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COMPARITIVE ANALYSIS OF RCC STRUCTURE ON SLOPING GROUND AGAINST SEISMIC LOADING BY USING FVD VS SHEAR WALL VS BRACINGS

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ABSTRACT

Consider recent construction and its failures in India and also helps well as its urbanization. And also, well as considering the elemental entities like industrialization, include in multi-story structures when the surface is considered to be in non-uniform. What is known as slope, considering the construction of the multi-story under these areas, is one of the important and also as well as Complex task. So, in order to overcome this systemic and all kind of load which affects the story while constructing in the area of slope for hilly regions. Extra support is needed to be given to the structure in order to reduce the effects. Considering the structure to be lying on the areas where the slope is a major factor. Sometimes the effect is unpredictable, hence the elements like bracings, shear wall and also as well as fluid viscous damper, is necessary to be provided in order to safeguard the multi-story structure. All the analysis has been considered under the code of response spectrum analysis considering the code book IS 1893:2002 all the valid values has been considered and respect to page number is also be noted in further project details. Response spectrum is one of the best methodologies in order to study the number of modes of the elements under the application of different loads. The main aim of the is to analyses the model under the behavior of the RCC structure over bracings and also as well as shear wall including fluid viscous damper

Key words: FVD, Shear Wall, Bracings, Response Spectrum, slope.

[1]INTRODUCTION

As discussed the multi-story structure considering its construction in the slope area is one of the most complicated task, and also it is considered to be most dangerous where due to the sudden drop in the climate which directly affects the ground levels and causes the ground to undergo a process of erosion where the construction of the multi-story structure will become much and much complicated. Hence we need to consider some of the important factor which can we overcome these effects, and to provide most long life effect to the structure to overcome all the climate changes including soil Erosion as well. So it is important to consider many elements like share wall at different locations and providing the share wall at the Same location as providing the bracings and also as well as fluid viscous damper.

[2]OBJECTIVE

Following are the objective to be studied to compare the seismic response of buildings with and without fluid viscous damper

1. To develop structure in Slope ground using ETABS and fixing the model using restrains.

2. To use IS 1893:2002 standard code book, for evaluation of results under Response spectrum analysis.

3. Comparing the models with bracing, damper and shear wall and plotting the results.

4. Best outcomes among the design elements needed to concluded by passing the minimum criteria of response spectrum, base reaction and response reduction factor

[3]LITERATUREREVIEW

Chandrasekaran and Rao (2002);investigated analysis and the design of multi- storied RCC the carried out the important analysis of the systemic intensity of the structure under the reinforced concrete over the multi-story building with a complex structural design and analysis.

the analysis is considered under using the same code book 1893 2002 the seismic forces and also as well as axial forces including the shape of bending moment and some of the important displacement in the stress-strain and also considering the important factor like support reactions including import and analysis like response spectrum is carried out.

Birajdar and Nalawade (2004); studied "seismic performance of buildings resting on sloping ground". the effect on the loss of the structure depends upon the conditions of the angle of the slope.

In this analysis zone 3 is considered for the 3D analysis of the structure including the torsional effect which is considered by using the response spectrum method which is one of the best method in order to study the proper nature of the structure in order to overcome all kind of irregular load conditions.

Liya Mathew and C.Prabha Title :Effectof FluidViscousDampersinMulti-StoriedBuildingYear:2014 This paper deals with buildings are subjected to various loading conditions. The fluid viscos damper (FVD)gives importance here. This paper explains to find the most harmful properties to reinforce concrete frames. The analysis is done in symmetrical square building using SAP2000 software.

