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DYNAMIC ANALYSIS OF SHEAR BUILDING AT DIFFERENT LOCATIONS IN DIFFERENT SEISMIC ZONES USING CYPECAD

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Abstract - *Simple kinds of structure were presumably utilized to provide protection from the sun, wind, and rain at the beginning of the building's history. According to archaeological and anthropological research, the history of constructed forms and building enclosures has furthered this knowledge that history helps explain distinct types of structures, unique construction processes, and a broad variety of materials used today. The current research involves adding a shear wall to an RCC structure in order to acquire the requisite stability, strength, and stiffness to withstand horizontal stresses (Seismic load). CYPECAD was used to assess a regular shaped with or without a shear wall. The outcomes of the Response spectrum approach employing CYPECAD are investigated. With the use of a structural shear wall system, the planned building is designed to decrease displacement. Storey displacement, storey drift, and story shear are the factors investigated in this work.*

Key Words: Storey displacement, storey shear, lateral forces, shear wall, seismic area.

1. INTRODUCTION

In recent decades the one problem arising nationwide is the rapid increase in population, this issue however directly and indirectly impacts on the rate of construction. Although the construction is spreading in horizontal direction, due to this issue there is an urge for construction to increase in vertical direction also resulting in apartments, skyscrapers and other multi-storey buildings.

Shear Wall: A reinforced concrete framed construction that can withstand lateral pressures like wind. Shear walls are commonly employed in high-rise structures that are subjected to lateral wind and earthquake stresses. Wind pressures become more significant as a structure's height grows in reinforced concrete framed constructions. Horizontal movement or sway is restricted under codes of practice.

In building construction, a strong vertical diaphragm capable of transmitting lateral loads from outer walls, levels, and roof to the base foundation in a plane parallel to their surfaces.

CYPECAD: Homes provide us with both living space and shelter from the outdoors. Systemic style is a technique that uses economy and simplicity to produce a safe, operational, and long-lasting foundation. Commercial training is vital to the development of practical knowledge abilities for every designer in the current environment. Structural loads, circumstances, and strong properties must all be known in order to conduct an accurate study. The outcomes of such an analysis included support actions, pressures, and displacements. The purpose of this study is to provide a system that is secure, serviceable, long-lasting, and cost-effective. The created building should be able to resist exceptional loading situations. Under normal working conditions, cracking and fracture must not exceed the structure's capability. The seismic weight, wind load, dead weight, and living load of the building are calculated and imposed. The maximal safety factor should be considered in load cases to ensure that the building does not fail due to natural hazards or overloaded. IS codes are utilized in manual computations.

Meaning of CYPE		
LANGUAGE	SPANISH	ENGLISH
C	CALCULOS	CALCULATION
Y	Y	AND
P	POTOLOGY	PATHOLOGY OF (Scanning)
E	ESTRUCTURAS	STRUCTURES

Table-1: Meaning of CYPE

2. OBJECTIVES

- To comprehend the structure's fundamental concepts using IS codes.
- To examine the structure's structural details.
- To be aware of the design parameters of beams, slabs, columns, stairwells, and other structural elements.
- Using tools for comprehensive design and analysis, create a 3D model of the structure.

- To design and assess a multistory residential structure utilizing CYPE software in order to achieve optimum accuracy and economic value.

3. METHODOLOGY

- Preparation of plan in Auto CADD.
- Importing to CYPECAD.
- Input All Data for the Analysis of structure.
- Analysing the Model in different Zones.
- Check the Results in CYPECAD.
- Using M.S Word Tabulate the values.
- Draw the Graphs for different zones.

4. LOAD COMBINATIONS

1. EQX
2. EQZ
3. DL
4. LL
5. 1.5(DL+LL)
6. 1.5(DL+EQX)
7. 1.5(DL-EQX)
8. 1.5(DL+EQZ)
9. 1.5(DL+EQZ)
10. 1.2(DL+LL+EQX)
11. 1.2(DL+LL-EQX)
12. 1.2(DL+LL+EQZ)
13. 1.2(DL+LL+EQZ)

