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SEISMIC RISK ASSESSMENT OF REINFORCED CONCRETE STRUCTURES WITH DEFECTIVE SYSTEM STRUCTURES USING PUSHOVER ANALYSIS

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ABSTRACT

An earthquake is a very dangerous and unpredictable force in the environment. Earthquake behavior remains a concern and requires special attention from architects. The presence of systemic and direct malformations makes building structures difficult and puts them at greater risk for earthquakes. Reversal analysis, detecting thunderstorms as an effective tool for measuring the vulnerability of seismic structures, is a good analytical method for dealing with volatile structures. In this study, the vulnerability of buildings with an unusual earthquake system was attempted to investigate using pushover analysis. In this study, 3 floors, 6 floors, and 9-story buildings with varying degrees of inconsistency and common configuration are modeled and analyzed. ETABS, an effective FE analysis tool, was used for analysis. Modeling and uploading considerations are based on appropriate Indian codes, while thrust analysis is performed according to FEMA and ATC codes. Comparable parameters include shear baseload capacity, shift capacity, working area, and state of built-in joints. Also, an attempt has been made to evaluate and evaluate the development of the seismic capacity of a building using shear wall elements. Analysis results show that buildings with systemic deficiencies are more at risk of earthquakes compared to conventional structures. Unusual buildings had a much lower capacity for shaving the foundation than conventional structures, and the hinge districts built were also in high-injury areas. The introduction of curtain walls has been an effective solution for planning inconveniences. Buildings reinforced with barbed walls have shown significant improvement in the sliding capacity of the foundation (3 to 5 stories) and the overall flexibility of the structures. Improved hinge conditions developed during thrust analysis also showed that abnormal structures with barbed walls had minimal damage.

Keywords: Trust Analysis, Foundation Shear Bearing Capacity, Release Capacity, Performance Point And Status Structures, Shear Wall Element.

I. INTRODUCTION

An earthquake can be defined as the sudden onset of a stress disorder associated with a brittle rock fracture causing an earthquake. Earthquakes caused by earthquakes are complex due to parameters such as source effect, road impact, and environmental impact. Earthquakes cause earthquakes and underlying structures are also at the bottom of this movement. It can be seen that the dynamic upload in a building does not come from any external source, but it does it for you. Earthquakes are events in which a person dies as a result of injuries or falls from buildings or other man-made structures. It has been found that a well-constructed structure against the force of earthquakes can reduce losses and damage to property. In existing buildings, remodeling according to the needs of an earthquake-resistant structure can increase the structural resistance and strength of the earthquake. Many parameters, including non-built structures and structures, are affected during an earthquake. The whole structure must have sufficient strength and ductility. Thus, damage may occur in the event of an earthquake. Earthquakes are natural phenomena, so they do not occur exactly when they occur. Earthquakes affect large numbers of people. Therefore, public awareness plays an important role. Earthquake technology has not yet been developed. However, damage from earthquakes can be reduced to a minimum with proper care. The geometry of the desired structure, form, and materials can be accessed from the data collected during the previous earthquake. Therefore, there is much to learn from past failures, and learning can be important for future construction.

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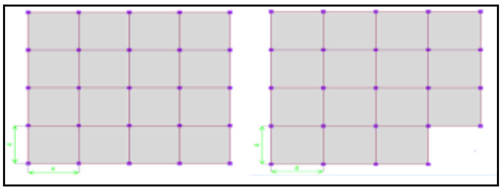
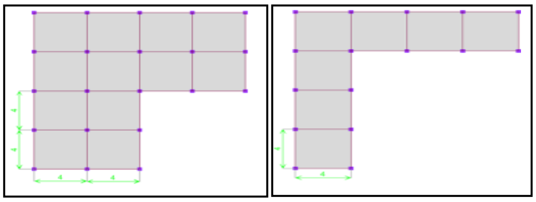
Table 1: Material

Number of Bays	4 bays in both directions
Spacing of Bays	5m in both direction
Beam Size	230x450
Column size	300x300 for 3 storey, 450x450 for 6 storey and 550x550 for 9 storey structure
Grade of Materials	M20 and Fe 415
Slab Thickness	150mm
Live Load Considered	2 kN/Sqm
Finishing and Wall Load	1.5 kN/Sqm and 12kN/m Respectively
Seismic Zone and Soil Type	Zone III and Medium Type Soil
Response Reduction Factor	3

As shown below, the plan is smooth and unusual, and the plan is considered a 3, 6, 9 story building.