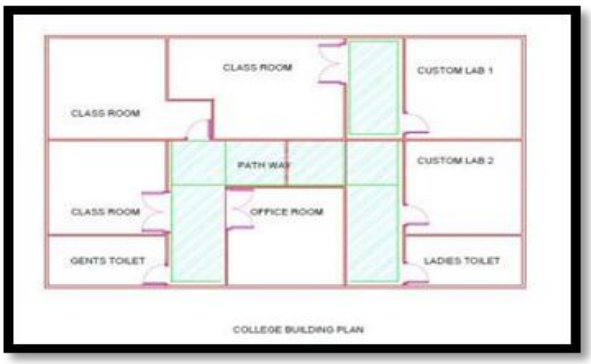
Sachin Kukian, Mohamed Parvez, Avinash.A.R and Kiran Kamath Title: A Study on Seismic ResponseofReinforcedStructuresRetrofittedwithFluid ViscousDampersin Shear Walls Year:2015 Paper description This paper is related to the investigation of the earthquake wave behavior on the structures with several floors. It is done with the devices that are located in the lateral load that resist the elements of the building. The study gives detailed information about the fluid viscous damper.

[4]METHODOLOGY

Response spectrum analysis

This method makes use of damping level and time history to measure pseudo spectral acceleration, displacement or velocity to provide dynamic behavior of a structure. For each structural period experienced by the structure there is a smooth curve on that gives peak response in a response spectra for the dynamic response this method is related with the type of the structure selection this method is useful for the decision making for the design of a particular structure

BUILDING PLAN AND LAYOUT



COLUMN LAYOUT

Building description

Grade of concrete : M45
Grade of steel : Fe 250
Beam :700x500mm
Column :700x700
One way slab :200mm
Story Height :3m
No. Of stories :10

Seismic Loads

All the Values for the seismic design and evaluation considered from the code book of IS:1893:2002. Value for the zone factor is zone 0.16.The values which is supposed to be also entered in to the E tabs as well is as given below

Zone Factor :0.16
Importance Factor :1.5
Response reduction factor:3
Soil Type :Medium
Structure Type :RCFrameStructure

[5]MODELINGANDANALYSIS

The analysis is carried out using ETABS

Introduction to ETABS

ETABS is software used for analysis purpose and also in design of buildings. ETABS is characterized by powerful graphical interface coupled with common data base which is integrated with unmatched modelling, analysis, design and detailing procedures

Merits of ETABS

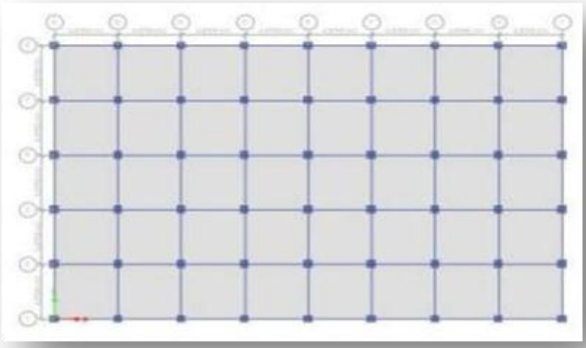
- ETABS includes various features with which geometry of a building having simple and straight forward symmetry with horizontal beam and vertical columns and floors can be established with minimum efforts.
- ETABS reduces the modelling and design time of the building having many floors but similar structure.
- ETABS gives the accurate design of the structure with formulation of member stiffness in the buildings having small or large bay width and story height. These dimensions highly affect the stiffness of the frame.

- This software is the most generally used as it works on center to center line dimensions.
- This EATBS software gives most reliable results that can be used by the engineers directly as compared to other software's which may need additional processes to be performed to be performed before used in structural design.

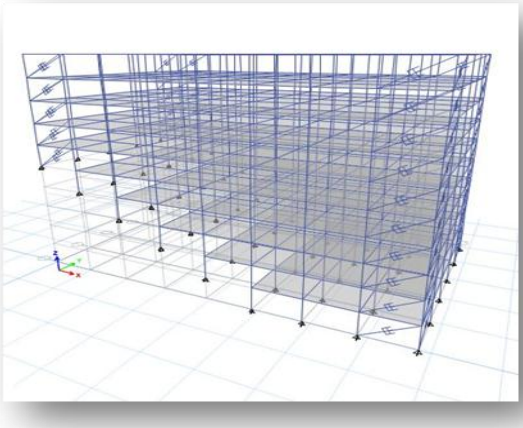
Modelling procedure using ETABS

1. Start up with ETABS
2. Set up grid lines
3. Selection and defining the material properties
4. Selection and defining the section properties
5. Assigning the section properties
6. Defining of load patterns
7. Defining of load combinations
8. Assigning of loads analysis of model

