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Seismic Retrofitting of Multistorey Buildings using ETABS Software

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Abstract: *The open ground building, which has only columns in the ground floor and both partitions and columns in the upper floors, as shown in the figure 1, has two clear characteristics. It is relatively flexible in a solid store, i.e. the relative horizontal movement it undergoes in the ground floor is much greater than that of each of the floors above it. This flexible ground floor is also called a soft floor. This document shows the floor displacement and the floor drift for models that have been modeled using ETABS software.*

Keywords: Retrofitting, seismic, ETABS & storey drift

I. INTRODUCTION

Recent earthquakes over the past ten years indicate that significant damage was not due to earthquake methods, but due to poor construction rates during the earthquake. The current construction system, which was designed and built in accordance with the first provisions on codes, does not meet the needs of modern seismic structures and coding methods. It is clear that the best technique for reducing the risk of a harmful structure is seismic modernization. In the recent past, there has been a huge improvement in modernization techniques. This analysis highlights the concept of evaluation, as well as the re-equipment of the structure against seismic events.

Moderate and severe earthquakes have occurred all over the world every year for the last thirty years. Such events lead to damage to concrete structures, as well as failures. Thus, the aim is to focus on a few specific procedures that can improve the practice of assessing the seismic vulnerability of existing reinforced concrete buildings that are more important, and their seismic modernization through the means of various innovative techniques, such as base isolation and weight reduction. Therefore, seismic retrophyting is a set of mitigation methods for an earthquake. This is extremely important for historical monuments, areas prone to strong earthquakes and tall or expensive buildings.

II. REVIEW OF LITERATURE

Chandurkar, Pajgade et.al (2013) evaluated the result of 10-storey development with a seismic structure of the shear wall using ETAB v 9.5. The main attention was paid to comparing the modification of the answer by changing the location of the structure of the shear wall in a multi-storey structure. 4 studied models - one of them was the structure of the program with a bare frame, and three rests were a structural double style system. The results were good for a sliding wall in a span that is short in the corners. The larger size of the shear wall was found to be insufficient in 10 or even ten stories. Sliding wall is an economical and efficient choice for high-altitude structures. It was noted that a change in the roles of the shear wall was detected to attract forces, so the correct location of the sliding wall structure is important. The main number of horizontal forces was taken by the structure of the walls when the size is large. Sliding walls in significant areas were also found to reduce displacement due to the earthquake.

Viswanath K.G et.al (2010) investigated the seismic performance of reinforced concrete structures using concentric steel cladding. The evaluation of 4, 8, 12, and 16 floor buildings in seismic zone IV was completed using Staad Pro software in accordance with the actual 1893: 2002 (part I). The bracket was placed for peripheral columns, as well as the usefulness of the distribution of steel fasteners throughout the level of the structure, the seismic functionality of the structure was studied. It was found that the lateral movements of the structures decrease after working with type X brakes. Steel weaves were found to reduce bending, as well as reduce demand for beams, as well as columns and transport the lateral load using the axial load mechanism. It was found that building frames with a lift of the X category have a minimum bend

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than various other types of a lift. Steel fastening technique was a much better option for seismic modernization, as they do not significantly increase the entire mass of the structure.

III. METHODOLOGY

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

1. Model I: G+10 storey building without retrofitting
2. Model II: G+10 storey building retrofitted with shear walls at corner at bottom storey
3. Model III: G+10 storey building retrofitted with shear walls at external central portion at bottom storey
4. Model IV: G+10 storey building retrofitted with plus shape shear walls at central portion at bottom storey