Set Normal Building Unusual Building-1



Unusual Building-2 Unusual Building-3

Figure 1: Buildings

As shown in the figures above, it appears that the unusual structure of structures 1.2 and 3 differs by 25%, 50%, and 75%, respectively, from the normal structure.

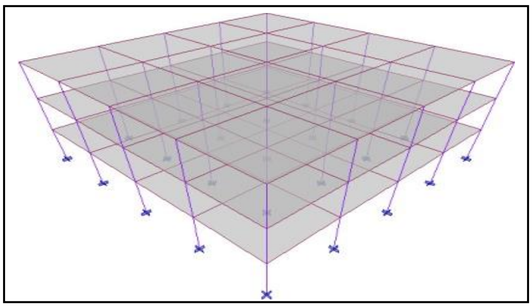


Figure 2: 3D Model of the 3-Storey structure

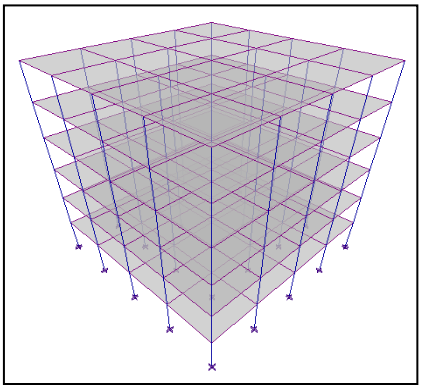


Figure 3: 3D Model of the 6-Storey structure

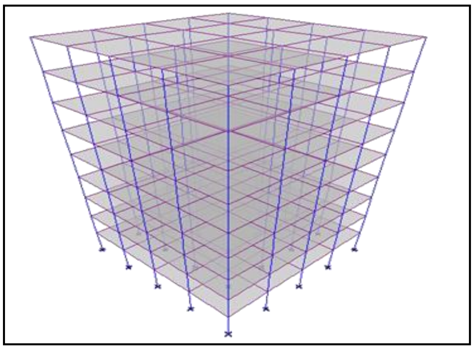


Figure 4: 3D Model of the 9-Storey structure

II. LOAD INSPECTION

Structure details are considered to analyze the missing volume 1.5 kN / m2, 2 kN / m2 live load, 1.5 kN / m2, and 12kN / m wall load, respectively, earthquake loads following IS 1893: 2002 (Part 1), thrust analysis using ACT 40.

III. ETABS MODEL

Version ETABS 9.6 is used for modeling, analysis, and design. The line model created for gravity analysis is made into a dynamic analysis; the linear frames are converted into a linear model.

IV. ANALYSIS METHOD

In this study, nonlinear static (push analysis) was used for structural analysis to evaluate the seismic performance of the structure. In this study, an attempt was made to quantify the effect of systemic instability on the earthquake structure and behavior of structures with reinforced concrete frames and possible reinforcement using shaving walls. For this purpose, standard reinforced concrete structures with G + 3, G + 6, and G + 9 were analyzed and modeled using ETABS software. Selected categories are analyzed and designed for weight loads before thrust analysis using the ATC40 code.

V. DISCUSSION AND RESULT

Analysis results for comparison include shear base volume, maximum shift, working area, and position of built-in members. Thrust curves of 3, 6, and 9 storey buildings as shown. And the base capacity of the base shear, the displacement volume are comparable.

