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Seismic Analysis and Retrofitting of Open Ground Storey Structure

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Abstract: *Of the many natural and environmental disasters, seismic actions - earth earthquakes have the greatest impact on structures. It has been observed that structures lose strength over time due to many reasons, such as seismic activity, soil failure due to land movement, and so on. Then there are problems such as damage to the roof, foundation, walls, pillars, columns and beams. For them, structures become statically dangerous. And there is a question of security, and a decision comes - retrophyting. There are various building structures of public, private and historical significance. This work consists of seismic analysis of the open ground floor building using ETABS software. The structure is analyzed, and different models consist of different parameters. The maximum floor displacement is observed for the floor 4, which has a value of 1.4 mm. The maximum time period is observed for the mode 1 and it decreases to model-12.*

Keywords: Base Shear, storey displacement, storey stiffness and storey drift

I. INTRODUCTION

To meet the requirements of the previous infrastructure, new innovative materials / technologies in the field of civil engineering began to break through. As the buildings age and the bar for the buildings is growing, the old buildings began to show a serious need for additional repairs. Retrophication of structures such as construction, which includes the restoration, maintenance and strengthening of the building, is not only a need for construction and management in urban areas, but also a problem, which arises from design engineers in the disciplines of property management. Retrophyte is defined as the process of modifying existing structures, such as buildings, bridges, heritage structures, to make them more resistant to seismic activity and other natural disasters.

II. LITERATURE REVIEW

Niels Peter Hoi and Marya - Kaarina Sederquist (2009) A new methodology for assessing the seismic or load-bearing capacity of existing buildings with traditional concrete building systems on site is presented. This is part of a multi-stage methodology (step 2) for seismic evaluation and reconstruction of existing buildings developed by the author. This methodology is based on the concept of performance-oriented evaluation (PBA) of existing buildings. Estimate the expected seismic strength, nominal expansion and maximum movement of the considered building, taking into account the characteristics of different structural subsystems (frames, wall panels / shafts). Building system of the carrier. Based on these estimates, it is possible to assess the expected behavior and static bearing capacity of existing high-rises in different seismic scenarios, taking into account the relevant seismic loads of the building under consideration. The results of the approximate evaluation can be very well compared with the results of the "accurate" analysis of the push of the considered building, made using a nonlinear computer code.

Giuseppe Oliveto and Massimo Marletta (June 2005) Seismic restoration of reinforced concrete buildings not intended for earthquake endurance is planned. After a brief description of how seismic activity is described for design purposes, methods for assessing the seismic vulnerability of existing buildings are presented. Traditional seismic methods of modernization are being revised and their weaknesses are being identified. Modern seismic modernization methods and philosophies are being reviewed, including basic energy dissipation and insulating devices. The presentation is illustrated by case studies of actual buildings, where traditional and innovative methods of repair are used.

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III. METHODOLOGY

The analysis is carried out on the different models using ETABS software, following models have been considered.

1. Model I: G+14 storey building without retrofitting
2. Model II: G+14storey building retrofitted with shear walls at corner at bottom storey
3. Model III: G+14storey building retrofitted with shear walls at external central portion at bottom storey
4. Model IV: G+14storey building retrofitted with plus shape shear walls at central portion at bottom storey
5. Model V: G+14storey building retrofitted with straight shear walls at external portion at bottom storey

