Scientific Journal of Impact Factor (SJIF): 4.72

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 4, Issue 9, September -2017

A Study On Tall Structure With Soft Stories At various Level By Non-Linear Analysis

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Abstract: *Now a days as population in cities is increasing day by day there is a big problem for parking of vehicles in tall building .This issue can be solved by providing the soft storey in each building .One lesson which we have learnt from past earthquake is that building sustain less damage when its plan and geometric configuration are as simple as possible. Providing a first open storey in multi-storeyed building is very common now a days. In seismic active areas it is highly undesirable to provide soft storey in a building which has been verified in numerous experiences from past earthquak*
In this project the modeling is done with software ETABS v9.70 for the analysis of tall structure with soft storey at various floor levels. The building with G+25 is taken into consideration for study. In this project six (6) models of zone-5 are created. The performance of the building is studied by considering 2nd storey, 7th storey, 12th storey, 17th storey, 22nd storey and 27th storey as a soft storey. Push over analysis is carried out to know the characteristics points of the building with soft storey.

Keyword*: Push over curve, displacement ,drift ,soft storey*

I. INTRODUCTION

In India mainly in urban storied buildings, open first storey is an unavoidable feature. These are provided for accommodation of vehicle parking. Buildings are referred as having a soft storey if that level is less than 70% as stiff as the floor immediately above it, or less than 80% as stiff as the average stiffness of the three floors above it.

In many commercial and industrial places and also in residential buildings, reinforced concrete frames structures with masonry infill walls are usually constructed. Masonry infill is basically made up of clay, brick or concrete blocks walls are installed between beams and columns of frame structures. In design process these panels are not preferred and considered as architectural components. When the infills are uniformly distributed in the structure and design is properly carried out then they have a positive effect on the seismic response of the structure. On the other side, the non-uniform distribution of the infill's will have bad effect or negative effect.

SOFT STOREY BEHAVIOR**:**

Numerous building structure having stopping or business zones in their first stories, endured major basic harms and broken down in the late seismic tremors. Huge open ranges with less infill and outside dividers and higher floor levels at the ground level result in delicate stories and henceforth harm. 1n such structures, the firmness of the sidelong load opposing frameworks at those stories is entirely not exactly the stories above or underneath. Amid a tremor, if irregular between story floats between nearby stories happen, the parallel powers can't be very much disseminated along the stature of the structure. This circumstance causes the horizontal strengths to focus on the story (or stories) having

expansive displacement(s). Likewise, if the neighborhood malleability requests are not met in the configuration of such a building structure for, to the point that story and the between story floats are not restricted, a nearby disappointment component or, far more atrocious, a story disappointment instrument, which may prompt the breakdown of the framework, might be shaped because of the abnormal state of burden twisting (P-Δ) impacts the breakdown instrument of such a building structure with a delicate story under both tremor and gravity loads. Horizontal uprooting of a story is a component of firmness, mass & sidelong compel appropriated on that story. 1t is additionally realized that the horizontal power dispersion along the tallness of a bụilding is specifically identified with mass & solidness of every story

II. OBJECTIVES OF PROPOSED WORK

- ✓ *Readiness of 3D building modules with and without masonry infill.*
- ✓ *To examine the conduct of structure with and without brick work infill if seismic burden is Connected.*
- ✓ *Determination of displacement and drift subjected to quake loading.*
- ✓ *To determine the base shear with and without brick infill effect.*
- ✓ *Examination of results from different methods of analysis.*

III. LITERATURE REVIEW

1. *Helmut Krawinkler and Seneviratna (1998) discussed that, the pushover synthesis would be a good betterment over current working elastic rating process and they also peaked out to give attention for execution of the pushover analysis aspects, with the control performances during severe earthquakes. Further it was concluded that, for structures that vibrate primarily in the fundamental mode, the pushover analysis would provide good estimates of global as well as local inelastic, deformation demands. These analyses also expose design weaknesses that may remain hidden in an elastic analysis.*

2. *A modal pushover analysis procedure for rating seismic requirement for buildings was improved by Chopra and Goel (2002). The modal pushover analysis was applied to a nine- storey steel building to determine the peak inelastic response and it was compared with rigorous non-linear response history analysis. It was concluded that the modal pushover analysis was accurate enough for practical application in building evaluation and design*