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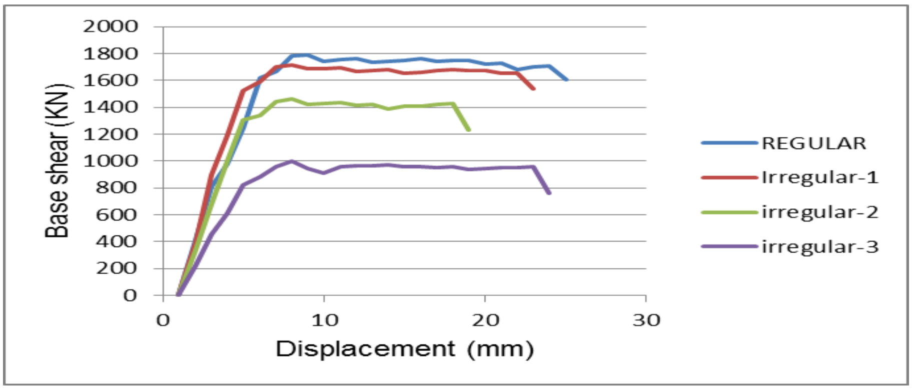

Figure 5: Comparison of pushover curve for 3-storey structure

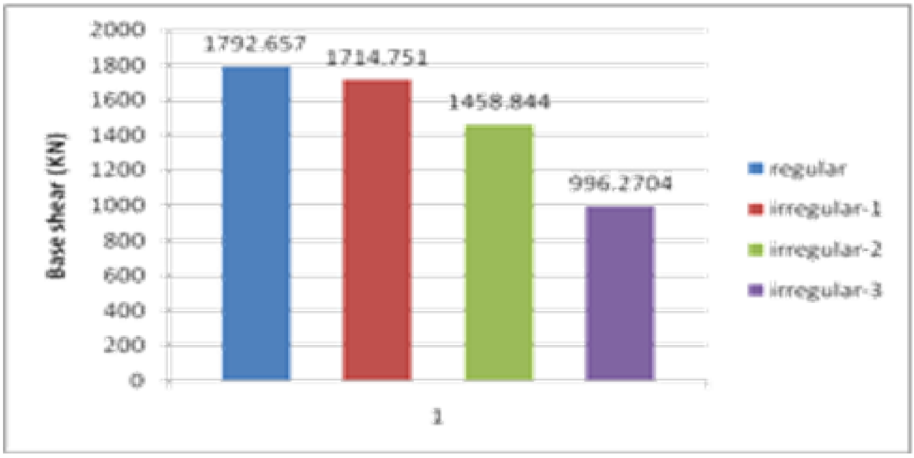

Figure 6: Comparison of Base shear Capacity for 3- storey structure

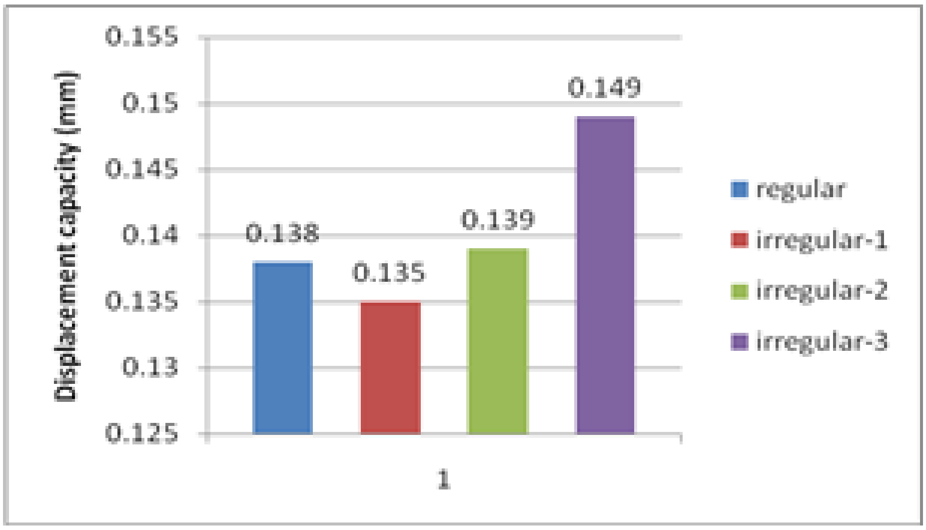

Figure 7: Comparison of the removable carrying capacity of a 3-story building

The parameters considered to compare the results of 6-storey and 9-storey buildings are the same as those of a 3-story building. Compared with the hinge regions formed during the thrust analysis, it was noted that the abnormal formation of 3 formations of 3,6, and 9 were more likely to reach countries of severe damage.