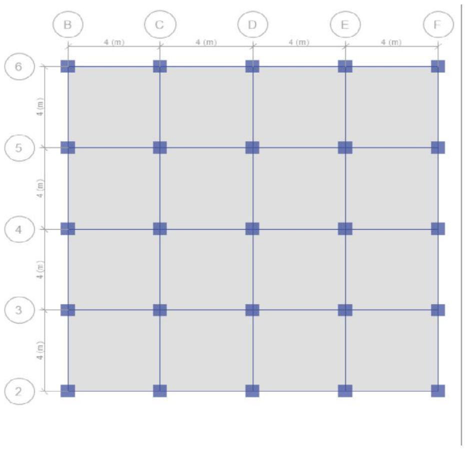

Fig.1: Plan of model-1

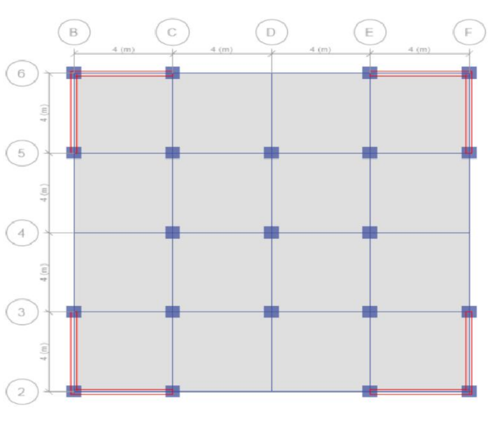

Fig.2: Plan of model-2

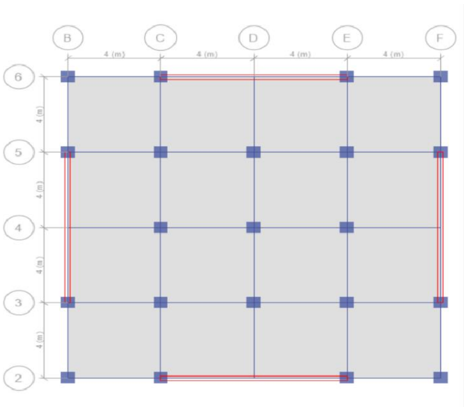

Fig.3: Plan of model-3

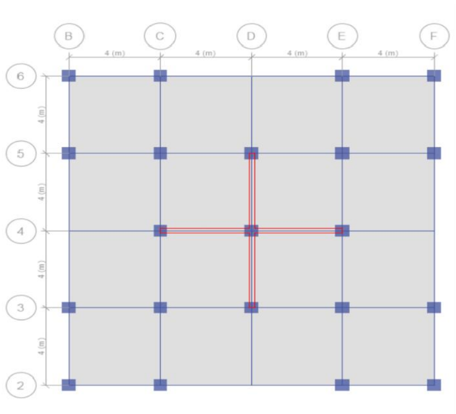

Fig.4: Plan of model-4

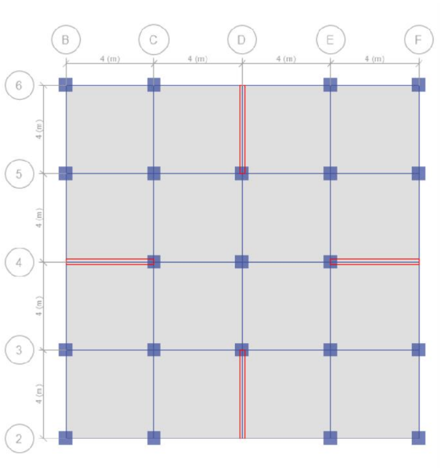

Fig.5: Plan of model-5

IV. RESULTS AND DISCUSSIONS

The following results are obtained for all the models which are analyzed using ETABS software.

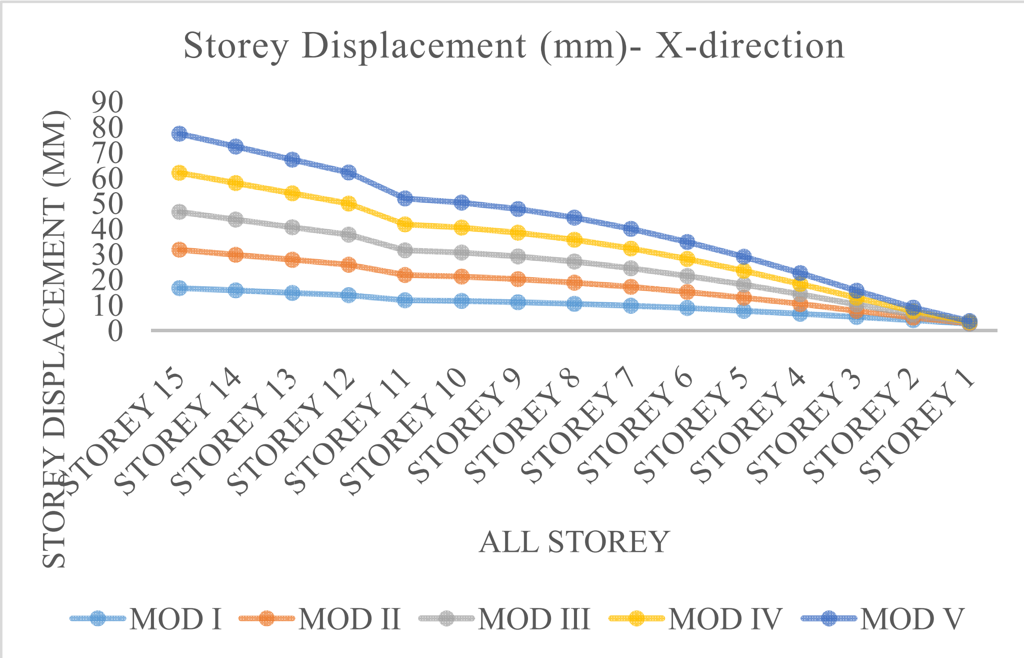

Fig.6: Storey Displacement (X-direction) for all models

The above graph gives the details about the Storey Displacement (X-direction) for all models, the all models have been mentioned in the graph & maximum results are obtained for the model-5 (G+14storey building retrofitted with straight shear walls at external portion at bottom storey).

