Structure analysis of multistoried building for different plan configuration

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Abstract - There are many types of structures which constructing now a days but frame structures are those structures which are having the combination of beam, column and slab to resist the lateral and gravity loads. These structures are usually used to resist the large moments developing due to the applied loading.In this paper the bay frame structure of RCC Regular shape building and LShape irregular building is studied in different seismiczones.

The following conclusions can be drawn from study that bending moment along x, y, and xy direction is more in L Shape building than in regular shape RCC building. And the Membrane and Shear Stresses are also more in L Shape building than in Regular shape RCC Building in different seismic zones 2 and 5 statically. While bending moment along x, y, and xy direction is less in L Shape building than in regular shape RCC building. The Membrane and Shear Stresses are also less in L Shape building than in Regular shape RCC Building indifferent seismic zones 2 and 5 dynamically.

Key Words: Moment, Shear Forces, Membrane Forces

1. INTRODUCTION

1.1 General: Many types of structures which are constructing now a days but the framed structures are the structures which are having the combination of column ,beam, and slab to resist the gravity and lateral loads.

1.2 Types of framed structures are as follows:

1.2.1 Rigid Structural Frame

Rigid means ability to resist the deformation of frame . Rigid frame structures are the structures in which beams & columns are constructed and they act collectively to resist the moments which are generating due to applied load.

1.2.1.1 A pinned ended frame: In a rigid frame system we usually have pins at their support conditions. This frame system in which supports are pinned is considered to be non rigid frame if its support conditions are removed.

1.2.1.2. Fix Ended Rigid Frame Structure: Fix ended rigid frame is a type of rigid frame systems in which end conditions are usuallyfixed.

1.2.2 Braced Structural Frames In Braced frame system, bracing are usually provided between beams and columns of frame to increase their resistance against the lateral loads and side forces due to applied horizontal load. Bracing is done by placing the diagonal members between the beams and columns of frame. This braced frame system provides more resistance against the earthquake and wind forces. This braced frame system is more effective than rigidframe system

1.2.2.1 Gabled Structural Frame:

In a Gabled frame structures the peak is at the top of frame . These gable frames systems are used where there are heavy rain and snow possibility is there.

1.2.2.2 Portal Structural Frame

Portal structural frames usually look like a door. Portal frame system is in use for construction of industrial and commercial buildings.

Load path in Frame Structure:

In frame structure it is a path through which the load of a frame structure is transferred to the foundations. In frame structures, generally the load path is:

Advantages of Frame Structures

1. One of the best advantages of frame structures is their ease in construction. It is very easy to teach the labour at the construction site.
2. Frame structures can be constructed rapidly.
3. Economy is also very important factor in the design of building systems. Frame structures have economical designs.

1.3 Disadvantages of Frames:

The span lengths are usually restricted to 40 ft in framed structure. As the spans greater than

1.4 Methods of Analysis of Frame:

Elastic analysis of frame deals with the study of strength and behaviour of the members and the structure at working and limit loads. Frames can be analysed by various methods. However, the method of analysis of frame adopted depends upon its configuration (portal bay or multibay) multi-storeyed frame, the types of frame, and Degree of indeterminacy. It is based on the following assumptions:

1. The Relation between force and displacement in frame is linear. (I.e. Hook's law isapplicable).
2. The Displacements in structure are extremely small as compared to the geometry of thestructure

2 METHODOLOGY

2.1 General: In this Paper of research the bay frame building of concrete is analysed statically and dynamically under different seismic zones of earthquake.

2.2 Preliminary Sections and materials considered: The plan area for the proposed work is 20x30 m in which size of panels is 5x6 m. The properties of material adopted are:

2.2.1 The Young's modulus of elasticity of concrete adopted was 25,000 MPa while the Poisson's ratio was 0.2.

2.2.2 The preliminary sections of columns and beams were fixed on the basis of deflection criteria [i.e. span to depth ratio].

3. Loads Considered:

3.3.1 Dead Load: The loads considered are as follows:

The self-weight of slab = 0.2 x 1 x 1 x 25 = 5 kN/m2

Load considered due to floor finish= 1 kN/m2

3.3.2Live Load: Live load adopted for floor slab and roof according to IS 875 part-II: 3 kN/m2 .

