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Effect of Building Shape on G+5 Residential Building for Seismic Foreces

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Abstract— *Structure is to be design for seismic forces by considering earthquake parameter. To design structure like Earthquake Resistant is very important factor in building designing of irregular shapes. The main objectives of study is to find earthquake effect of building shape of R.C.C. Structure. We have carried out dynamic analysis of shapes of structure, Method is adopted for analysis is Response Spectrum Analysis. We have considered 4 different shape of structure like Rectangle, Square, C-shape & L-shape. Seismic forces are applied on that all shape of structure, then we can conclude that the effect of all shapes of structure like mode shapes, mass participation factor, Base Shear, Eigensolution, acceleration. Joint displacement. Software is used for seismic analysis of all shapes of structure is STAAD-PRO V8i. We have carried out this design for the minimize effect of Earthquake on structure. Result are obtained the performance of Regular shapes of structure that is Rectangle and Square are better as compared to Irregular shape of structure that is C-shape and L-shape.*

Keywords—*Seismic forces,Earthquake Resistant,Regular shape,Irregular shapes,Response Spectrum Analysis.*

I. Introduction

Residential building is for people who lives with family. In building construction planning is important factor during construction, there is different forms of architectural view, shapes, building size.

Now after the architectural planning we need to do structural planning and design. It means where is placing of beam and column. In Residential building we are avoid to column as obstruction or couldn't place in wall, we have to put column in such placed it should be going to throughout from ground floor to top floor of the building. We have to do planning of building as per client requirement & safety factor.

Safety is important parameter in building. We have to keep safety in natural calamities like Earthquake and one of the most important factor in building construction is Economy as per architectural and structural planning we need to design as per building economy. Structure is not found heavy in reinforcement, proper planning and structural designing makes structure become light weight.

Earthquake is the most dangerous part of natural disaster which is unpredictable. We can't prevented earthquake but structure should design to resist the earthquake effect. Main objectives of structure, it performance should be good in earthquake.

We have taken different shape of structure like Rectangle, Square, C shape & L-shape. Process are applied to Dynamic Analysis and we are applying to Seismic Forces for to find the Earthquake effect in structure. For analysis method is adopted is Response Spectrum Analysis. We can predict that effect of earthquake through mode shapes of building, frequency, period, acceleration, mass participation factor, displacement, base shear, eigensolution and peak value.

In Modern construction it will be challenges for structural designer to design irregular plan shape of building and structure becomes safe against all external forces of earthquake forces. We know that, structure regularities play important role for well seismic response.

II. Methodology

To prepare the architectural plan for planning of Residential building, Planning should be proper and as per client requirement and aesthetics view.

Now after the architectural planning we need to do structural planning as per design criteria of the RCC structure. For the structural analysis STAAD-PRO V8i software is used to modelling and analysis of various building shape of structure.

Building shapes of four types of structure like rectangle, square, C shape & L-shape, we have to do seismic analysis of various shape of structure.

After the process of analysis of all shape of structure we can compare the effect of various shape of structure.

III. System Development

We know that, for structural analysis and seismic analysis we need structural parameter and earthquake parameter, Location of structure is matter in seismicity. Soil properties is also matter in that region. I have prepared four model in STAAD PRO V8i software, different types of data or parameter are given for to find seismic effect of building shapes of all structure.

TABLE I. MATERIAL PROPERTIES

Properties of Material	**Values**
Area of Building	929 SQ.M.
Column Sizes	300 X 600
Beam Sizes	230 X 600
Height of Building	18 M.
Thickness of Outer Wall	150 MM
Thickness of Inner Wall	115 MM
Thickness of Parapet Wall	115 MM
Thickness of Slab	125 MM

TABLE II. LOAD DATA

Load	**Values**
Dead Load	B X D X Y
Live Load	2 KN/SQ, M.
Roof Live Load	1.5 KN/SQ.M
Floor Finish	1 KN/SQ.M.