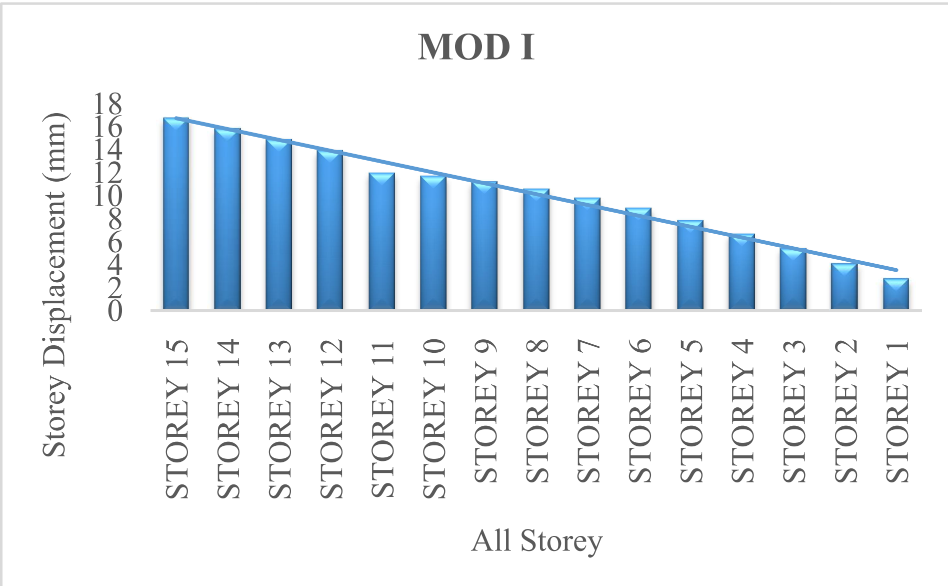

Fig. 7:Storey Displacement (X-direction) for model-1

The above graph is related to the Storey Displacement (X-direction) for model-1, the maximum storey displacement is observed for the storey 15 having value of 16 mm.

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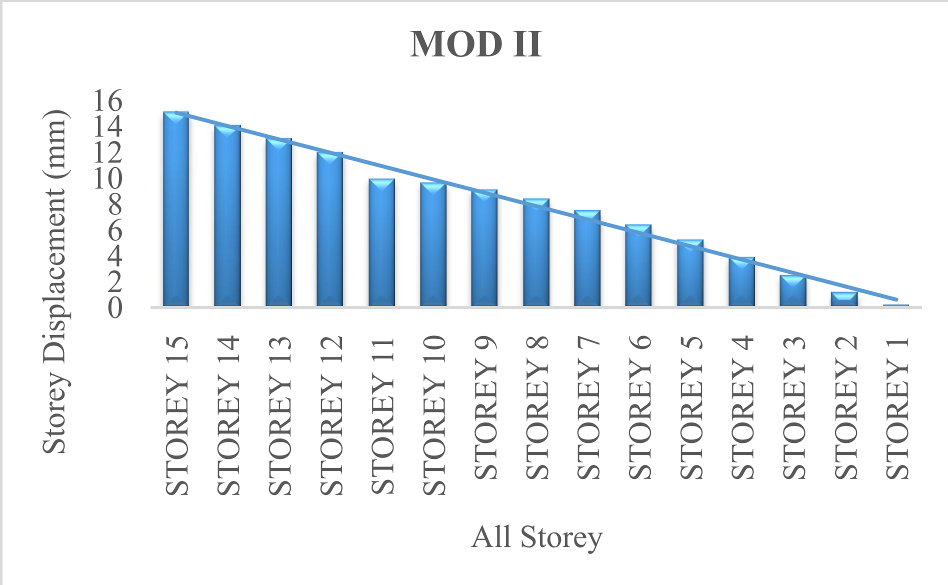

Fig.8:Storey Displacement (X-direction) for model-2

The above graph is related to the Storey Displacement (X-direction) for model-2, the maximum storey displacement is observed for the storey 15 having value of 15 mm.