The ETABS model of a 3-story building was reinforced with the help of barbecue elements.

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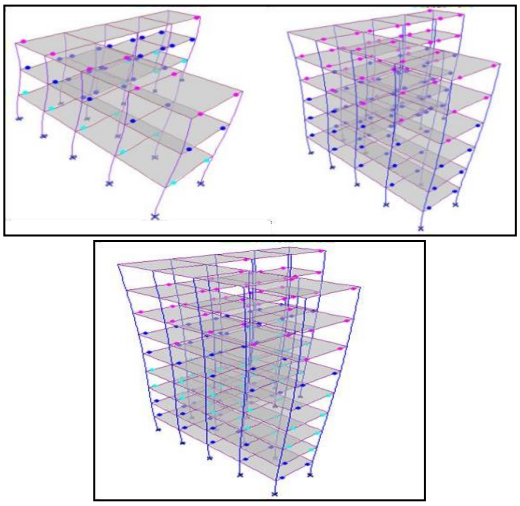

Figure 8: Structures

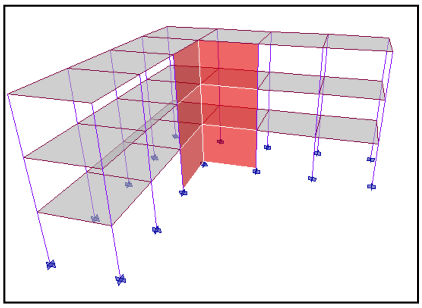

Figure 9: Unusual 3-story building with curtain wall - 3D model

Comparison of thrust curves of an unusual 3-dimensional structure with and without walls. The shear capacity of the shear and the removal power caused by thrust analysis as indicated.

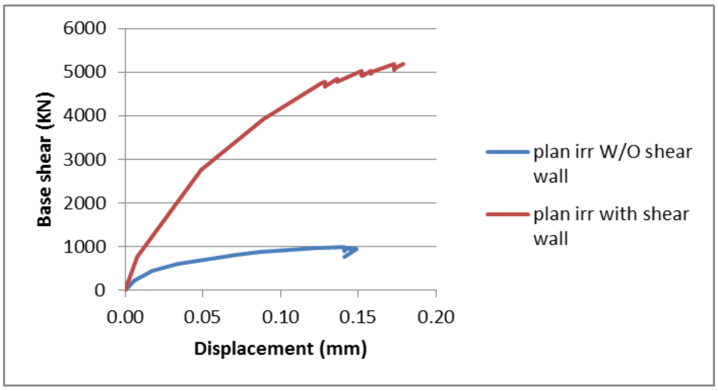

Figure 10: Thrust curve compression - A 3-story unusual structure with a curtain wall and exterior

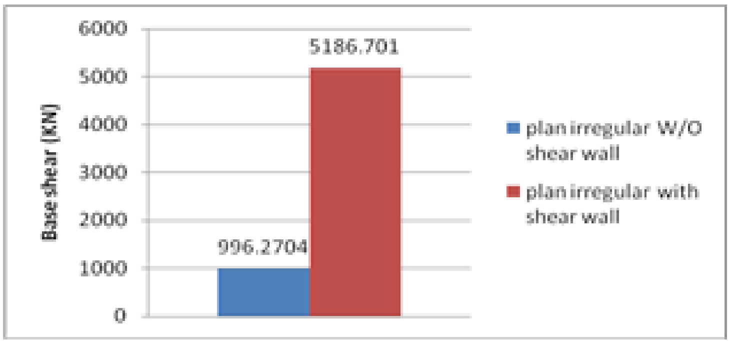

Figure 11: Comparison of basic shear volume - 3-Ply Unusual structure with curtains and no shear wall