TABLE III. SEISMIC DEFINITION

Seismic Parameter	**Values**
Earthquake Zone	II
Zone Factor	0.1
Damping Ratio	5 %
Importance factor	1.2
Response Reduction Factor	3
Type of Structure	1
Type of Soil	3

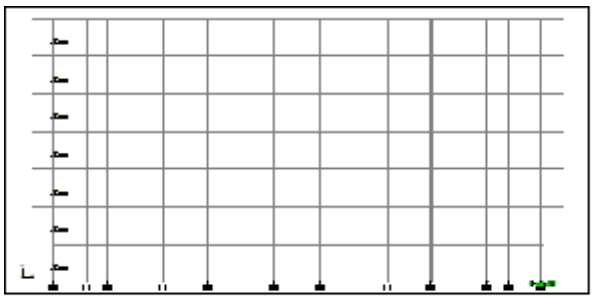

Fig.1. Elevation of Model

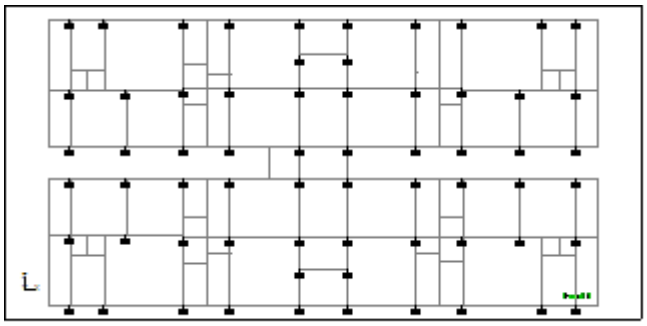

Fig.2. Rectangle Shape

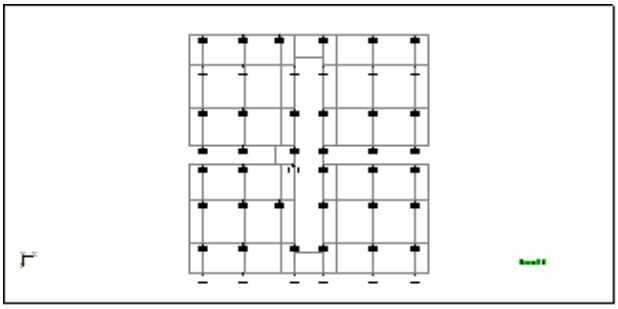

Fig.3. Square Shape

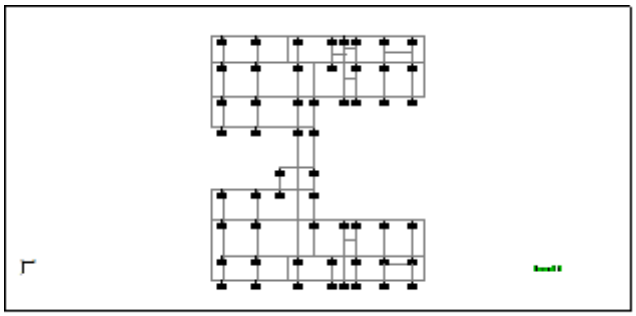

Fig.4. C- Shape

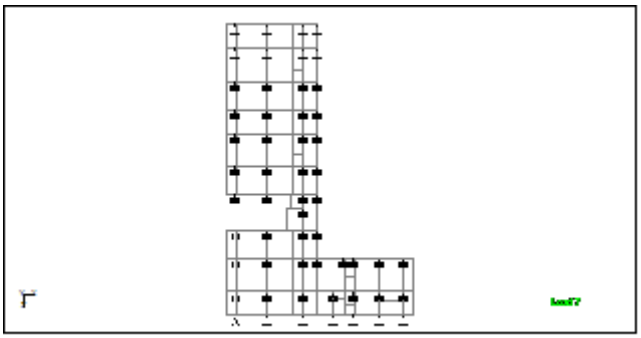

Fig.5. L- Shape

IV. Performance Analysis

In this structure, I have compared mode shapes of building, frequency, period, acceleration, mass participation factor, displacement, base shear, eigensolution and peak value.