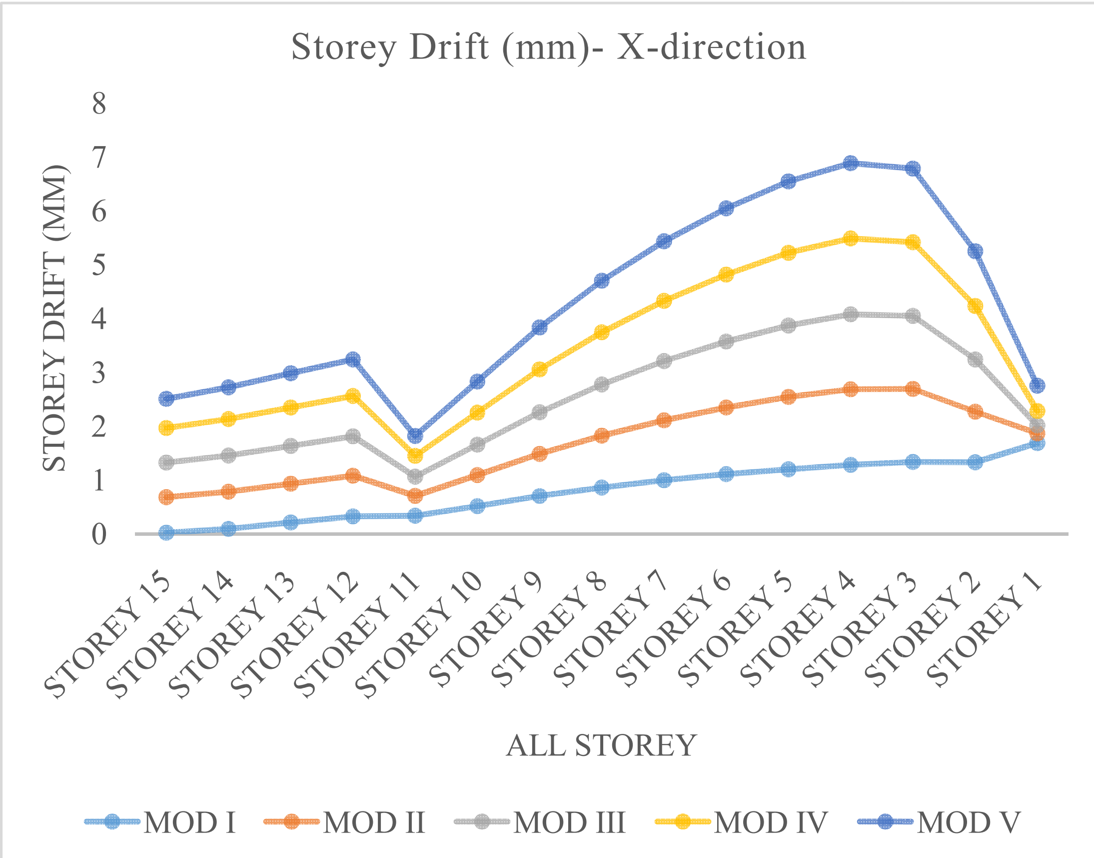

Fig. 9:Storey Drift (X-direction) for all models

The above graph gives the details about the Storey Drift (X-direction) for all models, the all models have been mentioned in the graph & maximum results are obtained for the model-5 (G+14storey building retrofitted with straight shear walls at external portion at bottom storey).

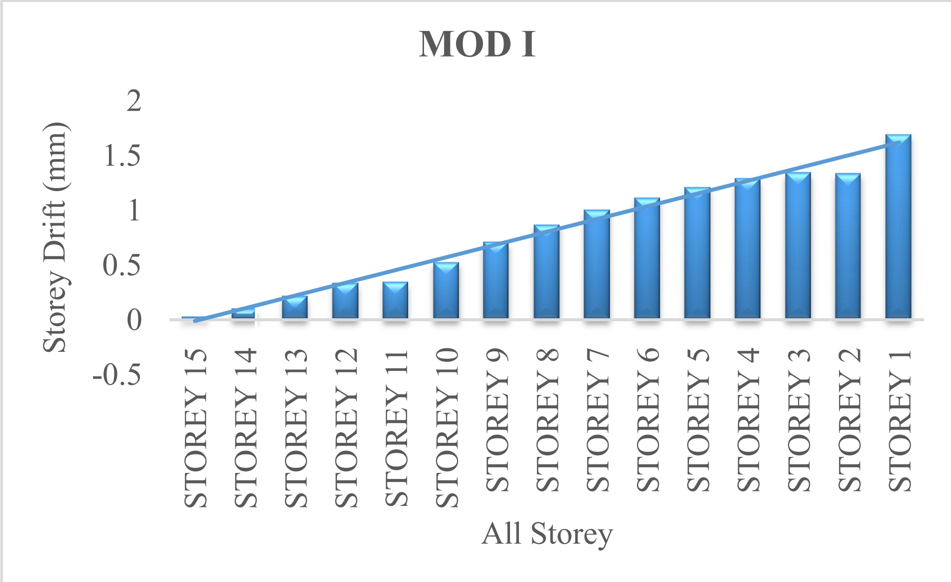

Fig. 10:Storey Drfit (X-direction) for model-1

The above graph is related to the Storey Drift (X-direction) for model-1, the maximum Storey Drift is observed for the storey 1 having value of 1.6 mm.

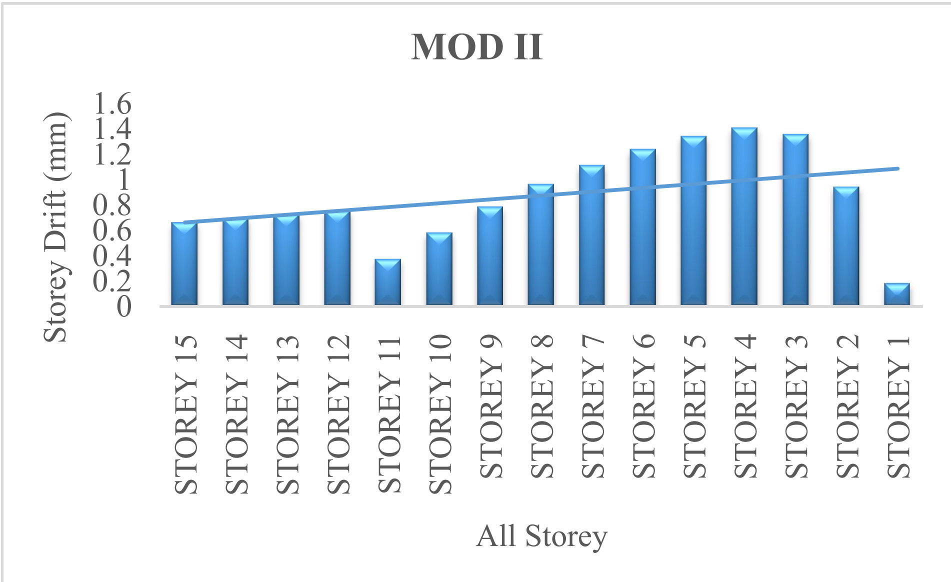

Fig.11:Storey Drfit (X-direction) for model-2

The above graph is related to the Storey Drift (X-direction) for model-2, the maximum Storey Drift is observed for the storey 4 having value of 1.4 mm.