5. DESCRIPTION OF MODEL

1. Structure : RCC Framed Structure with & without shear wall.
2. Plan Dimension : 18.50 X 12.50 M along X and Y directions.
3. No of storey : Basement+10
4. Grade of concrete : M 35
5. Grade of steel : Fe 500
6. Floor to floor height : 3.15 m (All floors)
7. Beam dimension : 300mmX600mm
8. Column dimension : 300mmX750mm
9. Thickness of slab : 150mm
10. Wall thickness : 230mm
11. Shear wall thickness : 200mm
12. Density of concrete : 25kN/m3
13. Masonry density : 20kN/m3
14. Soil type : Medium
15. Zone factor : II, III, IV, V

Loads considered

- Live load : 2.00 kN/m
- Floor finish : 1.5kN/m
- Dead load of Wall load : 13.00kN/m

6. BUILDING MODELING

In this study G+10 Building is considered soil Type-II & Different Seismic zones. Shear wall is constructed for regular frame. Analyse the regular building using CYPECAD.

- Model I: Regular frame without Shear wall.
- Model 2: Regular frame with Shear wall at building corners
- Model 3: Regular frame with Shear wall at building periphery.

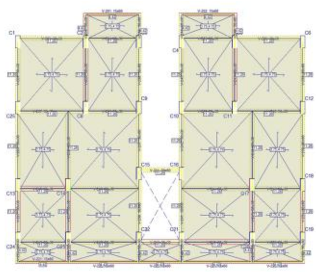

Fig 1: STRUCTURAL PLAN OF MODEL-1

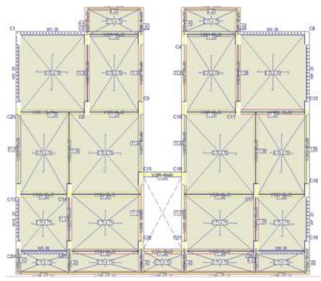

Fig 2: STRUCTURAL PLAN OF MODEL-2

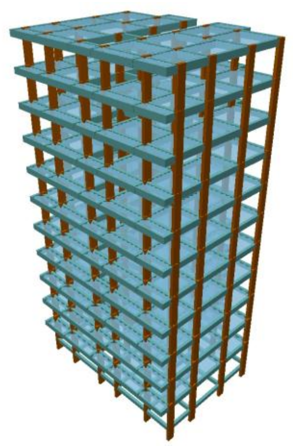

Fig 3: STRUCTURAL 3D VIEW OF MODEL-1

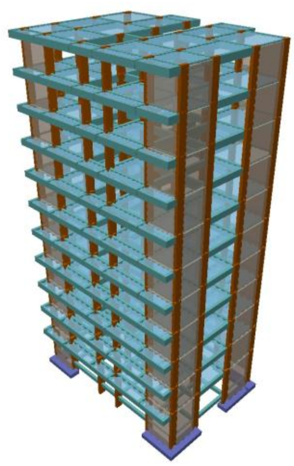

Fig 4: STRUCTURAL 3D VIEW OF MODEL-2

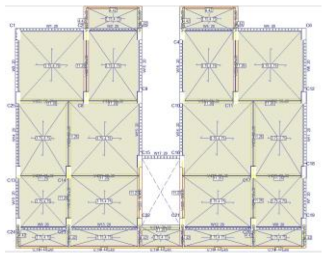	
Fig 5: STRUCTURAL PLAN OF MODEL-3	**Fig 6: STRUCTURAL 3D VIEW OF MODEL-3**

7. RESULTS AND DISCUSSIONS

CYPECAD results were obtained for analysis of G+10, models without and with shear wall are shown for the parameters such as storey shear, storey drift, storey displacement.