3.3.3 Earthquake Load: Response Reduction Factor: Depends on the perceived seismic damage of structure, it is characterised by ductile or brittle deformation; was taken from table-7(clause 6.4.2) IS1893 Part-1:2002. Importance Factor: Depends on the functional use of building characterised by hazardous consequences of its failure, it is taken from table-6 (clause 6.4.2) of IS1893 Part-1:2002. Time Period of undamped free vibration. In the present work, parameters of earthquake load were considered as: 14

Load Combinations as considered for static analysis: The load combinations were adopted according to IS 1893 Part-1: 2002 & IS 456:2000:

1. 1.5(DL + LL)
2. 1.2(DL + LL + EQX)
3. 1.2(DL + LL - EQZ)
4. 1.2(DL + LL + EQZ)
5. 1.2(DL + LL – EQZ)
6. 1.5(DL + EQX)
7. 1.5(DL – EQX)
8. 1.5(DL + EQZ)
9. 1.5(DL – EQZ)
10. 0.9DL + 1.5EQX
11. 0.9DL - 1.5EQX Here X & Z are the directions of earthquake loads considered in the analysis.

Generation of model using STAAD. Pro:

1 Create a new file and input the properties of member's i.e column, flat slab and shear wall.

2 Apply different loads on the structure and design the elements and then run analysis.

3 Go to post processing mode and get the results of members and elements.

4 View the output file to get the design results of all the members and elements

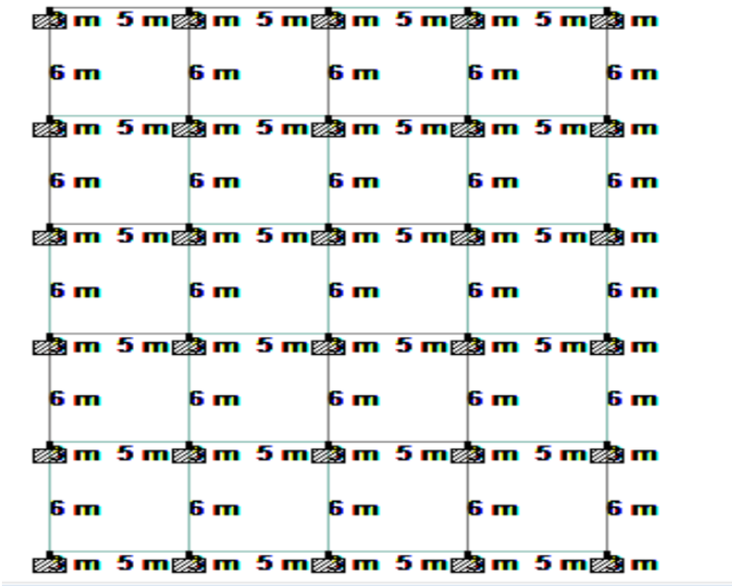


FIG. NO. 7 (PLAN OF MULTISTORIED BUILDING)