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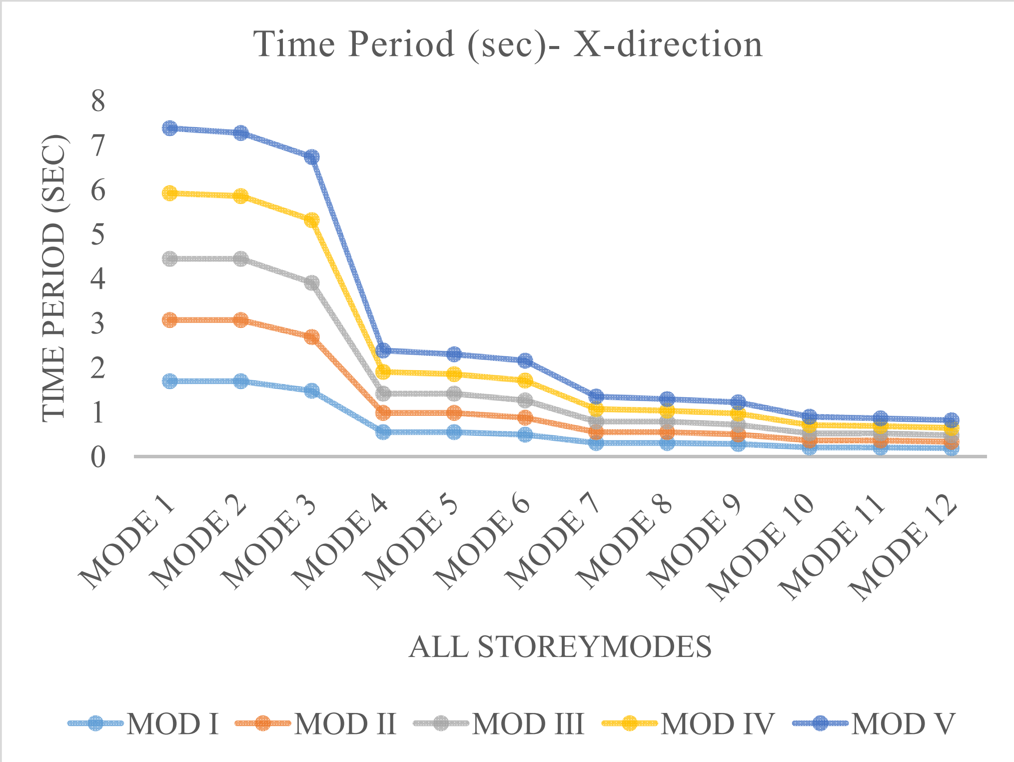

Fig.12: Time-Period (X-direction) for all models

The above graph gives the details about the Time-Period (X-direction) for all models, the all models have been mentioned in the graph & maximum results are obtained for the model-5 (G+14storey building retrofitted with straight shear walls at external portion at bottom storey). The maximum time period is observed for mode-1 and it goes on decreasing towards model-12.

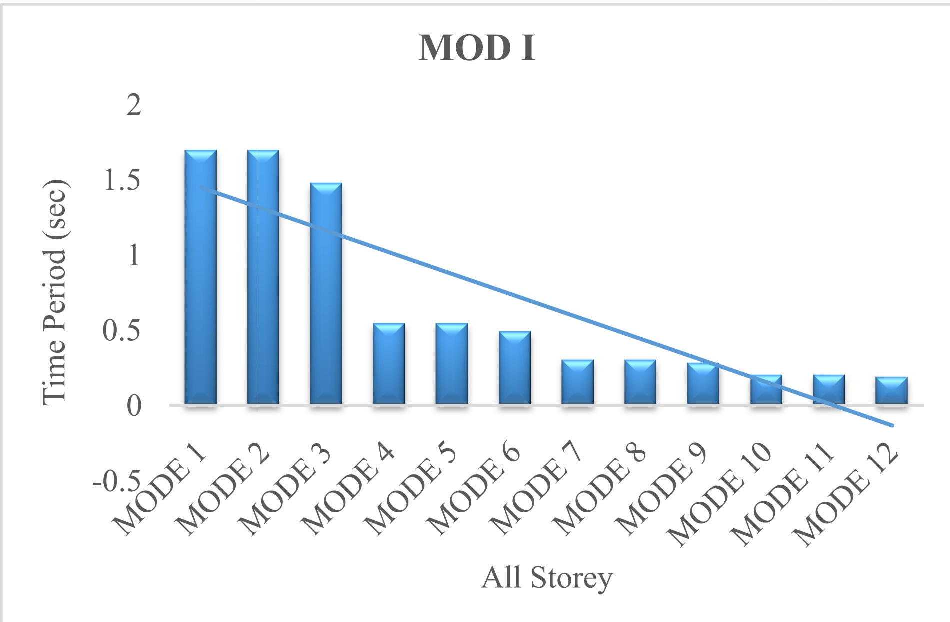

Fig.13:Time-Period (X-direction) for model-1

The above graph is related to the Time-Period (X-direction) for model-1, the maximum Time-Period is observed for the mode-1 having value of 1.6 sec.