3. *Mehmet Inel and Hayri Baytan Ozmen (2006) studied the effect of plastic hinges in nonlinear analysis of reinforced concrete buildings. Pushover analysis was carried out for four as well as seven storied reinforced concrete buildings to represent low and medium rise buildings. The structure were modeled to defined hinge properties to know the possible dissimilarity in the outcomes of pushover analysis. Comparison of response was also made in terms of base shear capacity, displacement capacity and deformation of hinges. User defined plastic model was found to be effective than the default hinge model. From the above discussion it was concluded that comparative studies were made between pushover analysis and inelastic time history analysis in evaluating the performance of existing building but, no comparison study was found between pushover analysis and Demand to Capacity Ratio (DCR) method of analysis*

4. *Zine et al. (2007) conducted the Pushover analysis for reinforced concrete structures project according to the Algerian code. The main aim of a pushover analysis to perform of response demand against capacity. If the required curve intersected the capacity envelope near the elastic range, then the structure had a better resistance. If the demand curve intersects the capacity curve with little reserve of strength and distortion capacity, then it can be resolve, that the structure would behave badly during the imposed seismic excitation and need to be retrofitted to avoid major harm or breakdown in future.*

IV. MODELLING AND ANALYSIS OF STRUCTURE

In this project the modeling is done with software ETABS v9.70 for the analysis of tall structure with storey at various floor level. The building with G+25 is taken into consideration for study. In this project six (6) models of zone-5 are created. The performance of the building is studied by considering 2nd storey, 7th storey, 12th storey, 17th storey, 22nd storey and 27th storey as a soft storey. Push over analysis is carried out to know the characteristic points of the building with soft storey.

All the structure frames considered are 28X20 in dimensions and 27 storey.

The six cases have been framed for analysis purpose.

1. *Soft storey at ground floor (2nd storey).*
2. *Soft storey at 7th storey along with 2nd storey.*
3. *Soft storey at 12th storey along with 2nd storey.*
4. *Soft storey at 17th storey along with 2nd storey.*
5. *Soft storey at 22nd storey along with 2nd storey.*
6. *Soft storey at 27th storey along with 2nd storey.*

