Comparative Study Of Static And Dynamic Analysis Of Regular And Irregular Structure By Different Types Of Analysis

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Abstract- *Most of the high raised structure have irregular configuration both in plan and elevation. In this situation it is imported to recognize the performance of the building to capable of survive against disaster for both new and existing one. In this paper 20 story regular and irregular structure is modelled. The whole models were analysed with the help of ETABS software.in the present study comparative static and dynamic analyses for regular and irregular structure have been investigated to calculate the displacement, storey shears, storey drifts of model have been obtained and compared using equivalent static method, response spectrum method, push over analysis. This Paper makes consciousness about earthquake weakness idea on engineers.*

***Keywords*-** equivalent static method, Response spectrum method, push over analysis

I. INTRODUCTION

During the immemorial period, nature's strength have impacted human presence. Of all the natural calamities the minimum comprehended and most damaging are seismic tremor. An important feature of the calamity created by seismic tremor is that damage to life is related completely with natural constructions like failure of dams, buildings and bridges. Earthquake loading necessitates an understanding of the building performance in great inelastic twisting.

performance of a structure through a seismic tremor depends on numerous features such as regular shapes, lateral power, rigidity, ductility.

This paper contains the investigation of RCC structure using static method contains equivalent static method, Pushover method as well as dynamic methods contains Response Spectrum method. Find the lateral displacement, storey drift, base shear. After compare the difference between the static and dynamic method for regular and irregular structure.

1. Equivalent Static Method

The linear static procedure of building is modelled with their linearly elastic stiffness of the building. The equivalent viscous damps the approximate values for the lateral loads to near the yield point. Design earthquake demands for the LSP are represented by static lateral forces whose sum is equal to the pseudo lateral load. When it is applied to the linearly elastic model of the building it will result in design displacement amplitudes approximating maximum displacements that are expected during the design earthquake. To design the earth quake loads to calculate the internal forces will be reasonable approximate of expected during to design earth quake.

2. Response Spectrum Method

The representation of the maximum response of idealized single degree freedom system having certain period and damping, during earthquake ground motions. The maximum response plotted against of un-damped natural period and for various damping values and can be expressed in terms of maximum absolute acceleration, maximum relative velocity or maximum relative displacement. For this purpose response spectrum case of analysis have been performed according to IS 1893.

II. PUSHOVER ANALYSIS

Pushover analysis is a static, nonlinear procedure in which the magnitude of the structural loading is incrementally increased in accordance with a certain predefined pattern with the increase in the magnitude of the loading, weak links and failure modes of the structure are identified. The loading is monotonic with the effects of the cyclic behavior and load reversals, being estimated by using a modified monotonic force deformation criteria and with damping approximations

III. ANALYSIS AND RESULTS OF STATIC AND DYNAMIC METHOD

In this current work a 20- storied RC regular and irregular structure plan are considered .Zone 5 are taken for the analysis. Using ETABS software analysis are carried out.

1. Statement of the work:

The RC frame was chosen. Fig 1 shows the Plan of the Regular building. Fig 2 shows the plan of irregular building. Dimension of the all the building (25.6*25.6) m, column size (.45*.45) m, size of beam (.45*.3), slab thickness (150) mm, Live load of 3 kN/m2 .Bottom Storey are 4m. And other storeys are 3.6m. Dimension along both X and y direction are 25.6*25.6 m

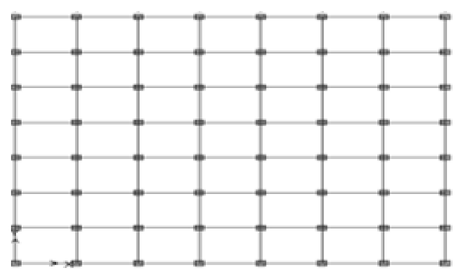

Figure 1.

