NON LINEAR TIME HISTORY ANALYSIS OF IRREGULAR SHAPED BUILDING

[1]Govind H. Dake, [2]Pratik P. Gunge, [3]Vaibhav B. Chavan

[1]Assistant Professor SYCET Aurangabad, [2]M-Tech Student, [3] Assistant Professor SYCET Aurangabad
Department of Civil & Structural Engineering, Shreeyash College Of Engineering & Technology Aurangabad, Maharashtra, India
Dr. Babasaheb Ambedkar Technological University Lonere, Maharashtra, India

Abstract : Earthquake is one of the very vital components to be taken into consideration whilst designing each structure. Lot of work has been said by using many researchers who worked to study the effect of systems with exclusive irregularities. By way of inspiring from their works the assignment is carried out the use of time records analysis in e tabs 2018. In this paper models of L-shaped and L-shaped each of g+30 are taken for evaluation. Both the buildings are assumed to be in Zone v and having medium soil kind. The previous elcentro earthquake 1940 facts has been take for analysis. For this evaluation listed parameters are considered particularly most displacement and float, base shear, most tale acceleration and time period. It's miles found that irregular shaped building ends in growth in displacement, drift, story acceleration, time period and member forces, but reduces the base shear.

IndexTerms -
L-shaped Building,C-shaped, Time History Analysis, E Tabs-2018, Lateral Displacement, Base Shear

I. INTRODUCTION

An earthquake means a sudden earthquake caused by the distribution of technology plates to the earth crust. We know that different types of structural defects are used in modern infrastructure. During the earthquakes, the building tends to fail. This is mainly due to the restriction of geometry, size and durability or some of the various features. These malfunctions are referred to as abnormal structures. So edit oddity is one of the major causes of structural failure during earthquakes. Now an unusual day-to-day layout of the buildings of great need in construction. Therefore during planning all related items should be considered. Once in this case the building must withstand the force of the earthquake in the opposite direction. Therefore this study was designed understand the difference in the response of a different structure during an earthquake. In this study the structure is considered in Zone V, which is medium-sized. The earthquake data for the Elcentro 1940 earthquake is taken analysis. Abnormal shape refers to the uneven distribution of hardness or strength in the face of an earthquake action.

There are often the following types of structural irregularities

1. Plan irregularities
2. vertical irregularities

1. Plan Irregularity: This is the inconsistency of the design of the straight parts of the collision drive, here's how to make the difference between a focal point and a constant, consistent focus it has led to great demand for the building. In other words the state of diversity, or rapid change, rather than stabilize. System failure may be one or more of the following

1) Torsional irregularities
2) Non parallel system
3) Out of Plane offsets
4) Re-entrant corners
5) Diaphragm Discontinuity

Non-Linear Dynamic Analysis:-In this method, the seismic response of the structure is evaluated using step-by-step time history analysis. The main methodology of this procedure is almost similar to the static method of analysis. However, this approach differs in the concept that the design displacements are not established using the target displacement; but, is estimated through dynamic analysis by subjecting the building model to an ensemble of the ground motions. The calculated seismic response is very sensitive to the ground motion characteristics, and the analysis is carried out for more than one ground motion record.

Objectives of Study:-The objective of the present work is to study the behavior of L-shaped and C-shaped G+30 Building under earthquake load by adopting Non-linear Time history analysis to evaluate and study the differentiation in Base shear, story displacement and story drifts using E Tabs 2018.

II. PERFORMANCE ANALYSIS

In this area I have studied the base shear, displacement and story drift of both the models with respect to each other in E Tabs 2018. By comparing the results one can easily understand the response of structure and can predict the good shape structure which performs well against earthquake forces. Detailed study of mentioned factors is shown further. Models are shaped by considering Plan irregularities i.e. the plan area for each structure is same only there is difference of geometry. For both the types of structure total numbers of story are 30 and elevation is also same. The models used for analysis are as below