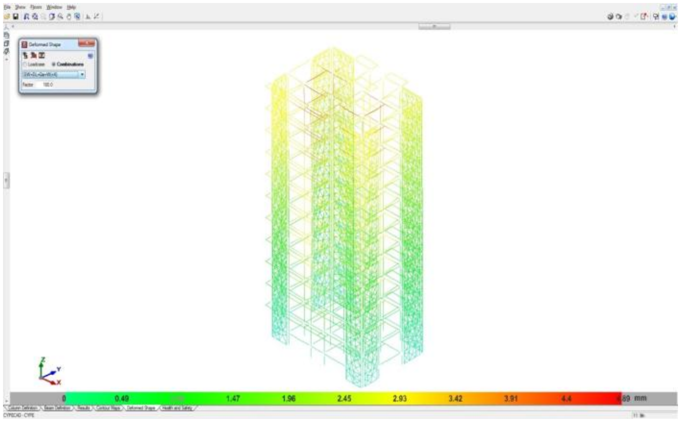

Fig -7: Storey Displacement 3D View

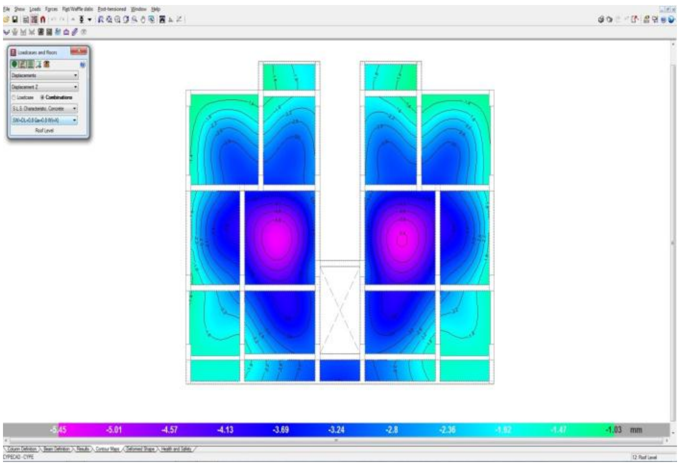

Fig -8: Maximum Displacement Diagram

7.1 Storey Displacement

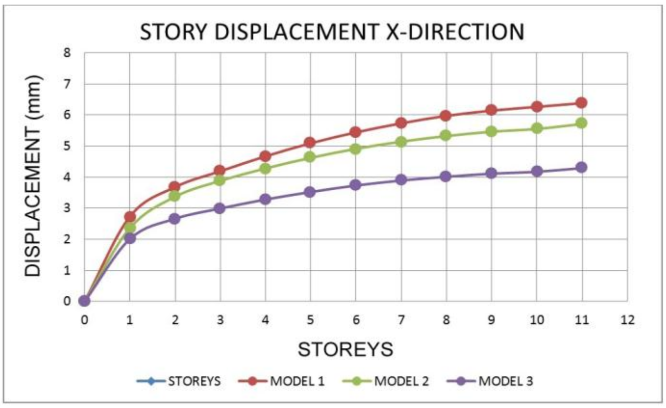

Chart -1: Displacement v/s storey along X direction for zone II

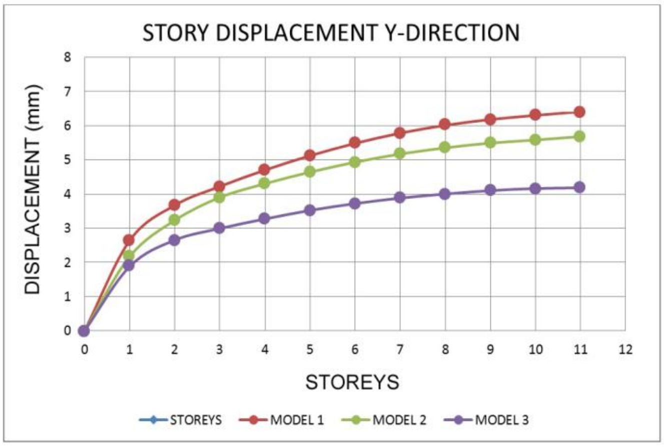

Chart -2: Displacement v/s storey along Y direction for zone II

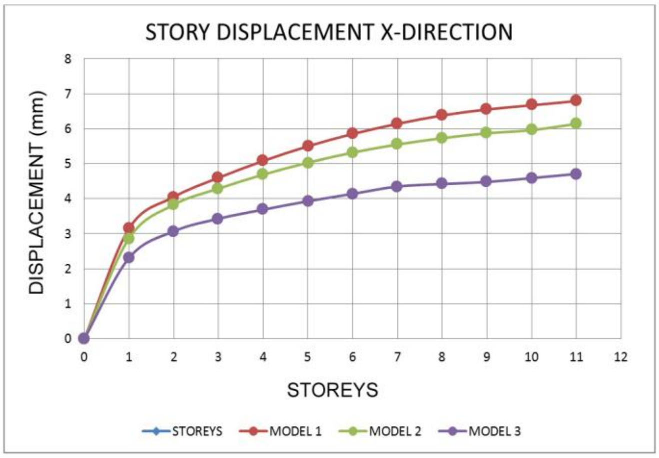