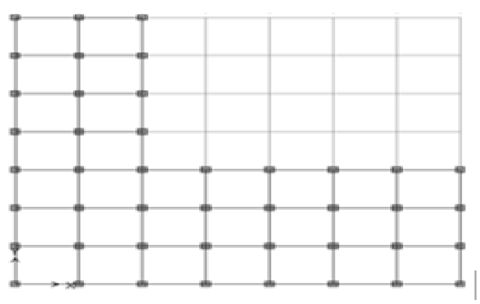

Figure 2.

Analysis of 3 dimension structural models

a) Design Seismic Base Shear:

Vb=Ah*W
Where,
Ah = (Z/2)*(I/R)*(Sa/g)

b) Combination of loads:

Load Combination taken as per IS1893 (part1):2002

1. 1.5(DL+LL)
2. 1.2(DL+LL+EQX)
3. 1.2(DL+LL+EQY)

Comparison of maximum displacement. Base shear, max. Drift for Regular structure

Table 1.

	Equivalent static	Response Spectrum	Push over
Max. Displacement in m	0.070787	0.024826	0.2126
Base Shear in KN	1728.24	754.79	1882.98
Max. drift in m	0.002708	0.001175	0.015586

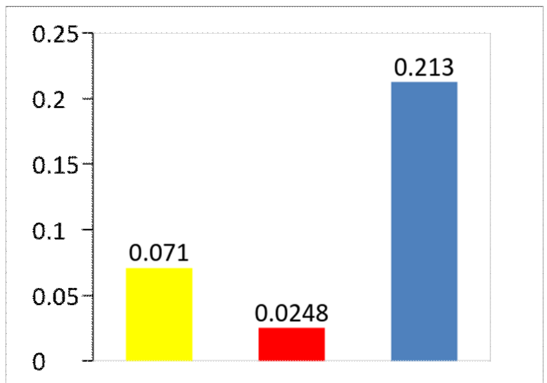

Figure 3. Maximum Storey displacement

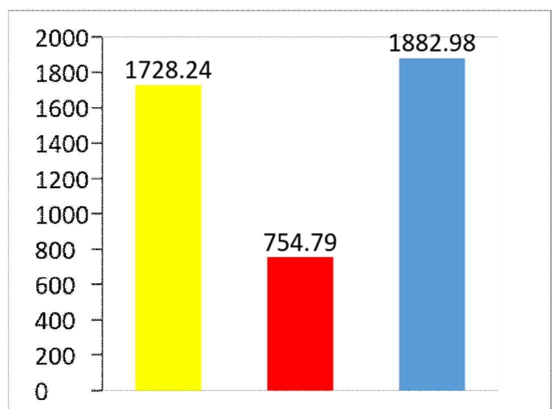

Figure 4. Maximum Base Shear

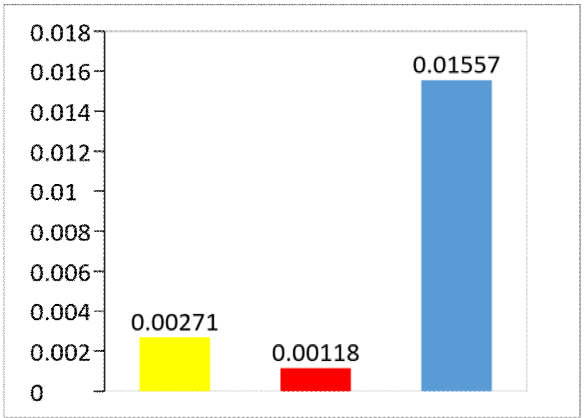

Figure 5. Maximum Storey Drift

Maximum storey displacement, base shears and maximum storey drifts for irregular structure

Table 2.