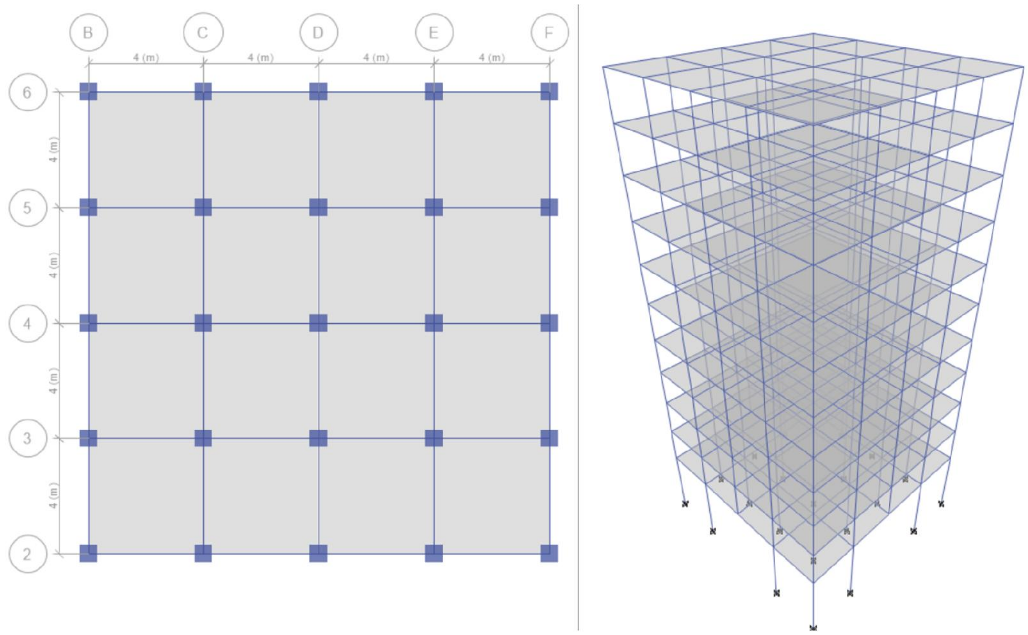

Figure 1: Plan & Elevation of model-1

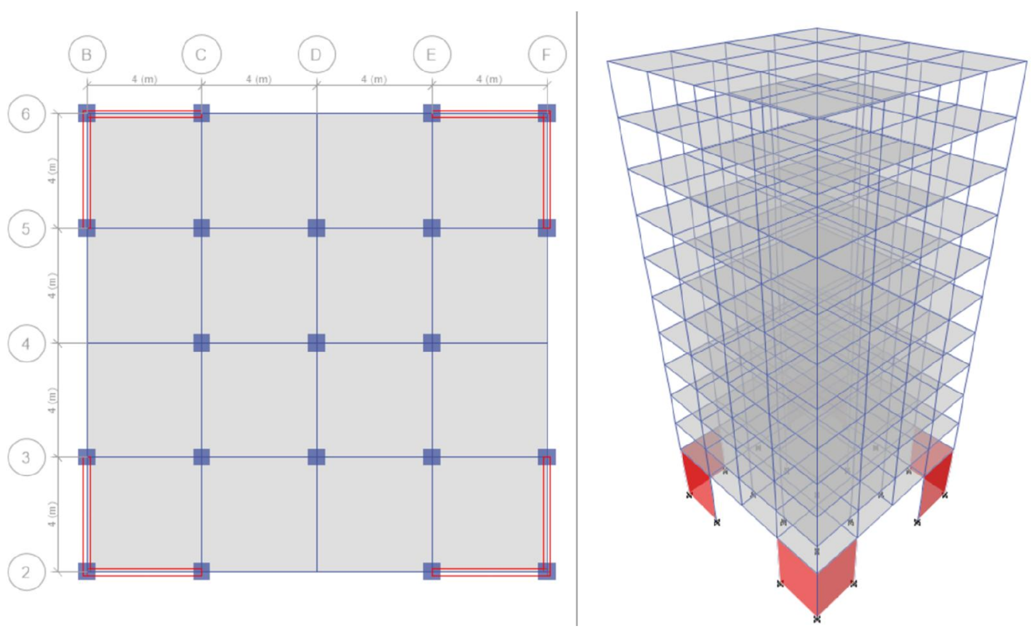

Figure 2: Plan & Elevation of model-2

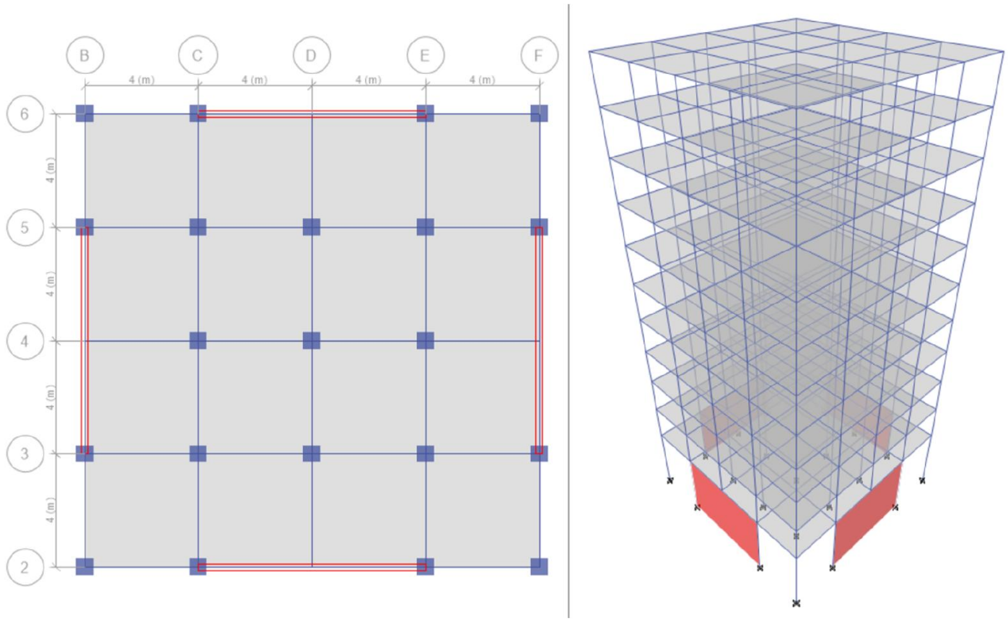

Figure 3: Plan & Elevation of model-3

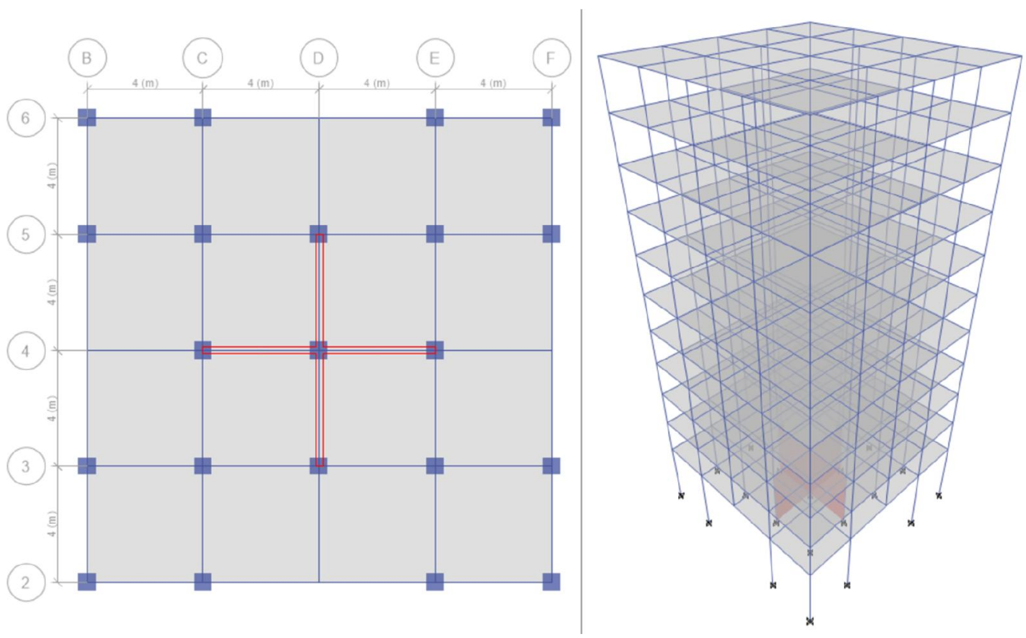

Figure 4: Plan & Elevation of model-4

IV. RESULTS & DISCUSSIONS

The different models are analyzed using ETABS software, the results in terms of the displacement, storey drift, storey shear, storey stiffness and time period is obtained and it is mentioned as follows.