Chart -3: Displacement v/s storey along X direction for zone III

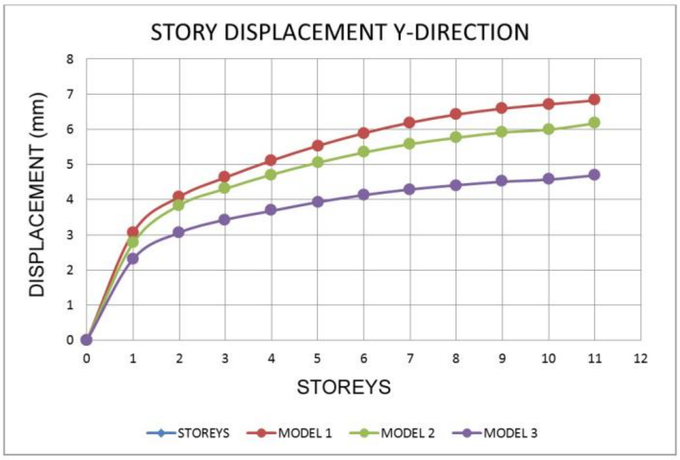

Chart -4: Displacement v/s storey along Y direction for zone III

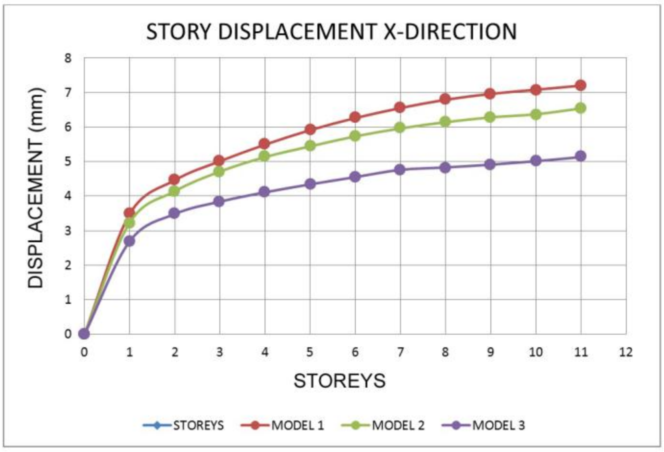

Chart -5: Displacement v/s storey along X direction for zone IV

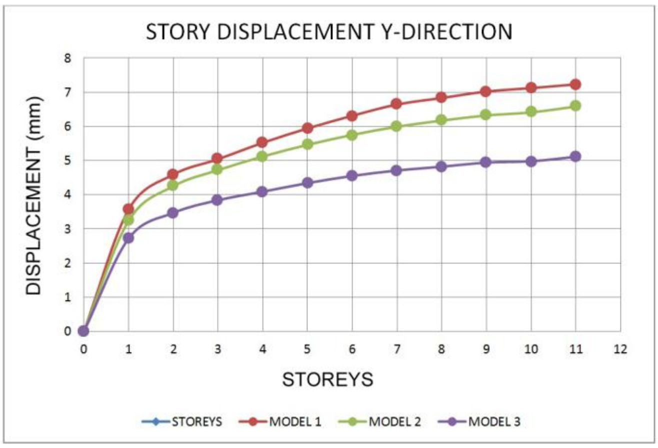

Chart -6: Displacement v/s storey along Y direction for zone IV

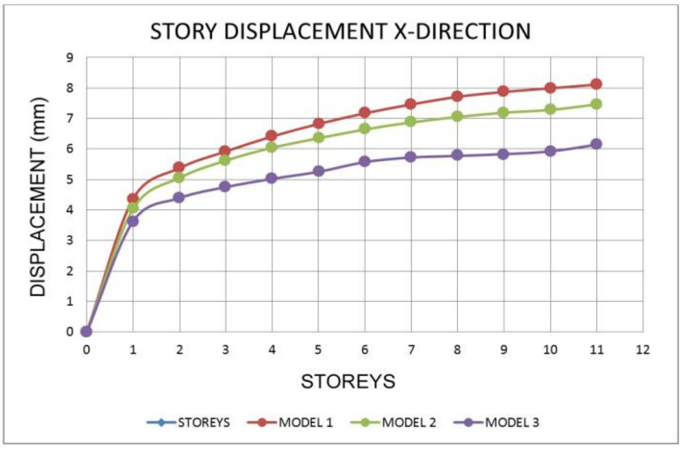