	Equivalent static	Response Spectrum	Pushover
Max. Displacements in m	0.0645	0.0194	0.134969
Base Shear in KN	1022.83	398.88	1200.96
Max. drift in m	0.002495	0.00112	0.013701

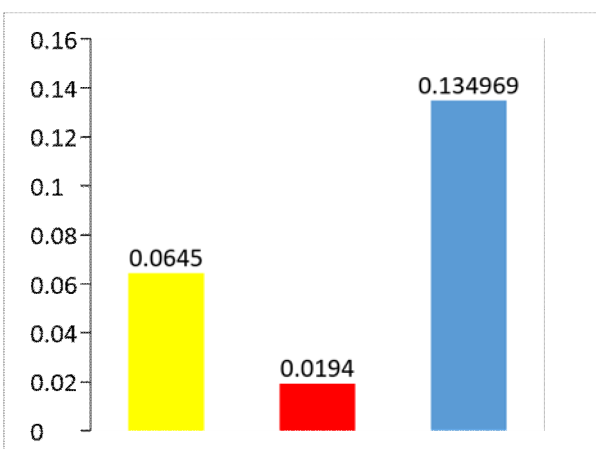

Figure 6. Maximum Storey displacement

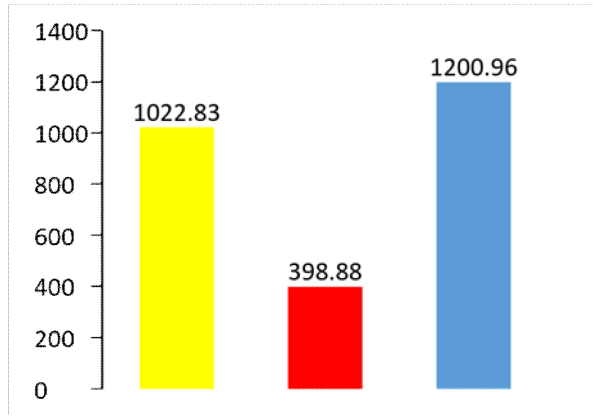

Figure 7. Maximum Base Shear

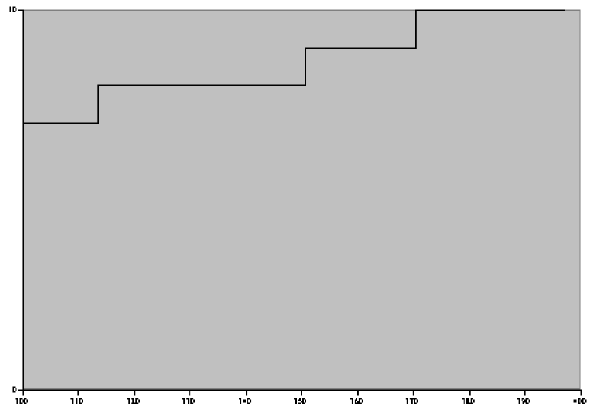

Figure 7 the batching of the products of size 17 response of the system

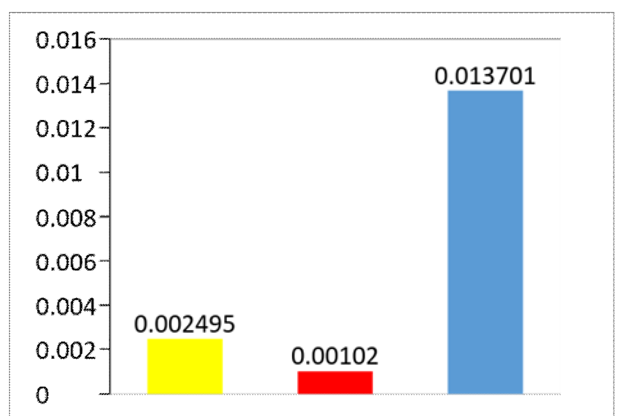

Figure 8. Maximum Storey Drift

IV. CONCLUSION

The results three methods are tabulated.

- As a consequence of contrast between three analyses it is seen that the displacements from equivalent static method and push over analysis are greater than dynamic analysis along with response spectrum analysis for both regular and irregular structure.

- Base shear is estimated using IS 1893-2002 method and shows the comparison of base shear by ESM. The lower base shear is receiving in L shape structure and the higher base shear is obtained in Rectangular shape structure.
- Irregular shapes are harshly affected during earthquakes.
- Static Nonlinear analysis gives higher values for maximum displacement of the stories in both X and Y direction.
- Base shear values obtained by manual analysis are slightly higher than software analysis.
- The results of equivalent static analysis are approximately uneconomical because values of displacement are higher than dynamic analysis.

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