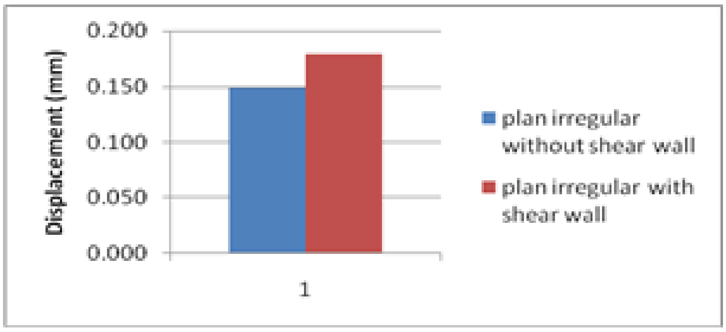

Figure 12: Transmission Comparison - 3-story unusual building with curtains and no curtains

The current work aims to explain the modeling considerations and the results from the current analysis work. Then different modeling details of the 3rd, 6th, and 9th-floor structures are presented and the results are explained which explains the impact of the system on the seismic behavior of the reinforced concrete structure. The results of unusual structures with and without orbits were presented to measure the performance improvement of informal structures by earthquakes and the addition of barbering walls.

VI. CONCLUSION

In this study, attempts were made to investigate possible improvements by introducing barbecue walls using seismic impairment and thrust analysis of random structures. Thrust Analysis is a simple and effective tool for measuring the seismic behavior of RC structures. The structure of the structure in terms of the volume of the shear base, the ductility of the displacement, the working surface, and the condition of the composite structure helps to compare the quantity of reinforced concrete structures. The future scope is presented as follows:

- It has been noted that the introduction of systemic irregularities causes significant damage to earthquake structures with strong concrete structures.
- The shear volume of the foundation has greatly decreased due to systemic instability. In addition, it has been determined that an increase in the amount of system deficit causes a decrease in the carrying capacity of the foundation of the structure.
- Decreasing the capacity of the basement due to systemic failure was found to be 44.4% in the 3-story building, 42.09% in the 6-story building, and 22.52% in the 9-story building with an uncommon high-resolution structure.
- Decreased foundation capacity of the foundation was particularly evident in low-rise buildings.
- The working site of the plan is located in the most critical areas of damage to unfamiliar buildings, and the condition of the hinges created in the workplace has reached the most critical levels of damage to unfamiliar buildings. The same pattern has been observed in 3-story, 6-story, and 9-story buildings.
- A close study of the condition of the hinges formed during the thrust analysis clearly shows that the chances of damage both locally and globally increase in buildings with an unusual structure, as the hinges are associated with higher levels of damage (Preventing collapse and beyond)
- The introduction of shaving walls has resulted in significant improvements in the shearing capacity of the foundation of the building. The increase in shear shear volume due to shaving was almost 4.2 times in the 3-story building, 3.12 floors of the 6-storey buildings, and 2.21 times in the 9-story buildings, and the effect was most noticeable on low-rise buildings.
- The introduction of shaving walls also reduced the wear of the hinges built into the thrust analysis function.

The conclusions drawn from this study can be summarized as follows:

- Thrust analysis in framed structures per the recommendations of ATC 40 is an effective tool for assessing the seismic performance of buildings.
- Comparing seismic behavior of reinforced concrete structures with and without structural defects has shown the poor performance of reinforced concrete structures with structural defects.
- An attempt to quantify the impact of the negative impact on the seismic behavior of reinforced concrete structures has shown that there is a decrease in the seismic activity of the building by increasing the number of systemic instability.

- Considering the type of joints that are designed to cut the foundation, relocation, work area, and buildings with standard and non-standard structures, it is determined that structures with structural defects are very sensitive and require appropriate reinforcement.
- The introduction of barber walls is an effective solution to improve the seismic volume of unplanned buildings.

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