PLAN LAYOUT FOR ALL THE MODELS ARE SAME AS SHOWN IN FIG

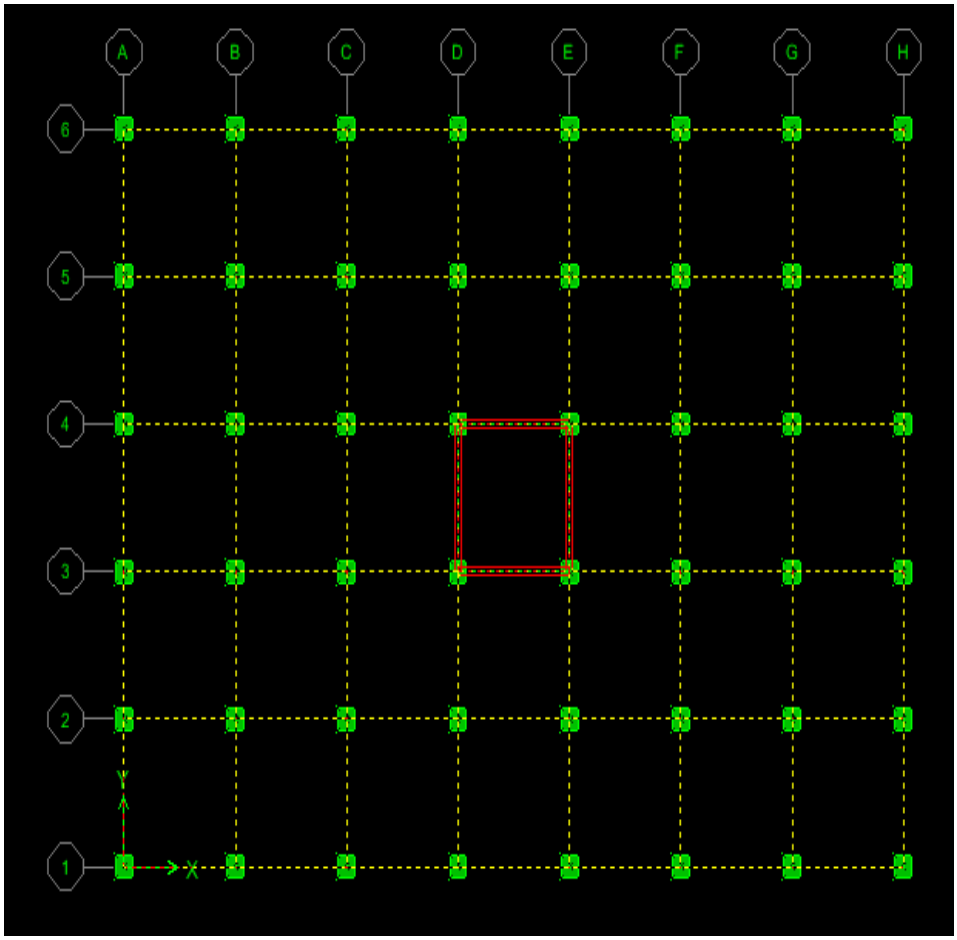


Figure 1

V. DESCRIPTION OF MODELS

1. Member properties *Thickness of rc slab=0.15m Column size = [600x600]*
Beam size = [230x450]
Thickness of brick masonry wall = 0.23m
Thickness of rc shear wall = 0.23m

2. Materials properties
Young's modulus [m25] concrete E=25X10^6KN/ m^2
Density of reinforced concrete = 25KN/ m^2
Poisson's ratio of concrete = 0.2
Modulus of elasticity of brick masonry = 3500x10^3KN/ m^2
Density of brick masonry = 18 KN/ m^2
Poisson's ratio of masonry = 0.3

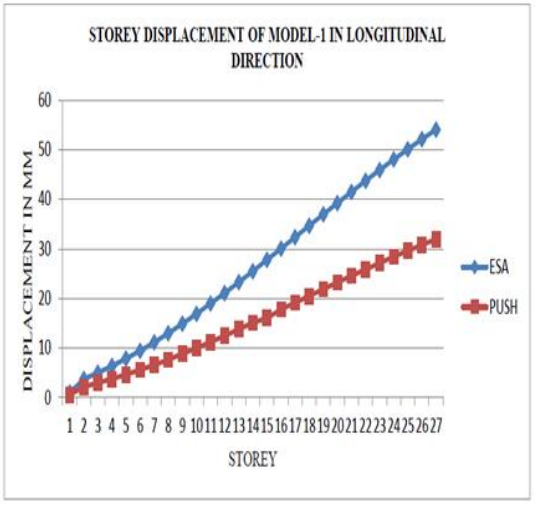
3. Assumed load intensities
Live load =3KN/ m^2
Floor finishes =1KN/ m^2
Wall load = 3.2-0.3=2.9
=2.9x0.23x18= 12KN/m^2

4. Seismic Zone 5

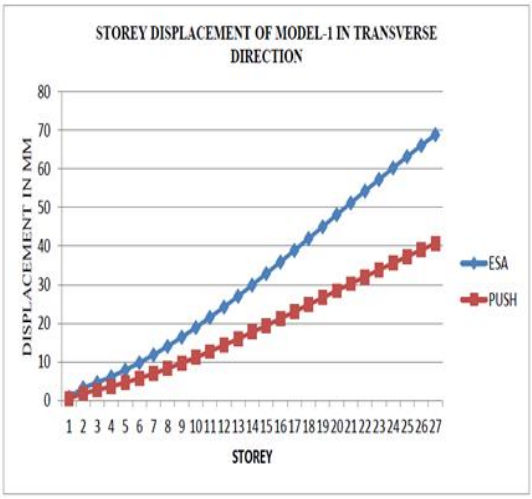
5. Height of the floor=3.2m

VI. RESULTS AND DISCUSSION

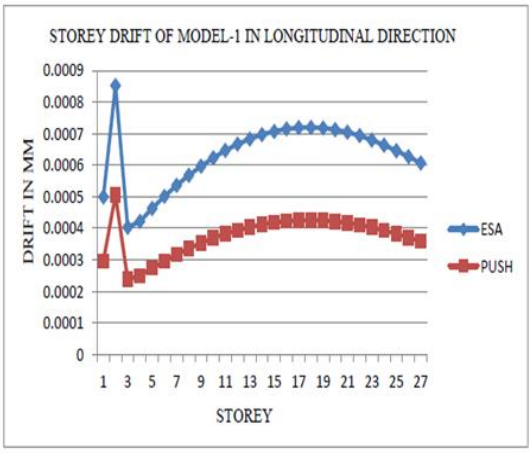
In this report, non-linear analysis of building with soft storey at various floor along with one at ground floor using etabs under the forces is analyzed. The main aim is to study the fluctuation of load displacement chart ,drift chart and know the utmost base shear and displacement of frames with soft storey at various floor. After analyzing the models we get the push over curves which is shown below:-