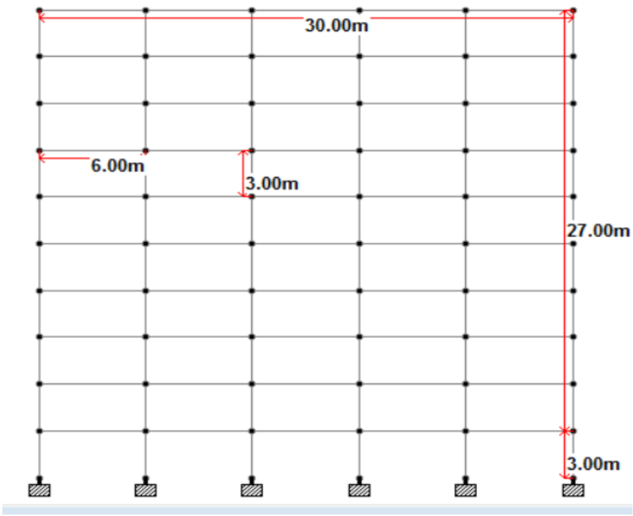


FIG. NO. 8

ELEVATION OF MULTISTORIED BUILDING

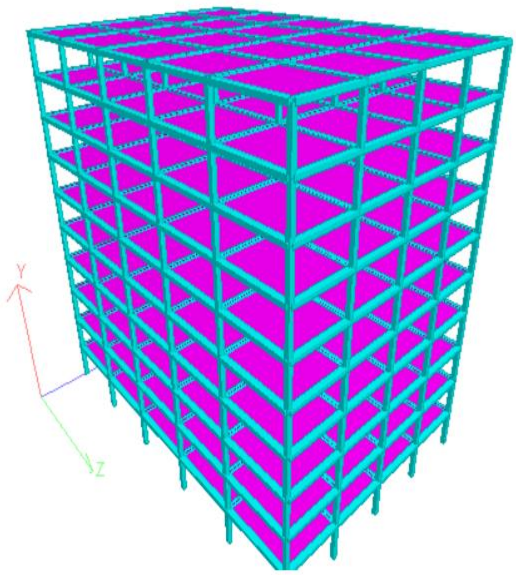


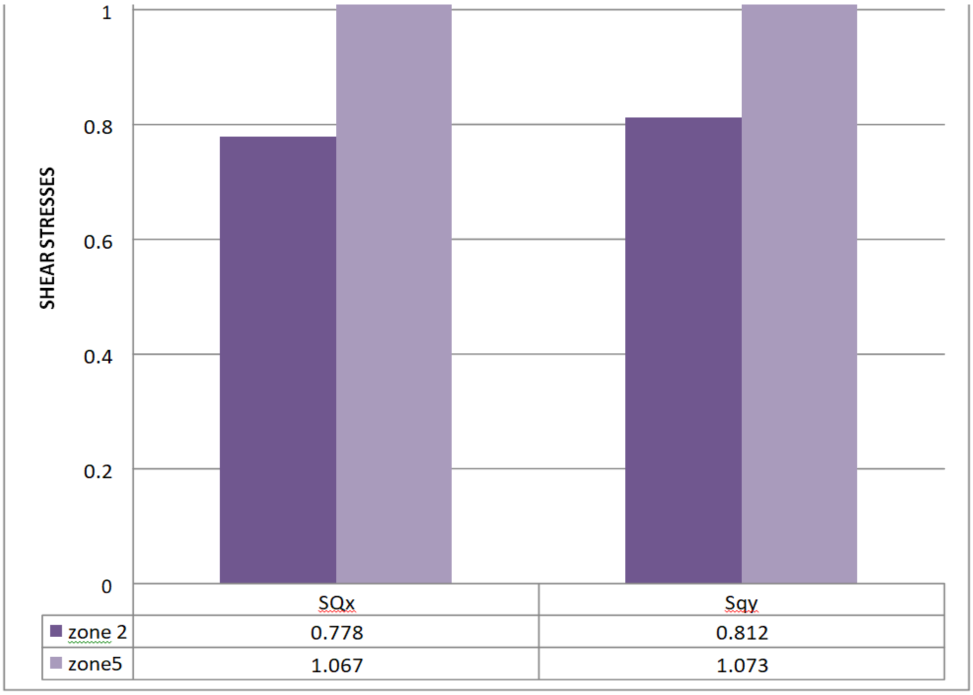
FIG. NO. 9

3 D VIEW OF MULTISTORIED BUILDING

4. Results

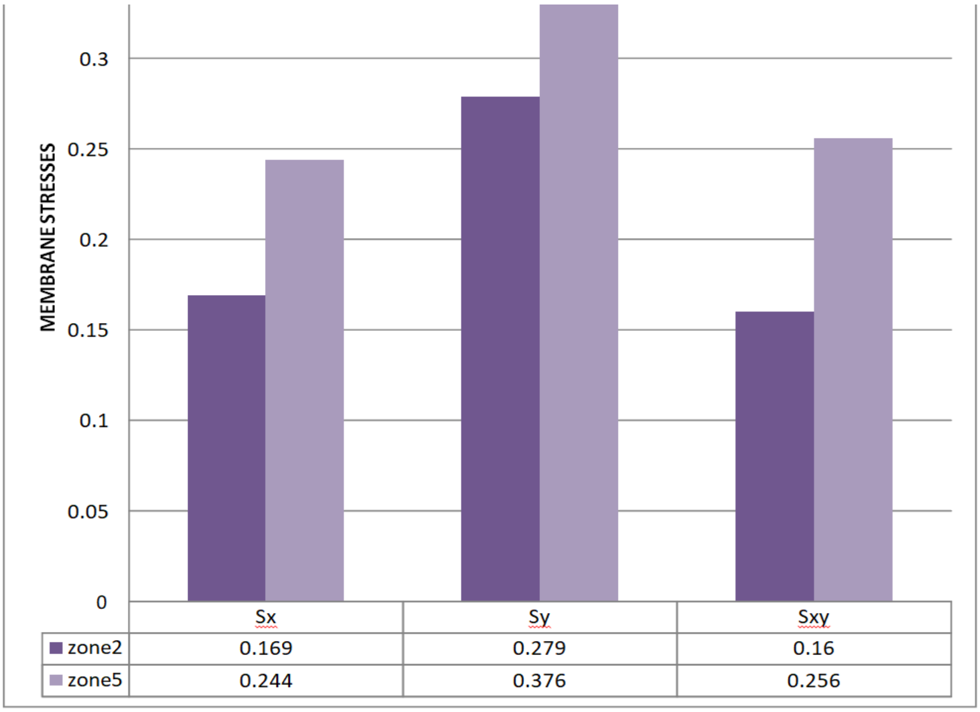