Chart -7: Displacement v/s storey along X direction for zone V

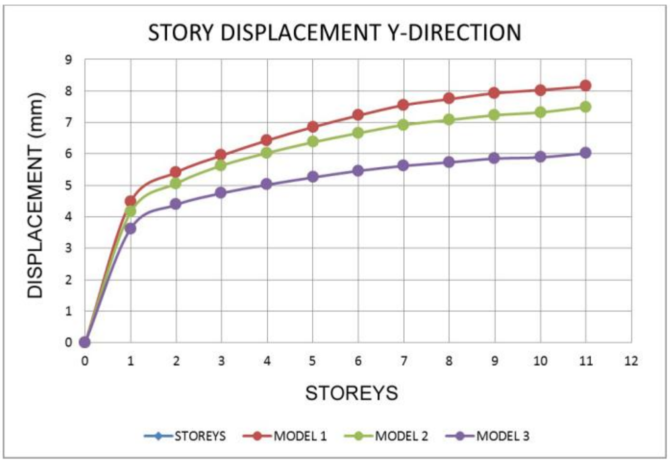

Chart -8: Displacement v/s storey along Y direction for zone V

7.2 Storey Drift Ratio

The Drift ratio of storey for response spectrum method is tallied in tables with X & Y axes for all storeys and models, and for each earthquake zones, graph provided. For seismic zones, it is discovered that the % increase in the drift ratio is the same.

