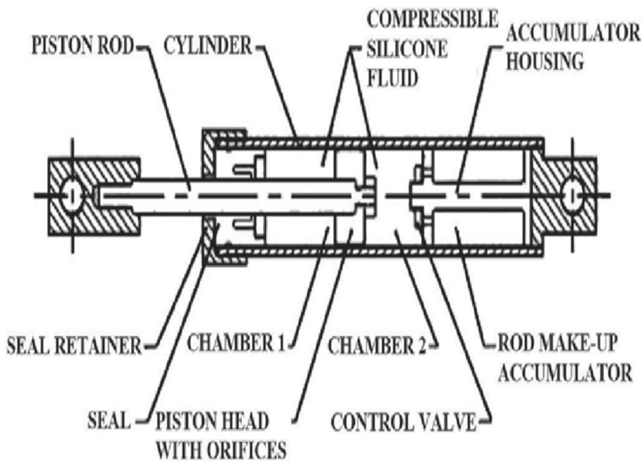
Earthquake is a natural shaking ground process due to tectonic plate motion. Earthquake loads should be carefully design to determine the structure's actual behavior with the clear understanding that damage is possible but should be controlled.

There are a no of passive energy dissipating devices in use, such as metallic dampers, friction dampers, viscous fluid damper and visco-elastic dampers.

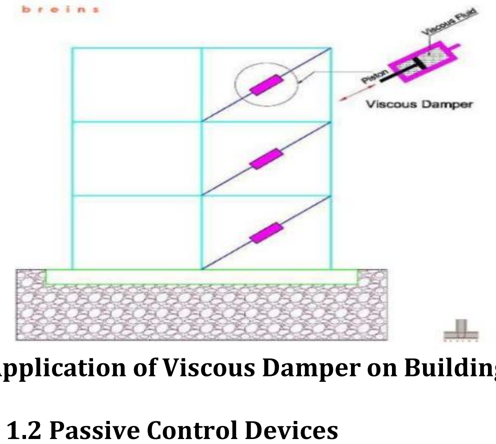
There are several possible equipment and mechanical system that can greatly enhance there efficiency by using the right configuration of these dampers.

As well as energy dissipation devices for structural control, these dampers are found to be efficient as base isolation. In this study, it is planned to evaluate seismic behavior of RC regular building with viscous fluid dampers, visco-elastic dampers and without any damping device using time history analysis.





Block diagram of Viscous Fluid Dampe



Application of Viscous Damper on Building

1.2 Passive Control Devices

Passive control system is devices that provide force that is generated by absorbing some of the input energy in response to the motion of the structure, reducing the demand for energy dissipation on the structure. Therefore, to add energy to the system, no external power source is required. The motion of the structure is regulated in passive control devices by adding stiffness and damping devices to the structure. Passive control

devices can be effective against the motion caused by earthquake and wind. Base isolation, Tuned Mass damper (TMD), Tuned Liquid damper (TLD), Metal yield damper and Viscous fluid damper are some example of passive control devices. It operates without any external source of energy being used. The cost of setting up these systems is therefore lower compared to active systems.
Up to a certain limit, these system can control the displacement, the safety system are designed according to the level of protection needed for an earthquake of a certain magnitude in a passive control system. The system consists of dampers, isolators and other devices that can be found and applied easily.

1.3 Dampers

Dampers are the devices used to absorb or dissipate the structure's vibration from the earthquake and to increase the structure's damping and stiffness. Dampers system are designed and manufactured to protect structure integrity, control structural damage and prevent resident injury through the absorption of seismic energy and reduction of structural deformation.

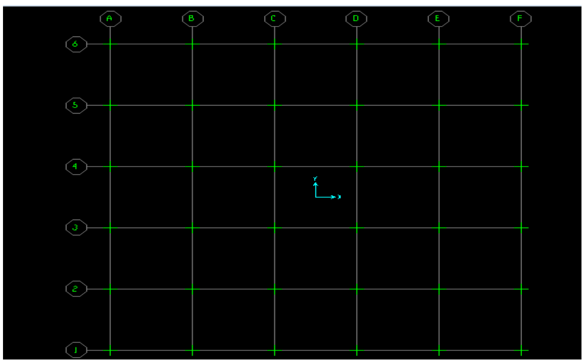
1 Methodology and Modeling

Objective of study:

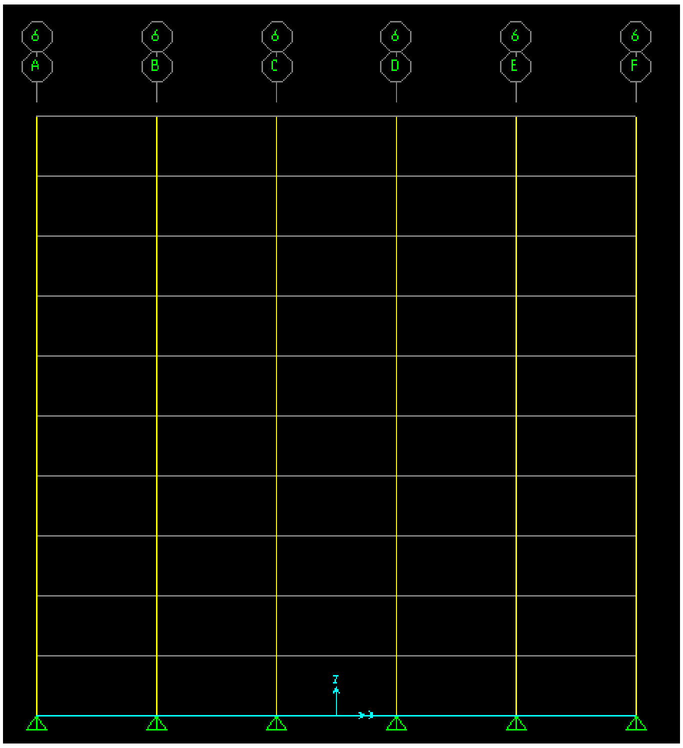
- In this project three models of the ten storied of normal RCC building is made and one is of RCC structure with damper system and another one RCC structure with isolator system is made and the analyses of the stresses and the displacement and the moments and shear forces of the structure is found in the static as well as dynamic analysis is done using SAAP software to make an earthquake resisting structure .

2 Modeling Parameters

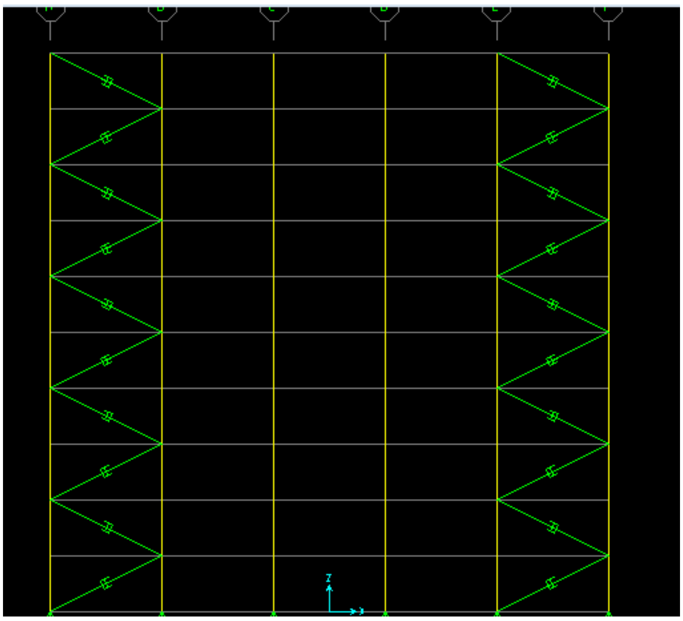
Using IS 1893:2000(part 1) for the following data was used the modeling procedure of the supplied dampers system and isolators in walls and fixed building analysis in SAAP software and design steps of dampers and fixed base analysis



10 storey RCC structure and with damper and with isolators systems



Elevation of 10 storey RCC structure



Elevation of 10 storey normal RCC structure with dampers

- **Number of storey:** G+10
  - Typical story height-3m
  - Bottom story height-3m
  - Parapet height -1.2m

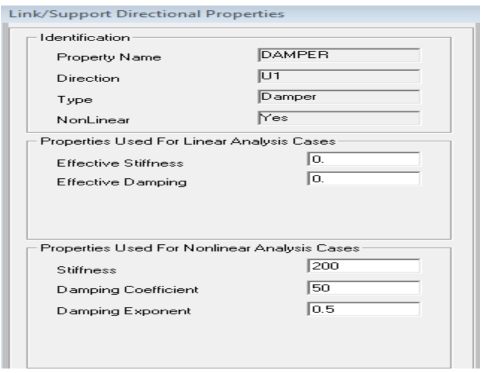
- **Elements consider:**
  - column size:450x500mm
  - beam size:250x450 mm
  - slab: Two way slab with grade of concrete M30 and thickness 150mm.
  - concrete grade:M30 for columns and beams.
  - Steel grade: for bending-500 N/mm^2, for shear-415 N/mm2