The Static and dynamic analysis of Bay Frame of Size 20*30 m is carried out for different seismic zones in 10 storey multi-storeyed building for finding the seismiceffects in multi-storeyed structure

Shear Stresses for bay frame dynamically in different seismic zones



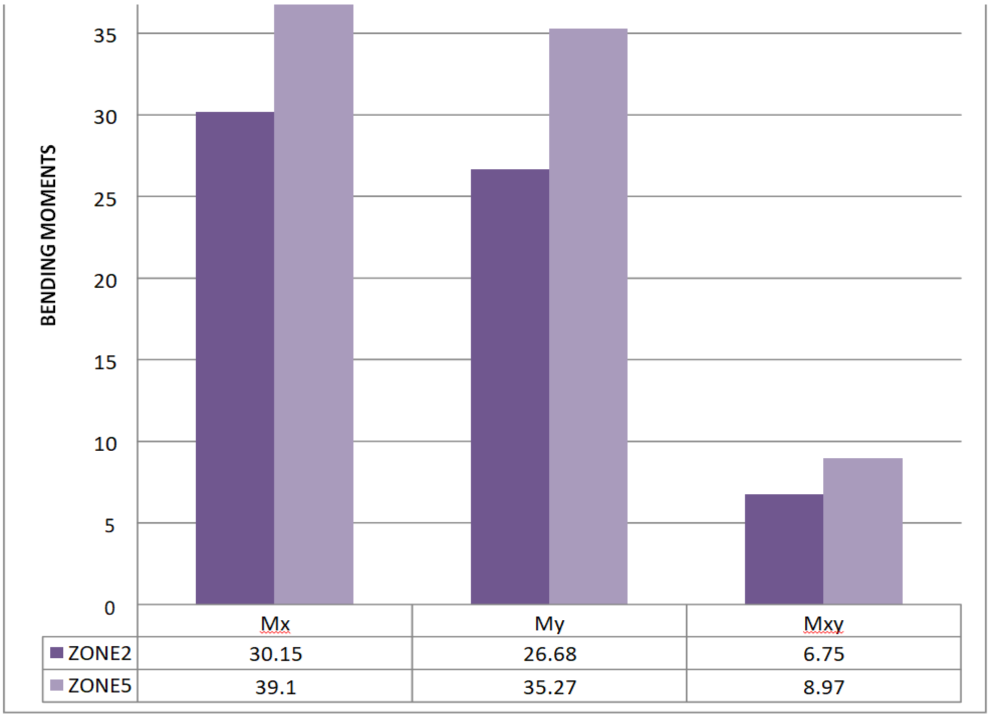
	SQx	Sqy
zone 2	0.778	0.812
zone5	1.067	1.073