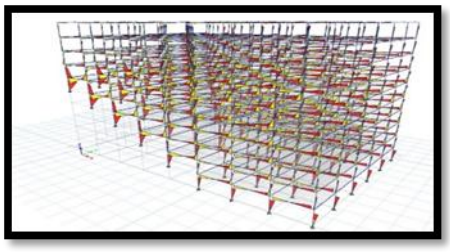
MODELING AND ANALYSIS CONVENTIONAL RC STRUCTURE



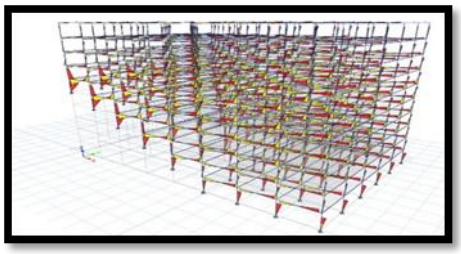
FLOORPLAN



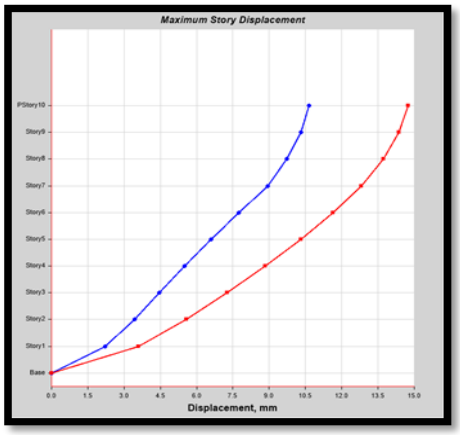
WIRE FRAME



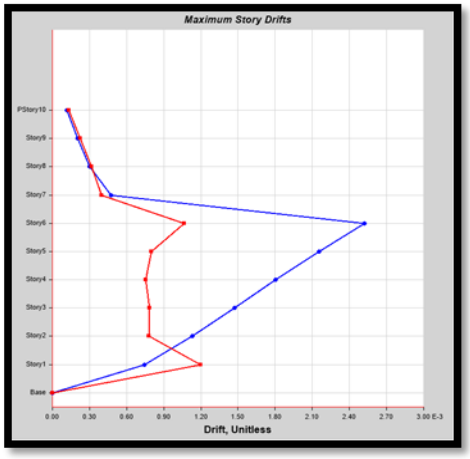
BENDING MOMENT



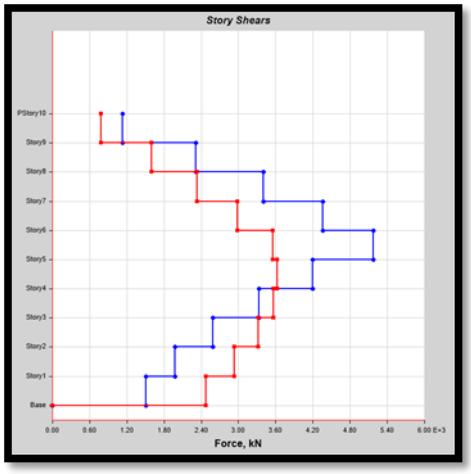
SHEAR FORCE



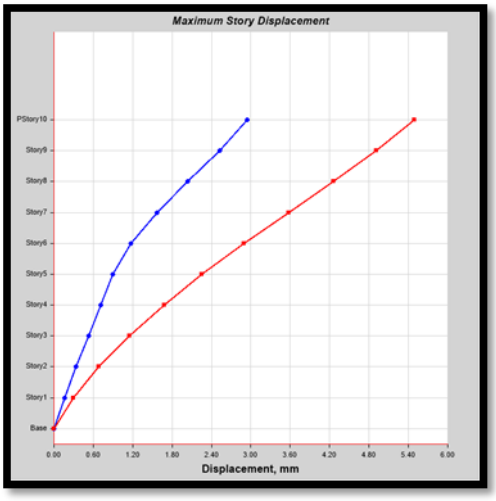
MAXIMUM STORY DISPLACEMENT



MAXIMUM STORY DRIFT