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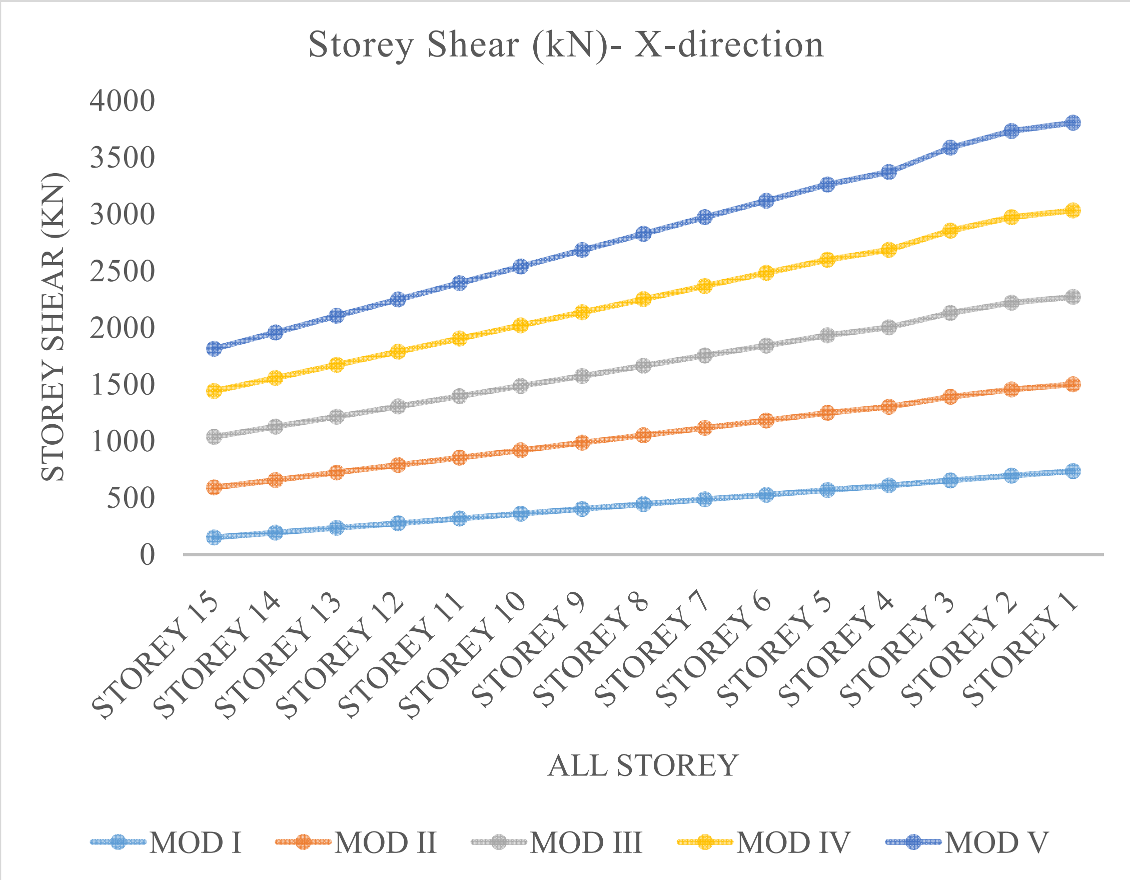

Fig.14:Storey Shear (X-direction) for all models

The above graph gives the details about the Storey Shear (X-direction) for all models, the all models have been mentioned in the graph & maximum results are obtained for the model-5 (G+14storey building retrofitted with straight shear walls at external portion at bottom storey).

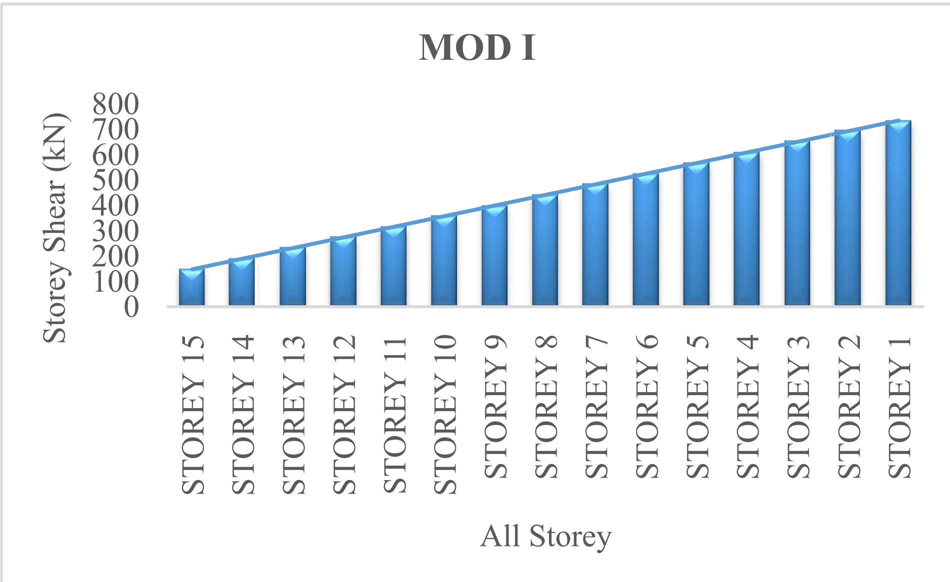

Fig.15:Storey Shear (X-direction) for model-1

The above graph is related to the Storey Shear (X-direction) for model-1, the maximum Storey Shear is observed for the storey 1 having value of 732.19 kN.