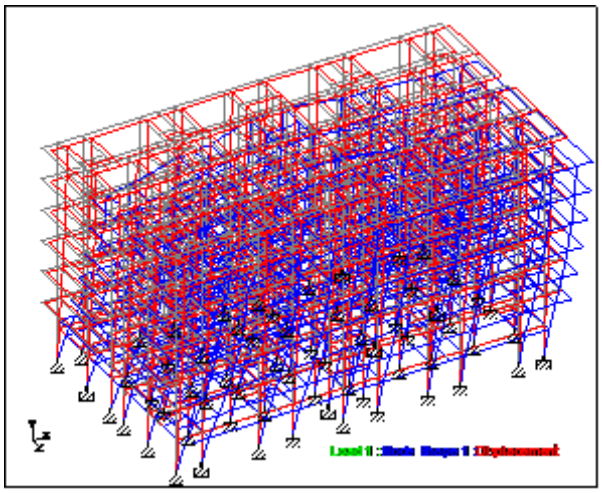

Fig.6. Mode Shape & Deflection Rectangle Shape

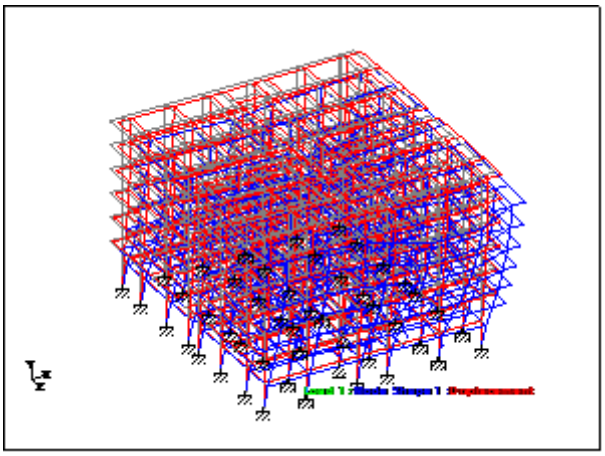

Fig.7. Mode Shape & Deflection Square Shape

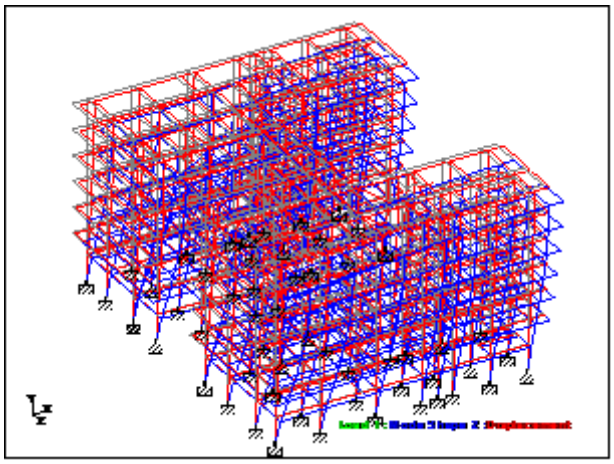

Fig.8. Mode Shape & Deflection C-Shape

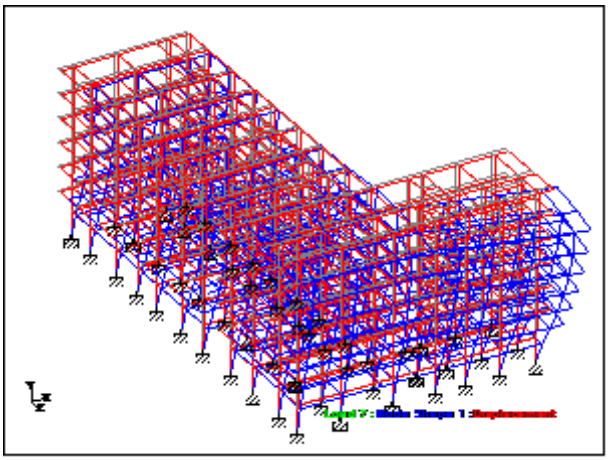

Fig.9. Mode Shape & Deflection L-Shape

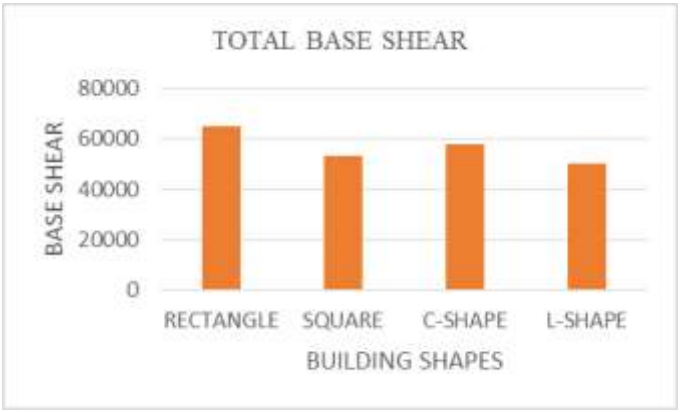

Fig.10. Total Base Shear of Structures

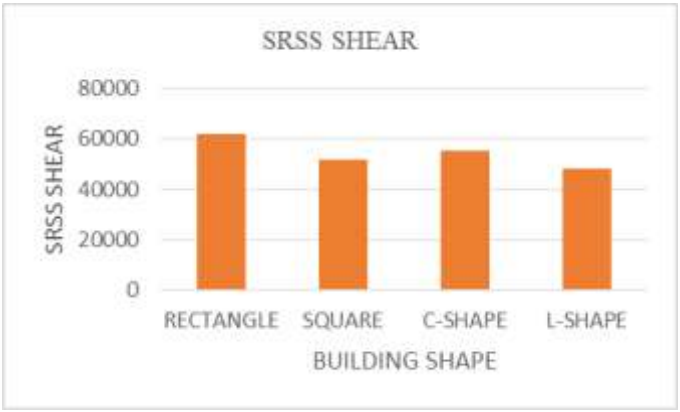

Fig.11. Total SRSS Shear of Structures

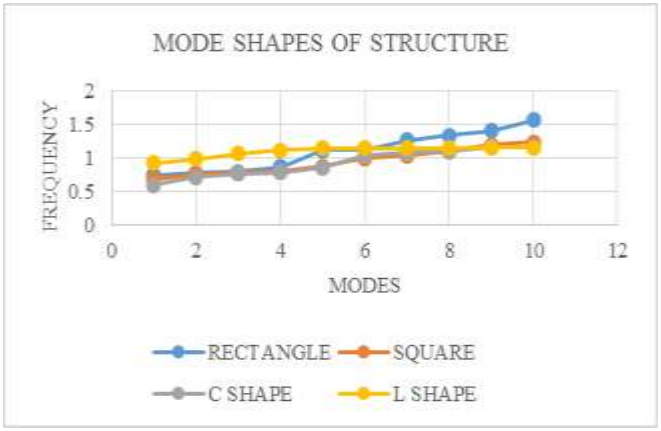

Fig.12. Mode Shape with Frequency of Structures

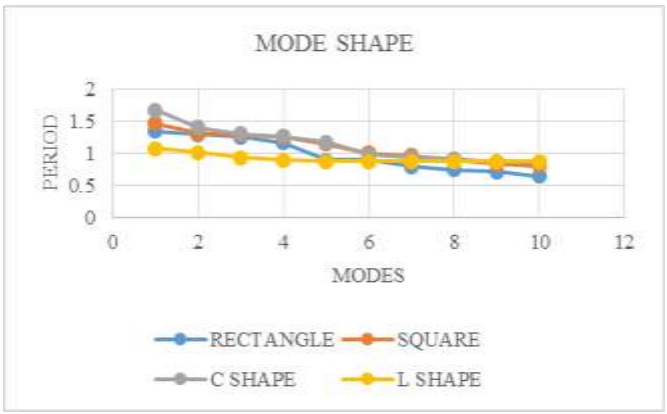

Fig.13. Mode Shape with Periods of Structures

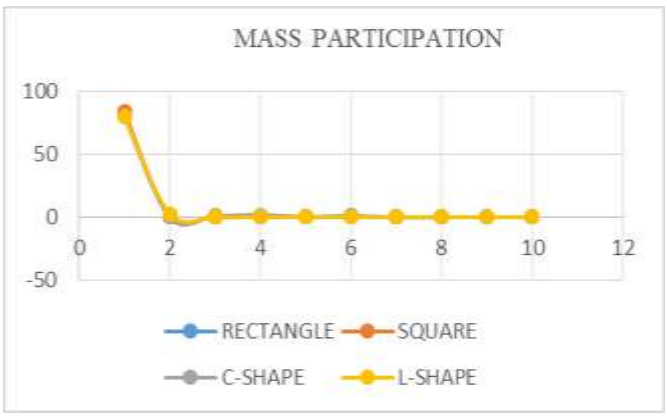

Fig**.14**. Mode Shape with Mass participation of Structures

V. Conclusion

1. Seismic analysis of all shape of structure, maximum deflection is observed in L-SHAPE of Building as compared to Rectangle, Square & C-Shape Building.
2. Considering the effect of earthquake, maximum Base shear is found on Rectangle shape of building and minimum Base shear is Found on L-shape of building, this is conclude from above graph chart.
3. We can conclude that, maximum SRSS Total Shear is found in Rectangle shape of structure as compared to Square, C shape & L shape building.
4. On seismic analysis of regular and irregular plan we can conclude that, during earthquake Regular plan performance are well as compared to irregular plans of structures.

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