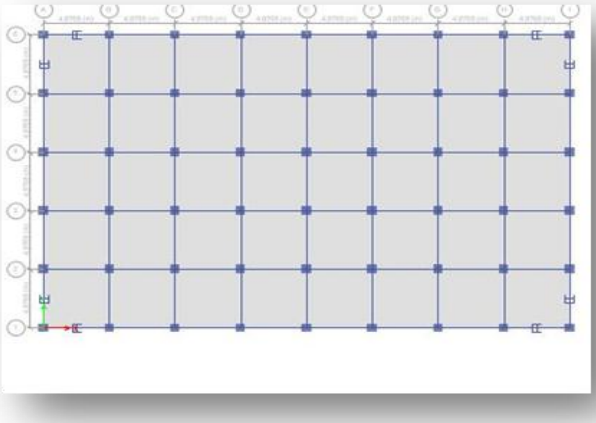


MAXIMUM STORY SHEARS

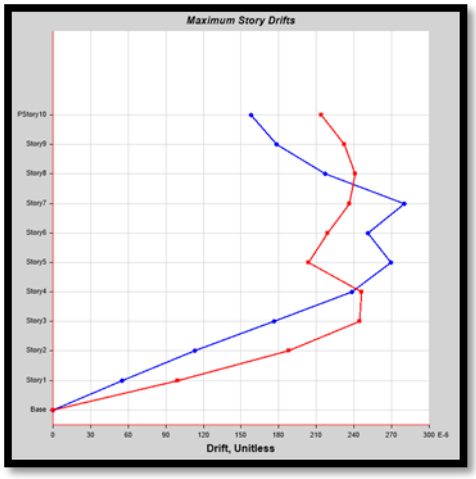


MAXIMUM STORY DISPLACEMENT

MODELING AND ANALYSIS CONVENTIONAL RC STRUCTURE WITH DAMPER



FLOOR PLAN



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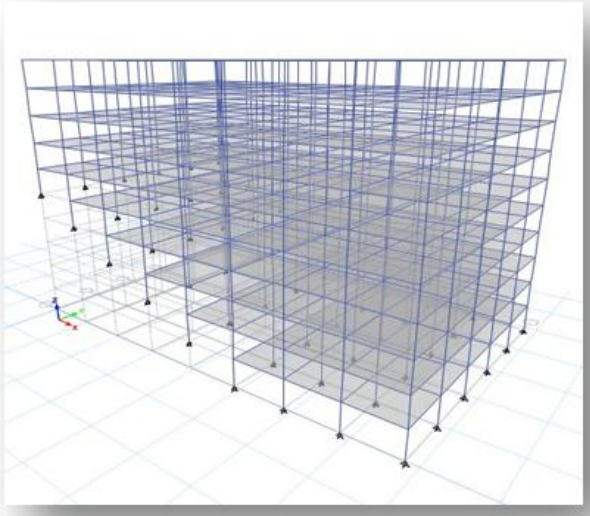
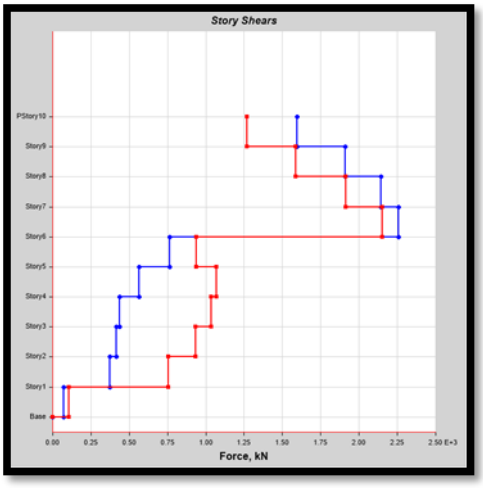
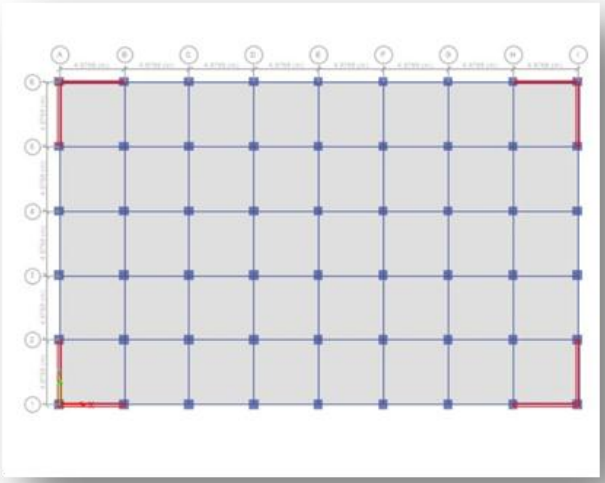