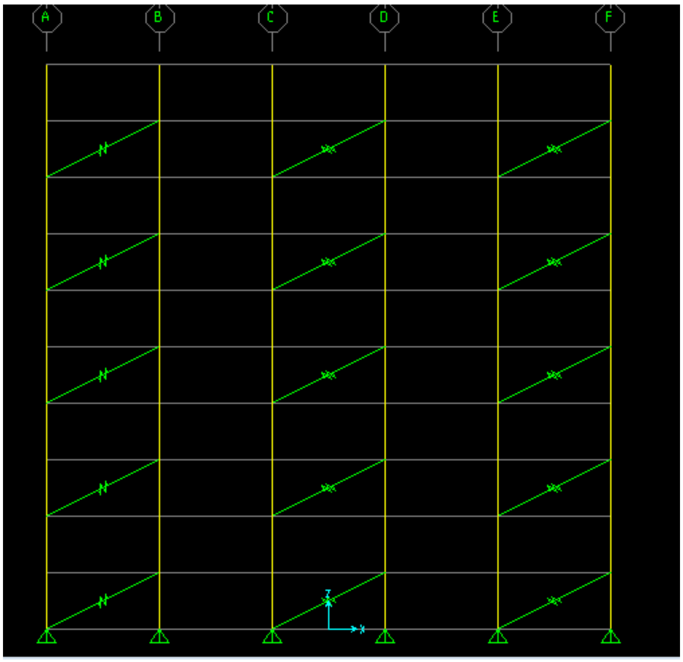
- **Load Consideration**:
- **Dead load:** In dead load the self-weight of the structure is considered.

- **Live load:** The live load taken in design is shown below :
  - Live load-5.0 KN/m2
  - Floor finish -1.5 KN/m^2
  - Wall load= 3.7KN/m

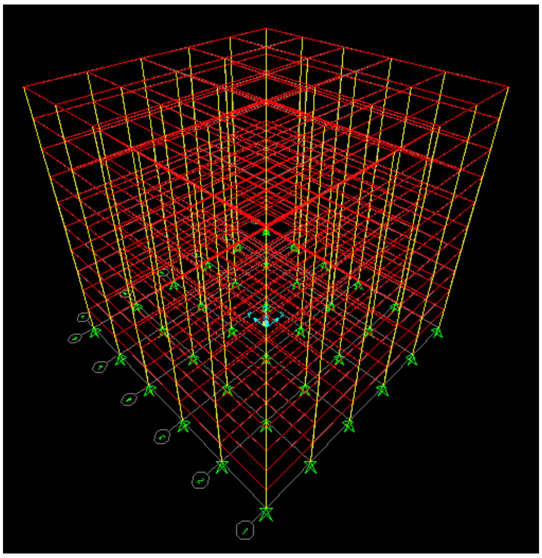
- **Earthquake static values**: Static earthquake values for zone 3 is shown below for multistoried building:
  - Seismic zone factor- III
  - Consider, Z=0.16
  - Soil type-II (Medium soil)
  - Importance factor-1.0
  - Response Reduction -5.0
  - Total height of structure -33m.
  - Wind coefficient; Vb = 44m/s

  Damper properties

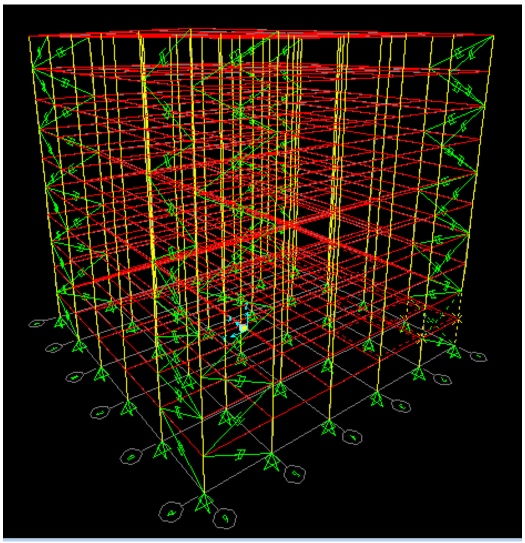




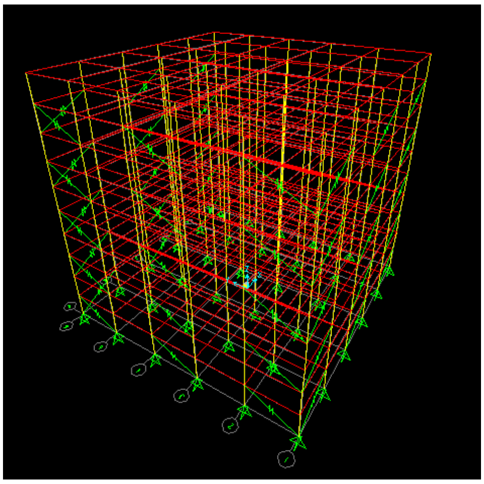
Elevation of 10 storey normal RCC structure with isolators