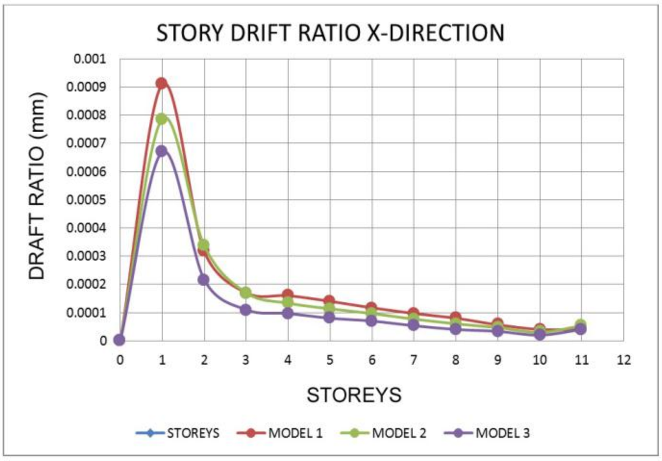

Chart -9: Drift ratio v/s storey along X direction for zone II

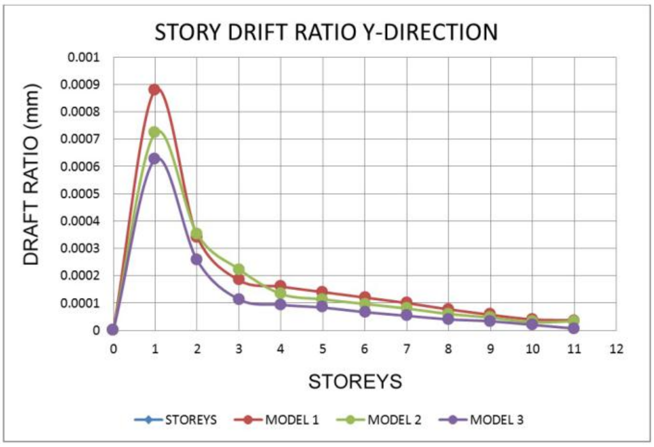

Chart -10: Drift ratio v/s storey along Y direction for zone II

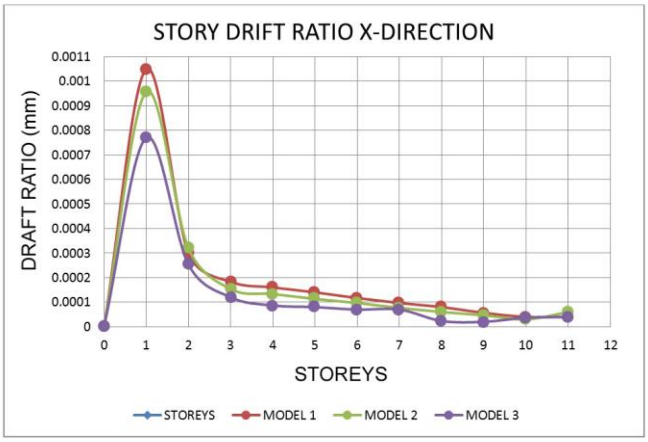

Chart -11: Drift ratio v/s storey along X direction for zone III

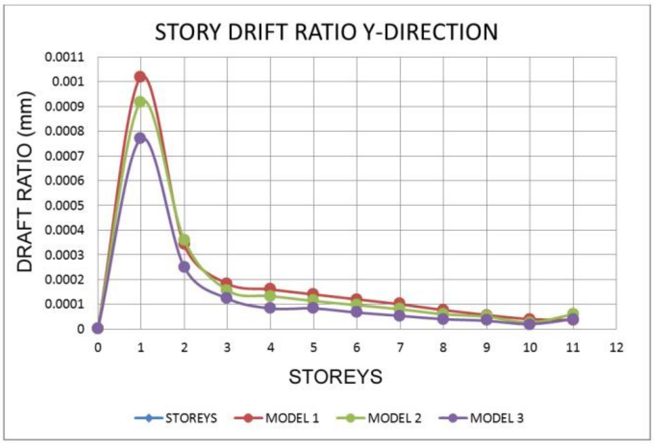

Chart -12: Drift ratio v/s storey along Y direction for zone III

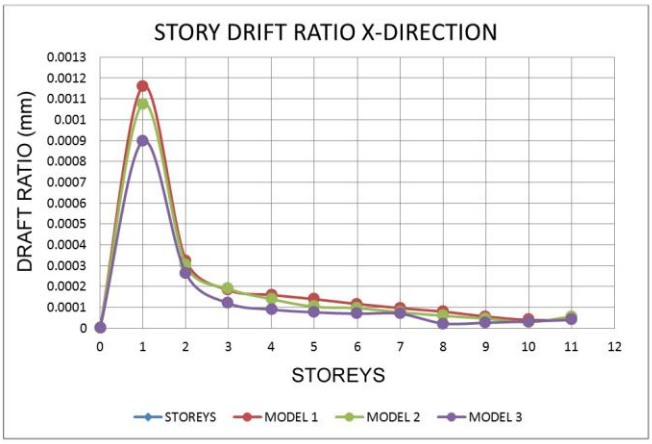

Chart -13: Drift ratio v/s storey along X direction for zone IV

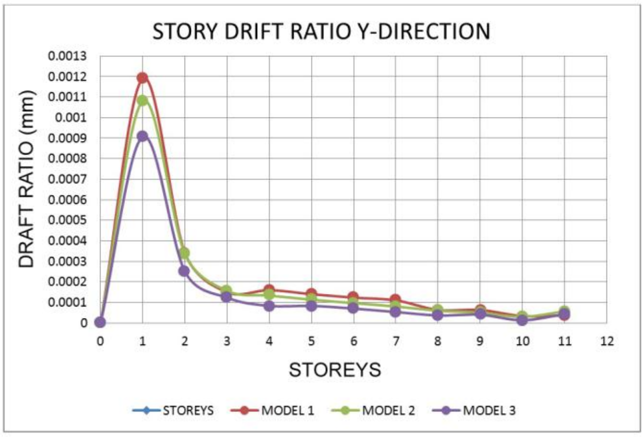

Chart -14: Drift ratio v/s storey along Y direction for zone IV

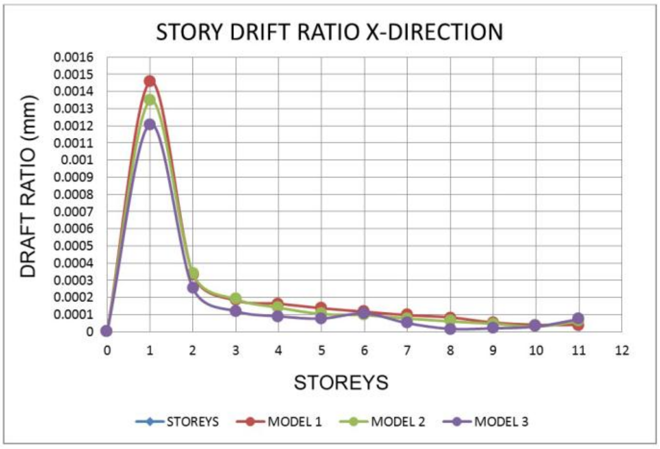

Chart -15: Drift ratio v/s storey along X direction for zone V

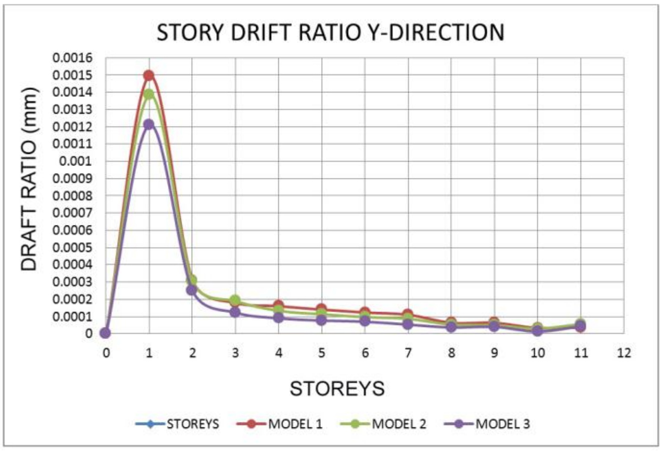

Chart -16: Drift ratio v/s storey along Y direction for zone V

The current research aims to better understand the impact of shear walls on structures in earthquake-prone zones. Following are the conclusions obtained from the analysis carried out:

- Shear walls significantly increase the rigidity and strength of the frame structure, hence ignoring them during structure analysis and design will result in failure due to stiffness irregularity.
- Symmetry in position of shear wall in plan is a key factor to obtain desirable performance of shear wall structure.
- Increment in number of storeys make the building frame more vulnerable and therefore shear wall becomes a necessity in high rise buildings to save damage due to earthquake.
- As the number of storeys increases, lateral movement increases, resulting in increased storey drift. As a result, we've discovered that high-rise buildings without shear walls are vulnerable to collapse under seismic stresses, posing a risk to both life and property.
- The structure with the shear wall at the corners has a higher base shear than the other structure. As a result, shear walls at corners in more earthquake-prone places are viable.