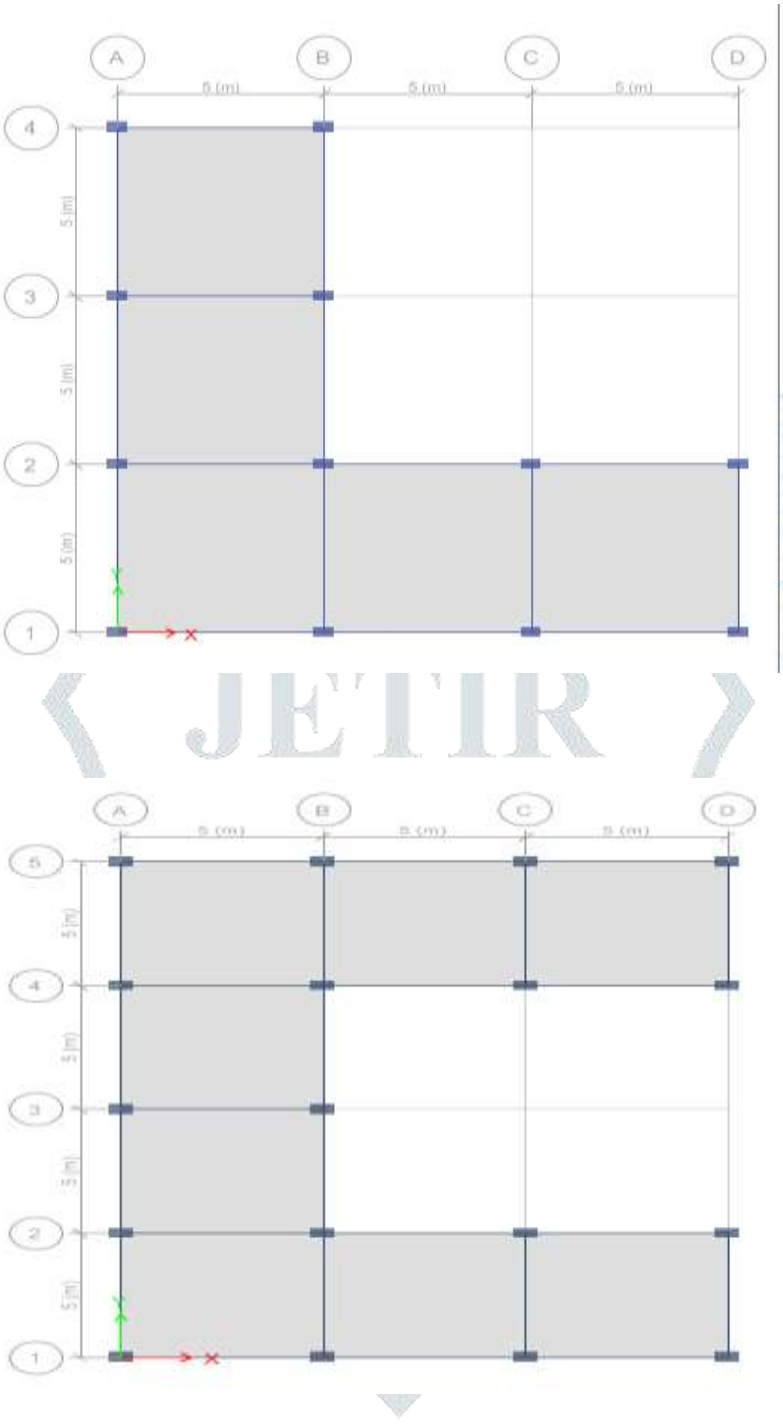
Table No.1. Details of Structure

SHAPE OF BUILDING	**L-SHAPED**	**C-SHAPED**
Storey	**G+30**	**G+30**
Height Of Each Story	3.0m	3.0m
Plinth Height	1.5m	1.5m
Thickness Of External Walls	230mm	230mm
Live Load	3.0 kN/sq.m	3.0 kN/sq.m
Grade Of Concrete	M25	M25
Grade Of R/F Steel	HYSD 500	HYSD 500
Density Of Concrete	25 kN/m3	25 kN/m3
Density Of Brick Masonry	20 kN/m3	20 kN/m3
Size Of Columns	300mm x 500 mm	300mm x 500 mm
Size Of Beams	300 mm x 450 mm	300 mm x 450 mm
Thickness Of Slab	150 mm	150 mm
Density Of Steel	7849.047 kg/cu.m	7849.047 kg/cu.m
Density Of Concrete	2548.538 kg/cu.m	2548.538 kg/cu.m
Modulus Of Elasticity Of Steel	200000 MPa	200000 MPa
Modulus Of Elasticity Of Concrete	25000 MPa	25000 Mpa

Table No.2. Load case summary

Dead	Linear static
Live	Linear Static
EQ x	Linear Static
EQ y	Linear Static
Wall	Linear Static
THA x	Nonlinear Modal History (FNA)
THA y	Nonlinear Modal History (FNA)

PLAN VIEW OF MODELS USED



III. RESULT AND DISCUSSION

1. **Base Shear:** Comparison of weight of building and base shear evaluated for both the models in both the direction.