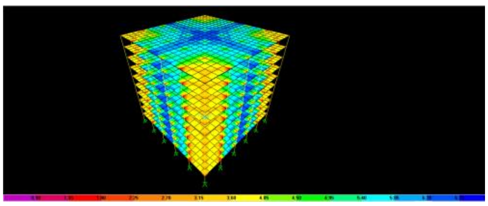
3 D View of 10 storey normal RCC structure



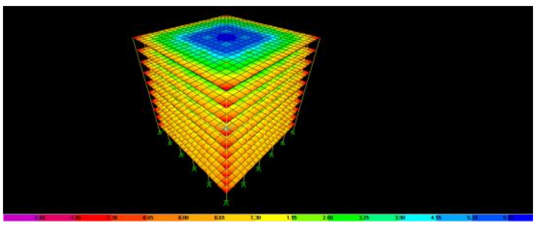
3 D View of 10 storey normal RCC structure with dampers



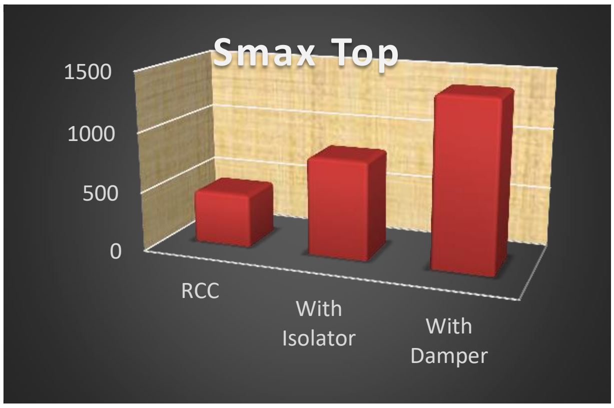
3DView of 10 storey normal RCC structure with isolators



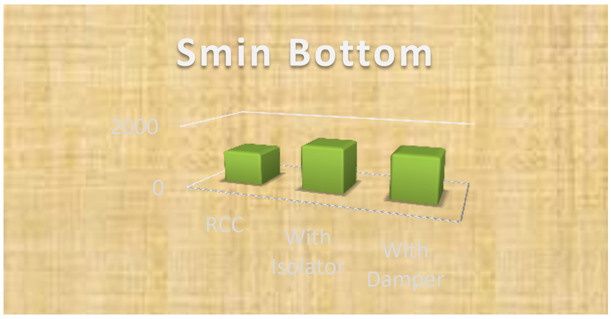
Max moment(M max) at 10 storey RCC structure



Min moment (M min) at 10 storey RCC structure



Smax top variation of multi storey RCC building with isolator and with damper system



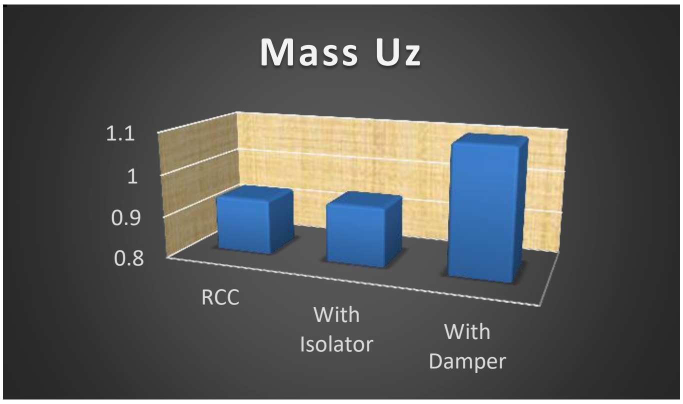
Smin bottom variation of multi storey RCC building with isolator and with damper system

2. RESULT AND DISCUSSION

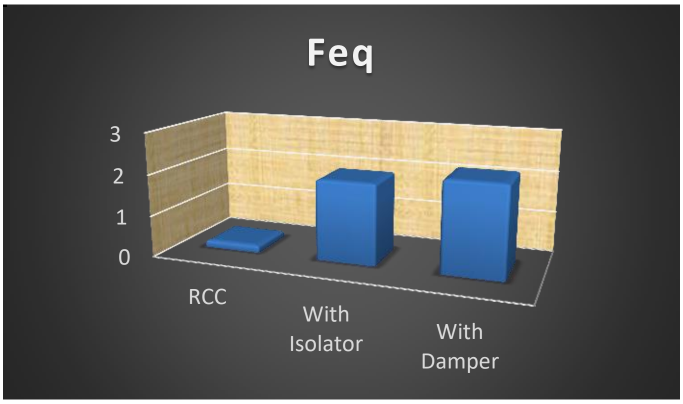
The different models of multi storied building with same plan area and height with RCC structure with damper system and one model with isolator system is analysed using SAAP software and the results are shown above in graphs and from following graphs the variation shown below.