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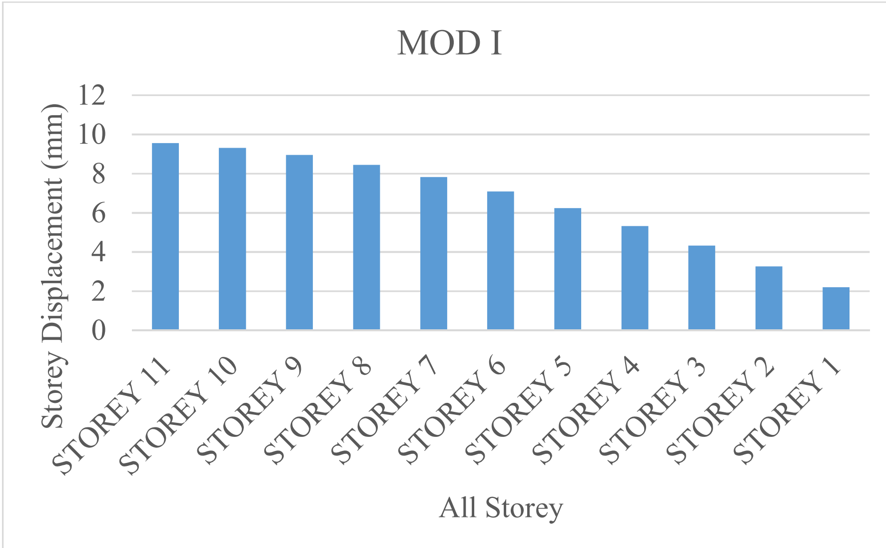

Figure 5: Storey Displacement (X-direction) for model-I

The above graph gives the details about Storey Displacement (X-direction) for model-I, the maximum displacement is observed for the storey 11 having the value of 9.563 mm.

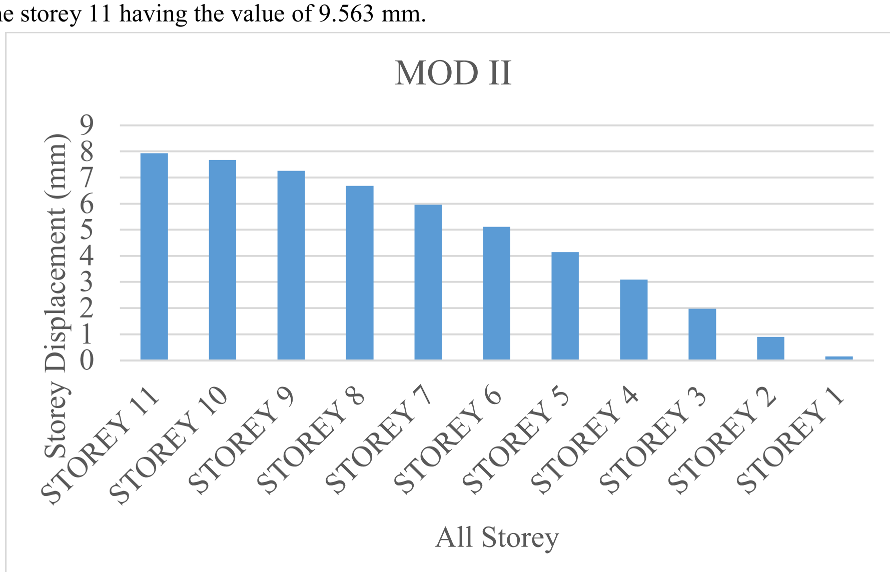

Figure 6: Storey Displacement (X-direction) for model-II

The above graph gives the details about Storey Displacement (X-direction) for model-II, the maximum displacement is observed for the storey 11 having the value of 7.933 mm.