Membrane Stresses for bay frame dynamically in different seismic zones

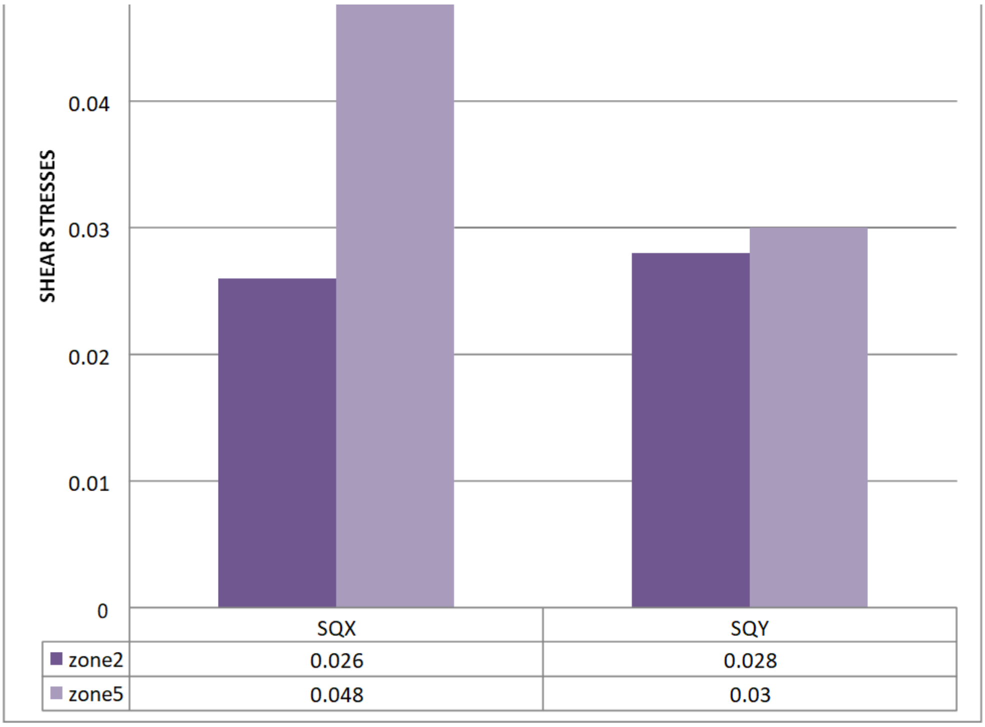


	Sx	Sy	Sxy
zone2	0.169	0.279	0.16
zone5	0.244	0.376	0.256

Bending Moment for bay frame dynamically in different seismic zones



Shear Stresses for bay frame Staticallyin different seismic zones



5. CONCLUSIONS

The shear stresses in x and y direction in bay frame increases dynamically in zone 5 than in zone 2

1. The membrane stresses in x,y and xy direction in bay frame increases dynamically in zone 5 than in zone
2. The bending moment in x, y, and xy direction in bay frame increases dynamically in zone 5 than in zone 2

3. The shear stresses in x and y direction in bay frame increases statically in zone 5 than in zone 2

4. The membrane stresses in x,y direction has no variation in zone 2 and zone 5 and in xy direction in bay frame increases dynamically in zone 5 than in zone 2

5. The bending moment in x and xy has no variation in zone 2 and zone 5 and bending moment in y direction in bay frame increases dynamically in zone 5 than in zone 2

6. Frequency variation in zone 2 and zone 5 varies about more in zone 5 than in zone2

7. Peak storey shear for zone 2 and zone 5 for 10 floor in x and z direction is more in zone 2 than zone5

8. Peak storey shear for zone 2 and zone 5 for base floor in x and z direction is more in zone 2 than zone 5

9. Bending moment along x, y, xy direction is more in L Shape building than in regular RCC building in different seismic zones2 and 5 statically.

10. embrane Stresses along x, y, xy direction is more in L Shape building than in regular RCC building in different seismic zones2 and 5 statically.

11. Shear Stresses along x, y direction is more in L Shape building than in regular RCC building in different seismic zones2 and 5tatically.

12. 13. Bending moment along x, y, xy direction is less in L Shape building than in regular RCC building in different seismic zones2 and 5 dynamically.

13. Membrane Stresses along x, y, xy direction is less in L Shape building than in regular RCC building in different seismic zones2 and 5 dynamically.

14. Shear Stresses along x, y direction is less in L Shape building than in regular RCC building in different seismic zones 2 and 5 dynamically.

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5 **Rajib Kumar Biswas, Md.Meraj Uddin, Md.Arman Chowdhury, Md.Al- Imran Khan:** work was concerned to increase lateral stiffness of flat plate structure and to minimize the displacement of the structure under lateral loading

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