1) Smax top variation of multi storey RCC building with isolator is 45% and with damper system is 65%
2) Smin top variation of multi storey RCC building with isolator is 65% and with damper system is 15%
3) S angle top variation of multi storey RCC building with isolator is 0.05%and with damper system0.2%
4) Svm top variation of multi storey RCC building with isolator is 28.48% and with damper system is 25.2%
5) Smax bottom variation of multi storey RCC building with isolator is 38.5% and with damper system 30. %
6) Smin bottom variation of multi storey RCC building with isolator is 27.3 % and with damper system 20.3 %

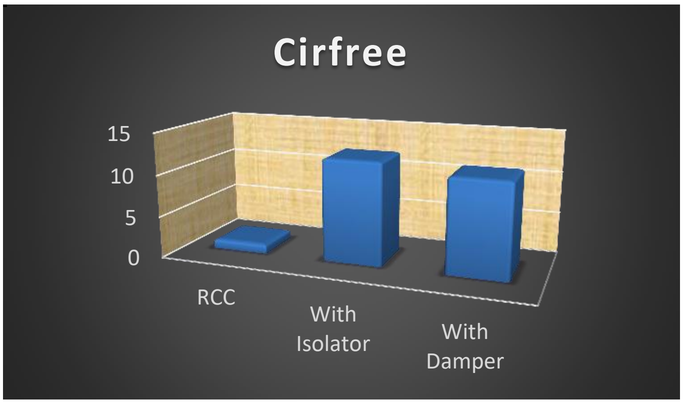
7) Sangle bottom variation of multi storey RCC building with isolator is 0.05% and with damper system is 0.75%
8) Svm bottom variation of multi storey RCC building with isolator is 28.48% and with damper system 35.2%
9) Static Ux variation of multi storey RCC building with isolator is 0.03 % and with damper system is 0.02 %
10) Static Uy variation of multi storey RCC building with isolator is 0.01 %and with damper system is 0.01 %
11) Static Uz variation of multi storey RCC building with isolator is 0.01 % and with damper system is 0.001 %
12) Dynamic Ux variation of multi storey RCC building with isolator is 0.77 and with damper system0.002%
13) Dynamic Uy variation of multi storey RCC building with isolator is is 0.01 % and with damper system is 3 %
14) Dynamic Uz variation of multi storey RCC building with isolator is 0.23 and with damper system is 0.31%
15) Dynamic mass Ux variation of multi storey RCC building with isolator is 0.01 % and with damper system is 0.02 %
16) Dynamic mass Uy variation of multi storey RCC building with isolator is 0.01 %and with damper system is 0.38%
17) Dynamic mass Uz variation of multi storey RCC building with isolator is 0.01 % and with damper system 2.5%
18) frequency variation of multi storey RCC building with isolator is 90.8 and with damper system is 94.8%
19) Circular frequency variation of multi storey RCC building with isolator is 91 and with damper system is 92 %
20) Eigen Value variation of multi storey RCC building with isolator is 99 and with damper system 95%



Dynamic mass Uz variation of multi storey RCC building with isolator and with damper system



Frequency variation of multi storey RCC building with isolator and with damper system



Circular frequency variation of multi storey RCC building with isolator and with damper system

3. CONCLUSIONS

The three models of multistoried building with same plan area and height with normal RCC structure with damper system and one model with isolator system is analysed using sap software and the comparative study is made between three models and the following conclusions are drawn from models shown below:

Dynamic Ux, Uy, is more in RCC and Uz is more in isolator system than building with damper system and normal RCC building

Frequency is more in damper system than building with isolator system and normal RCC building

Circular frequency is more in isolator system than building with damper system and normal RCC building

Eigen value is more in isolator system than building with damper system and normal RCC building

The min stresses Smin at top and bottom are more in multistoried building with damper system than isolator system and RCC multistoried building

The Sangle i.e angular stresses at top and bottom are more in multistoried building with damper system than isolator system and RCC multistoried building

The Svm stresses at top and bottom are more in multistoried building with isolators system than damper system and RCC multistoried building

Static Ux,Uy, is more in damper system Uz is more in RCC than isolator system and building with damper system

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