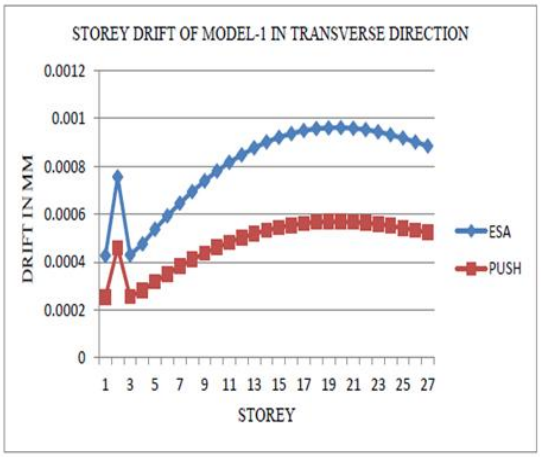


Graph 1

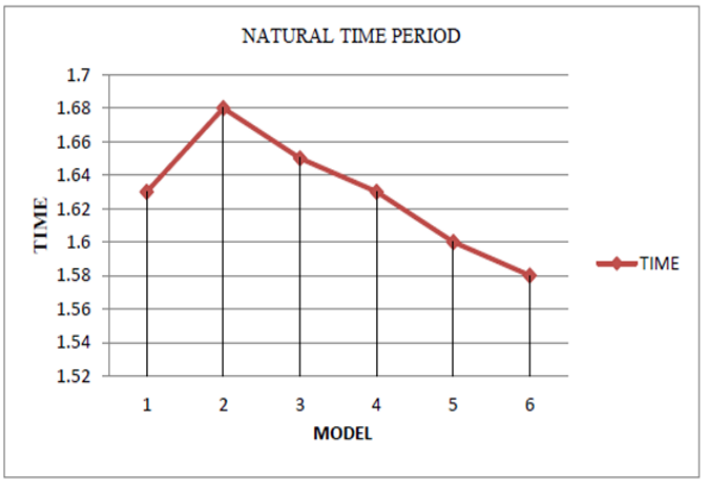


Graph 2

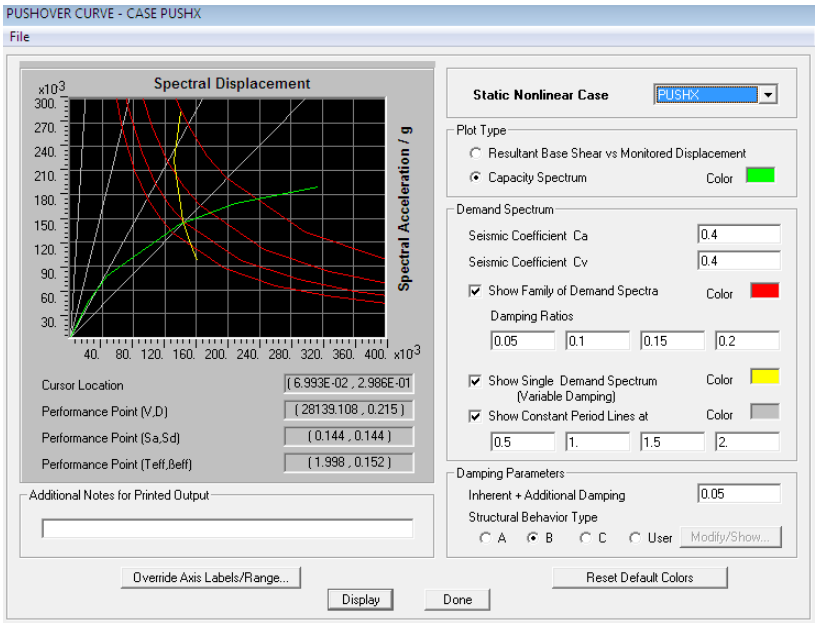




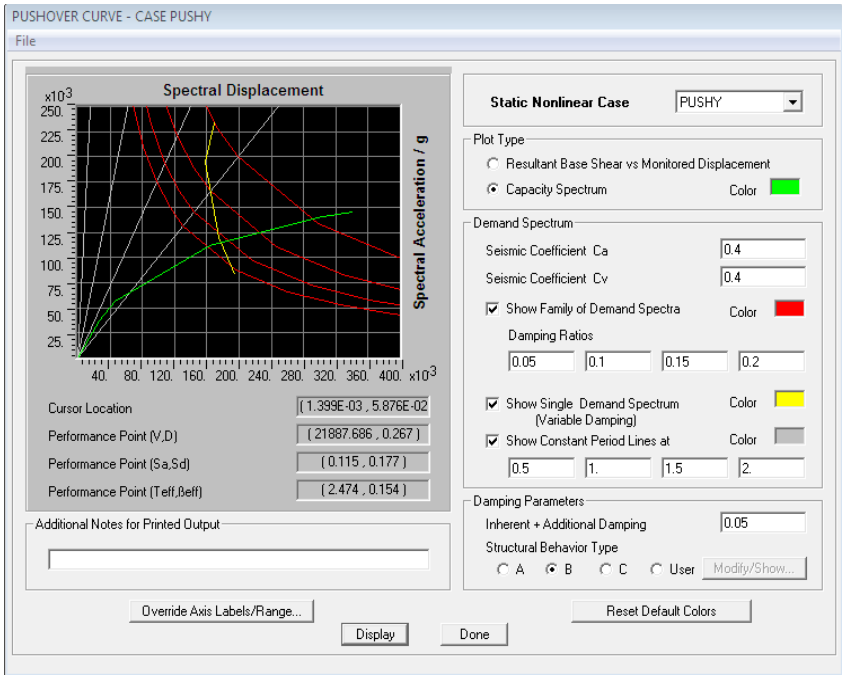
NATURAL TIME PERIOD FOR ETABS ANALYSIS



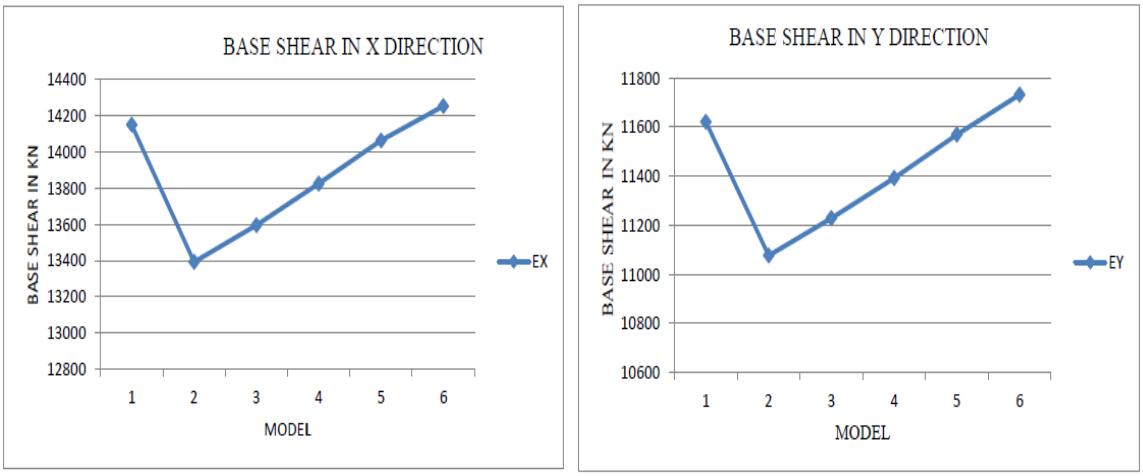
PUSHOVER CURVE OF MODEL 1 ALONG X DIRECTION



PUSHOVER CURVE OF MODEL 1 ALONG Y DIRECTION



BASE SHEAR IN X DIRECTION AND Y DIRECTION



VII. CONCLUSION

In this analysis models in etabs it can be seen that:

1. To evaluate the seismal activities of buildings under different steps of shaking, the pushover analysis is an efficient tool.
2. The pushover analysis is a easy way to explain the nonlinear analysis of building.
3. Changing the soft storey to greater stage the strength of flexible joint becomes lesser and simultaneously displacement and base shear increases.
4. At the base storey maximum yielding is seen, due to soft stories utmost plastic hinges are seen through shear.
5. It can been seen from pushover curve that reducing soft storey from 1.63 sec for 2nd storey to

1.58 sec for 27th storey.

6. Soft storey is reliable at higher level in tall buildings.
7. Safer to build additional soft storey at high levels with ground floor soft.

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