WIRE FRAME

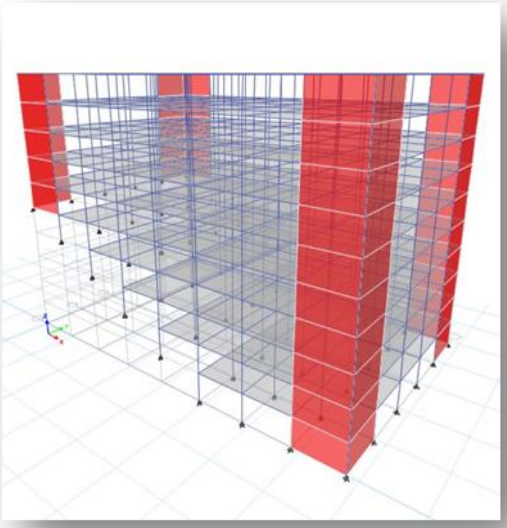


MAXIMUM STORY SHEAR

MODELING AND ANALYSIS CONVENTIONAL RC STRUCTURE WITH SHEAR WALL



FLOOR PLAN



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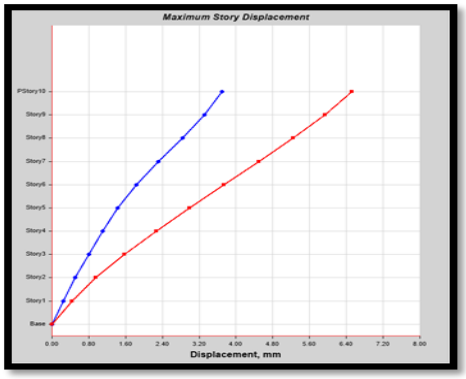

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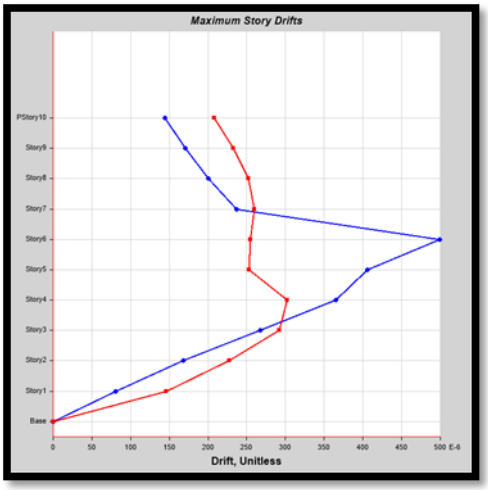