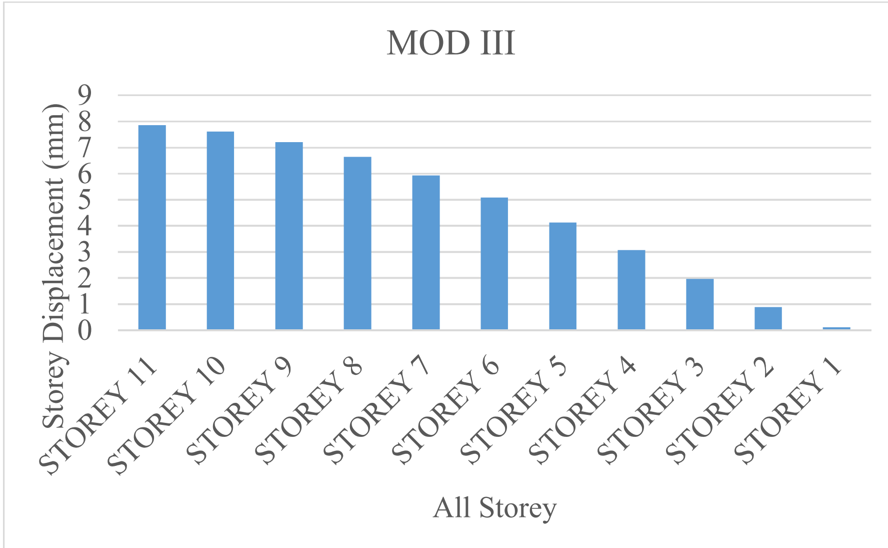

Figure 7: Storey Displacement (X-direction) for model-III

The above graph gives the details about Storey Displacement (X-direction) for model-III, the maximum displacement is observed for the storey 11 having the value of 7.861 mm.

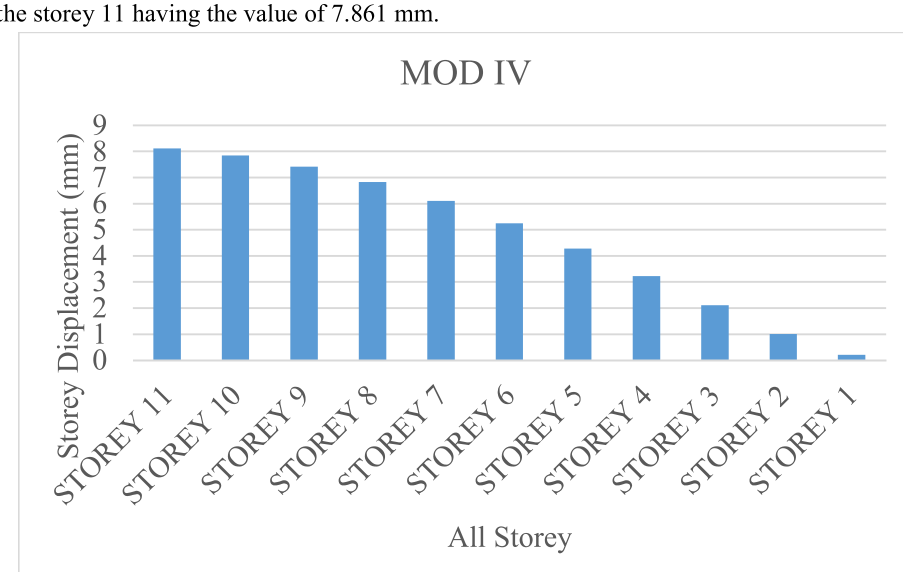

Figure 8: Storey Displacement (X-direction) for model-IV

The above graph gives the details about Storey Displacement (X-direction) for model-IV, the maximum displacement is observed for the storey 11 having the value of 8.121 mm.

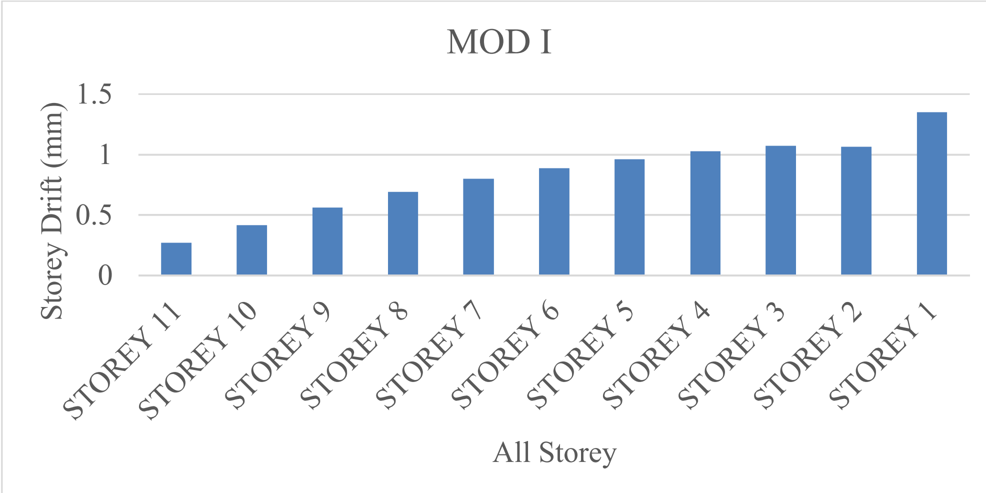

Figure 9: Storey Drift (X-direction) for model-I

The above graph gives the details about Storey Drift (X-direction) for model-I, the maximum storey drift is found in the case of storey 1 having the value of 1.352 mm.