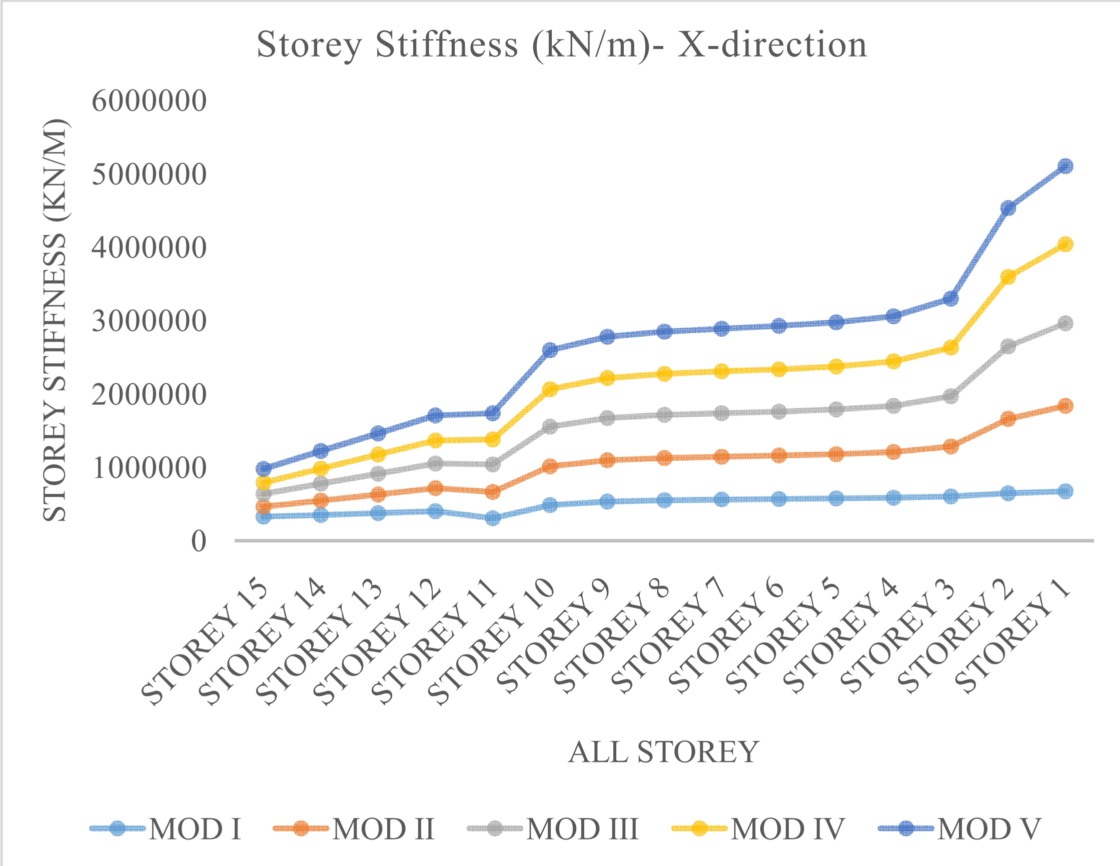

Fig.16:Storey Stiffness for all models

The above graph gives the details about the Storey Stiffness (X-direction) for all models, the all models have been mentioned in the graph & maximum results are obtained for the model-5 (G+14storey building retrofitted with straight shear walls at external portion at bottom storey).