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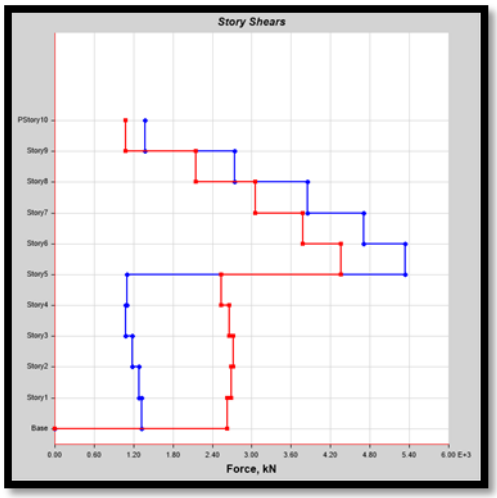
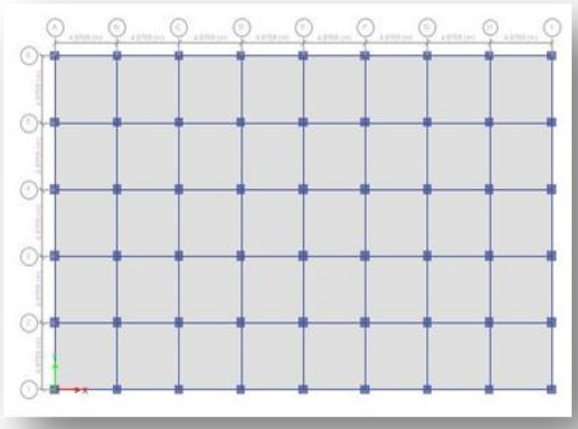
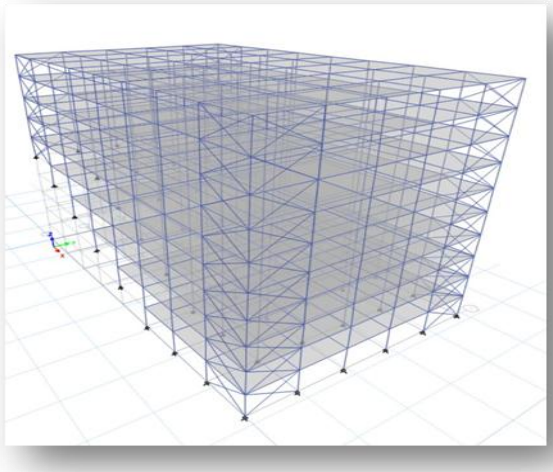


MAXIMUM STORY SHEAR

MODELING AND ANALYSIS CONVENTIONAL RC STRUCTURE WITH BRACING



FLOOR PLAN



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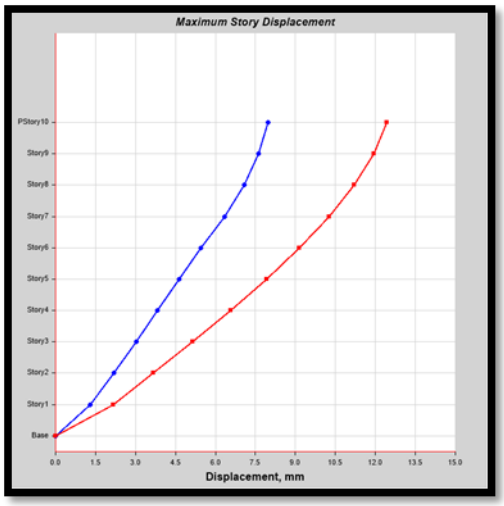

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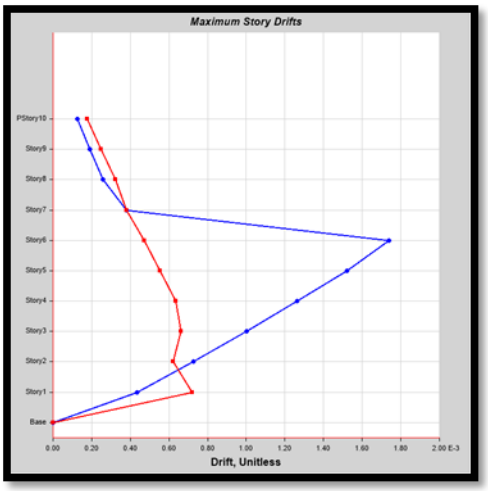
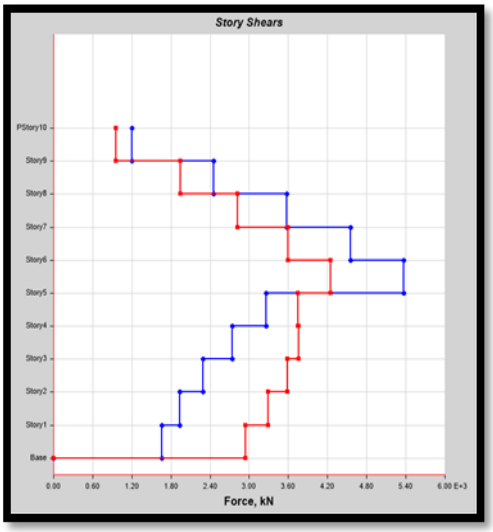