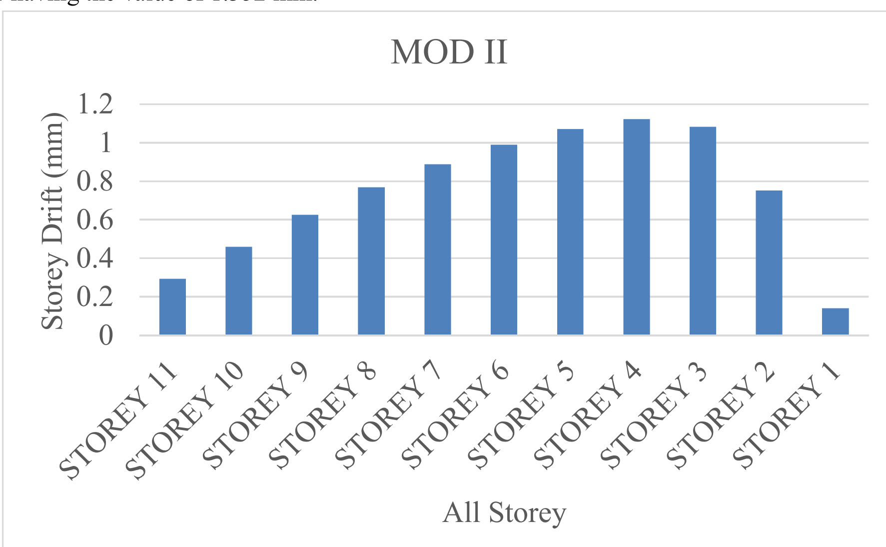

Figure 10: Storey Drift (X-direction) for model-II

The above graph gives the details about Storey Drift (X-direction) for model-II, the maximum storey drift is found in the case of storey 4 having the value of 1.12 mm.

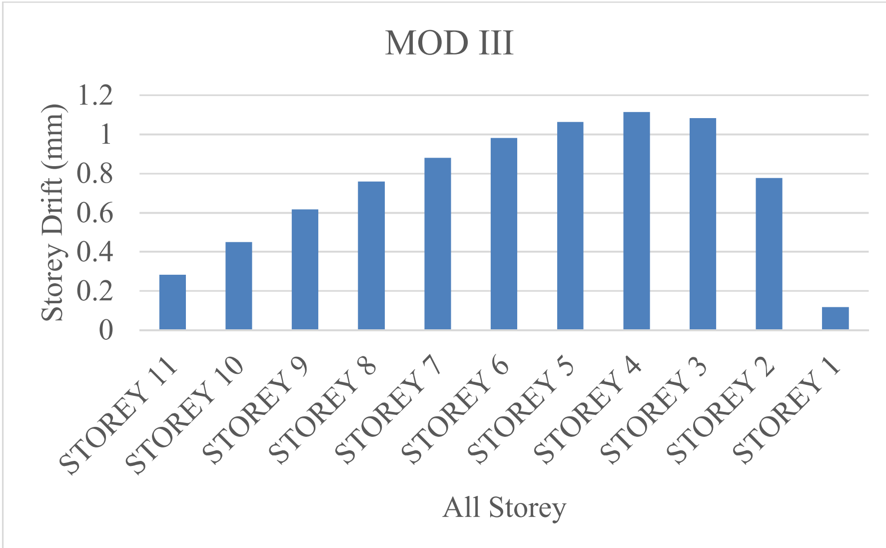

Figure 11: Storey Drift (X-direction) for model-III

The above graph gives the details about Storey Drift (X-direction) for model-III, the maximum storey drift is found in the case of storey 4 having the value of 1.115 mm.

V. CONCLUSION

The following conclusions are obtained.

1. From Storey Displacement (X-direction) for all models, there are all nine models with all 11 storey have been presented.
2. From Storey Drift (X-direction) for all models, the storey drift goes on decreasing from the storey no. 4 towards storey no.11.
3. The maximum displacement is observed for the storey 11 having the value of 7.861 mm for model-III.
4. Maximum storey drift is found in the case of storey 4 having the value of 1.12 mm for model-II.
5. Maximum storey drift is found in the case of storey 4 having the value of 1.115 mm for model-III.

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