- When a structure has a shear wall at the corners, the storey displacement is lower than when the building does not have a shear wall. As a result, it is possible to construct a shear wall.

Shear walls have a wide range of benefits, including:

- Because of their strong rigidity in their own plane, they can effectively reduce undesirable deflection.
- Act as fire compartment walls, with the ability to withstand the effects of lateral wind on the superstructure and earth motion on the substructure.

Shear walls, on the other hand, are more time intensive and less exact in measurements than steelwork for below ten stories). In general, RC walls develop sufficient stiffness and strength to withstand loading from the side of building. These walls have a low degree of ductility and may not be able to withstand the energy necessary in a major earthquake.

8. CONCLUSIONS

The conclusions about dynamic response spectrum analysis of RCC Structural frame with or without shear wall are drawn from the results.

- In all zone models, the displacement at the top level is higher.
- Models with a shear wall reduce movement, resulting in models with the least displacement when compared to other models.
- As the number of seismic zones increases, so does the number of displacements in the response spectrum way of analysis.
- When compared to other models, the movements in the shear wall model-3 are less.
- In zone V, the percentage reduction for model-1 and model-2 is 8.49 % and 9.86 %, respectively, compared to the least displacement model, model-3.

- From the lowest to the top story, the displacement rises steadily.
- In models 1 and 2, the story drifts gradually decreased.
- For all zones, the Drift ratio is lowest in model-1 and model-2 in the X and Y directions.
- For all earthquake regions, the proportion of increase in displacement and drift ratio is the same.
- The base shear values are increasing in all zones, with zone V having the greatest base shear value.
- Model-3 has the highest base shear of all the zones.

ACKNOWLEDGEMENT

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