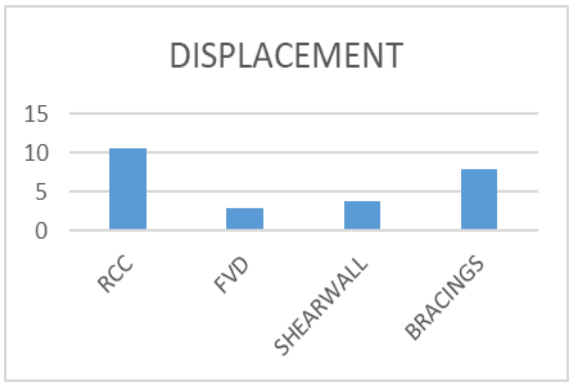
MAXIMUM STORY DRIFT

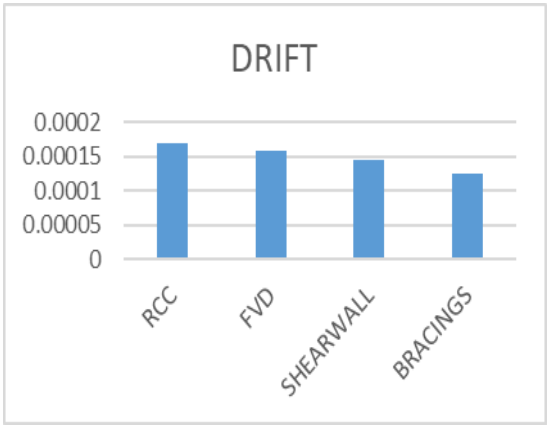


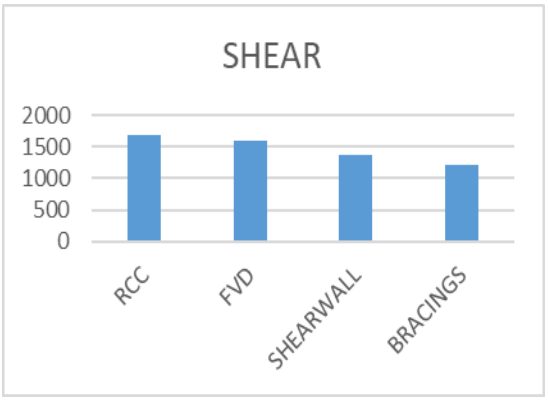
MAXIMUM STORY SHEAR

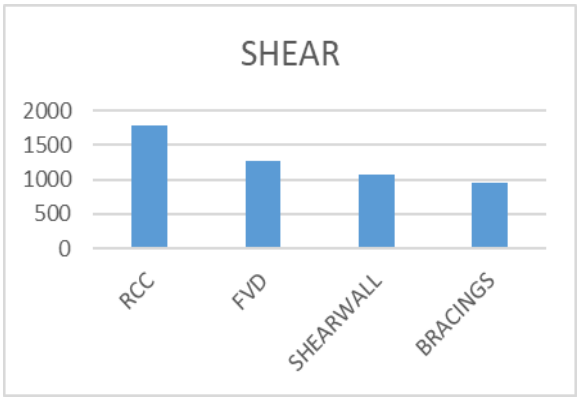
[6]RESULTS AND COMPARISION

X DIRECTION:





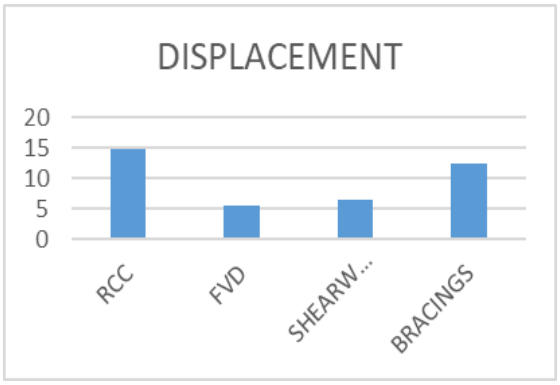


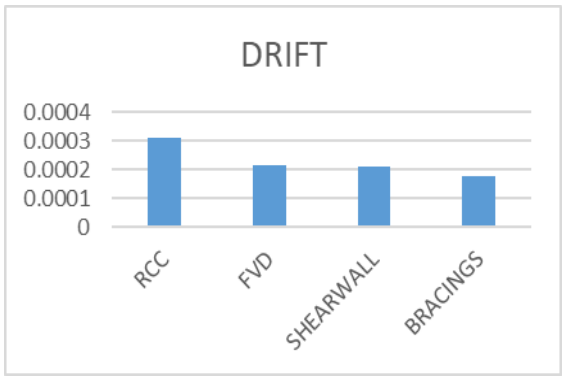


[7]CONCLUSION:

Considering all the possible and maximum Result passing the X bracing is found to Better Performing when compared to all other models. While all the elements like FVD and Shear wall is provided at same Position. X bracing will remain Better Choice while considering Slope ground Analysis.

Y DIRECTION:





[8]REFERENCES

1. ACI Committee 350.3-06, "Seismic design of liquid-containing concrete structures (ACI 350.3-06) and commentary (ACI 350.3R-06)", American Concrete Institute, Farmington Hills, MI, U.S.A, 2006.

2. ACI Committee 373R, "Design and Construction of Circular Prestressed Concrete Structures with Circumferential Tendons (ACI 373R-97)", American Concrete Institute, Farmington Hills, MI, U.S.A, 1997.

3. ACI Committee 350-06, "Code Requirements for Environmental Engineering Concrete Structures (ACI 350-06) and Commentary (ACI 350R-06)", American Concrete Institute, Farmington Hills, MI, U.S.A, 2006.

4. American Water Works Association (AWWA), "Wire and strand-wounded circular prestressed concrete water tanks", AWWA D110, Denver, CO, 1995. ATC, "Structural Response Modification Factors", ATC-19 Report, Applied Technology Council, Redwood City, California, 1995.

5. BSSC, NEHRP (National Earthquake Hazards Reduction Program) Recommended Provisions for Seismic Regulations for New Buildings and Other Structures (FEMA 450). Part 2: Commentary. Building Seismic Safety Council, Washington, D.C, USA, 2003. CSA-A23.3, "Design of concrete structures," Canadian Standards Association, Mississauga, Ontario, Canada, 2004.

6. CSA-A23.1, "Concrete Materials and Methods of Concrete Construction" Canadian Standards Association, Mississauga, Ontario, Canada, 2010. Dassault Systèmes Simulia Corp., "ABAQUS/CAE Documentation, Version 6.8–3", Providence, RI, USA, 2008.

7. Fournier, J. A, and Cheng, S., "Impact of Damper Stiffness and Damper Support Stiffness on the Efficiency of a Linear Viscous Damper in Controlling Stay Cable Vibrations", Journal of Bridge Engineering, V. 19, No. 4, 2014, Page 733 - 745.

8. T.T Soong, B.F. Spencer Jr, Supplemental energy dissipation: state-of-the-art and state-of-the-practice, Engineering Structures 24 (2002), 243-259.

9. Douglas P. Taylor, Fluid dampers for applications of seismic energy dissipation and seismic isolation, Eleventh World Conference on Earthquake Engineering, Paper no.798.Douglas Taylor, Philippe Duflot, Fluid viscous dampers used for seismic energy dissipation in structures.

10. IS 1893 (Part –1): 2002, Indian Standard criteria for earthquake resistant design of structures –General provisions and buildings, Bureau of Indian Standards, New Delhi.SP: 6-1 (1964), ISI Handbook for Structural Engineers – Part –1 -Structural Steel Sections, Bureau of Indian Standards, New Delhi. Liya Mathew, C. Prabha, Effect of fluid viscous dampers in multistorey buildings, IMPACT: IJRET, Vol.2, Issue 9, Sep 2014, 59-64.