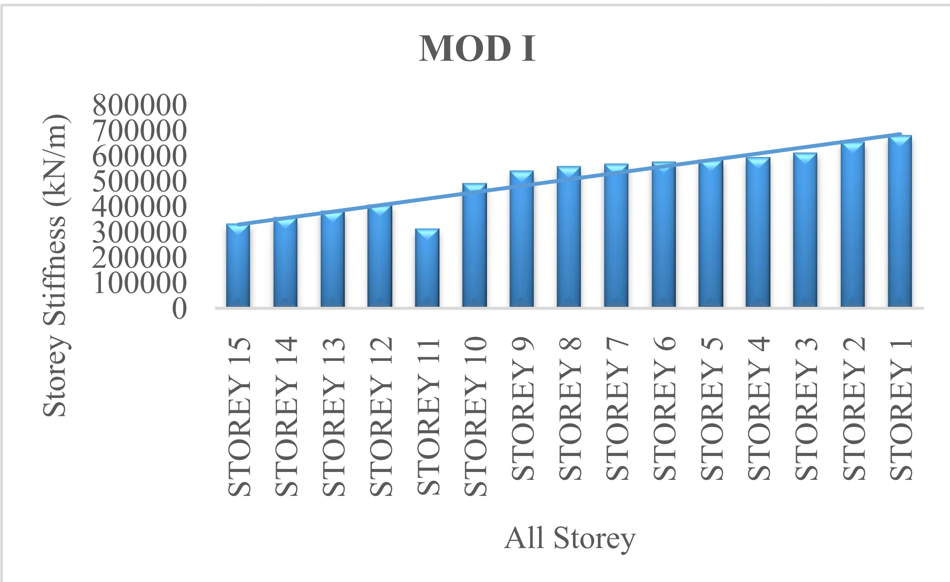

Fig.17:Storey Stiffness for model-1

The above graph is related to the Storey Stiffness (X-direction) for model-1, the maximum Storey Stiffness is observed for the storey 1 having value of 677446.89 kN/m.

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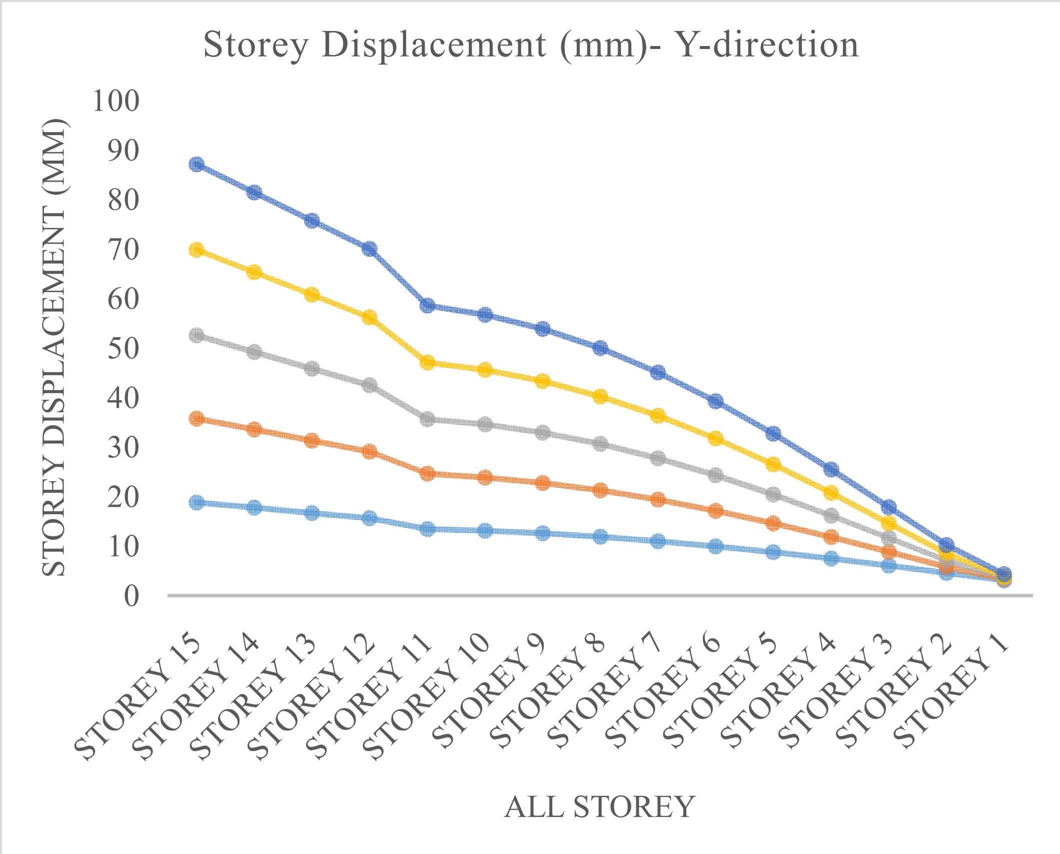

Figure 0.1:Storey Displacement (Y-direction) for all models

The above graph gives the details about the Storey Displacement (Y-direction) for all models, the all models have been mentioned in the graph & maximum results are obtained for the model-5 (G+14storey building retrofitted with straight shear walls at external portion at bottom storey).

V. CONCLUSION

The present work consists of the seismic analysis of the open ground storey building using ETABS software. The structure is analyzed and the different models consists of Model I: G+14 storey building without retrofitting, Model II: G+14storey building retrofitted with shear walls at corner at bottom storey, Model III: G+14storey building retrofitted with shear walls at external central portion at bottom storey, Model IV: G+14storey building retrofitted with plus shape shear walls at central portion at bottom storey and Model V: G+14storey building retrofitted with straight shear walls at external portion at bottom storey. The following conclusions are made.

1. The maximum storey displacement is observed for the storey 4 having value of 1.4 mm.
2. The maximum time period is observed for mode-1 and it goes on decreasing towards model-12.
3. Maximum results of Storey Shear (X-direction) are obtained for the model-5 (G+14storey building retrofitted with straight shear walls at external portion at bottom storey).
4. The maximum Storey Shear is observed for the storey 1 having value of 773.36 kN.
5. The maximum Storey Stiffness is observed for the storey 1 having value of 677446.89 kN/m.

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