Table No.3. Base shear in X & Y Direction

Direction	L-shaped building	C-shaped building
Weight	37985.7414 KN	50647.6552 KN
X direction	365.93 KN	673.3703 KN
Y Direction	381.3444 KN	588.9279 KN

2. **Storey Displacement**: Storey displacement in both X and Y direction .

Table No.4. storey displacement in X & Y Direction

	X direction	
Storey	L-shaped building	C-shaped building
Storey30	104.95	82.69
Storey29	102.69	78.45
Storey28	99.58	77.06
Storey27	97.03667	76.98
Storey26	94.35167	75.69
Storey25	91.66667	73.99
Storey24	88.98167	72.58
Storey23	86.29667	71.58
Storey22	84.55	70.25
Storey21	81.55	69.55
Storey20	79.65	67.89
Storey19	78.55667	66.58
Storey18	77.87167	65.99
Storey17	76.978	64.09
Storey16	74.639	62.86
Storey15	71.835	61.058
Storey14	68.422	58.633
Storey13	64.428	55.635
Storey12	59.933	52.139
Storey11	55.021	48.221
Storey10	49.773	43.951
Storey9	44.266	39.398
Storey8	38.574	34.622
Storey7	32.765	29.678
Storey6	26.902	24.617
Storey5	21.047	19.488
Storey4	15.271	14.342
Storey3	9.682	9.264
Storey2	4.545	4.471
Storey1	0.674	0.689
Base	0	0

	Y direction	
Storey	L-shaped building	C-shaped building
Storey30	154.621	141.338
Storey29	148.215	136.887
Storey28	144.365	133.659
Storey27	139.854	128.673
Storey26	134.65	123.779
Storey25	128.452	119.864
Storey24	123.985	115.658
Storey23	118.214	111.325
Storey22	113.248	105.879
Storey21	109.235	99.325
Storey20	104.875	95.328
Storey19	99.616	90.256
Storey18	94.515	86.985
Storey17	89.811	81.725
Storey16	84.162	79.484
Storey15	79.922	76.673
Storey14	76.014	73.158
Storey13	71.49	69.009
Storey12	66.449	64.323
Storey11	60.985	59.192
Storey10	55.186	53.704
Storey9	49.137	47.94
Storey8	42.915	41.974
Storey7	36.593	35.878
Storey6	30.237	29.715
Storey5	23.908	23.544
Storey4	17.662	17.422
Storey3	11.562	11.411
Storey2	5.747	5.661
Storey1	0.895	0.872
Base	0	0

IV. CONCLUSION

1. The base shear in both the direction is not equal because the sizes of columns. As the dimension of all columns are smaller in X direction and larger in Y direction. Hence the forces in X direction will have less area to resist and will result in higher value of base shear. Similarly the forces in Y direction will have larger area to resist and will result in smaller value of base shear.
2. As the columns facing the forces in X direction though have lesser dimension but are performing well against all the forces.
3. So from above results we can say that C-shaped building perform well during the earthquake. But if someone wants to change the shape then can go for C-shaped building instead of L-shaped building. as it is more safer than other two shapes.
4. Base shear in L shaped building is 365.93 KN where as in C shaped is 673.37 KN for X- direction, so base shear in C-shaped building is 45.74 % more as compared to L- shaped.
5. Base shear in L shaped building is 381.3444 KN where as in C shaped is 588.9279 KN for X- direction, so base shear in C-shaped building is 35.24 % more as compared to L- shaped.
6. The max story disp. For L shaped is 104.95 mm where as for C shaped 82.69 mm for top most floor.
7. The percentage increase In max story displacement is 21.21 % in between L shaped & C shaped structure.

V. REFERENCES

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