International Journal of Engineering Sciences & Emerging Technologies, July 2015.
ISSN: 22316604 Volume 8, Issue 1, pp: 12-16 ©IJESET

PUSHOVER ANALYSIS ON ASYMMETRIC FRAMED STRUCTURES

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ABSTRACT

The aim of the project is about the non-linear pushover analysis of the reinforced concrete building using Etabs software. The strength of the components is determined by non-destructive tests (Rebound hammer and UPV). This data is necessary to perform pushover analysis in Etabs. Using this method of analysis the changes in the structural properties has been determined and comparison be made for ductile detailing and non-ductile detailing of frames.

KEYWORDS: *pushover analysis, components, ductile, non-ductile*

I. INTRODUCTION

Seismic peril in the setting of building configuration is for the most part characterized as the anticipated level of ground speeding up which would be surpassed with 10% likelihood at the under thought because of the event of a quake anyplace in the area, in the following 50 years. A ton of complex investigative discernment and logical displaying is included in seismic risk estimation. A computational plan includes the accompanying steps: depiction of seismic source zones and their portrayal, determination of a suitable ground movement and a prescient model of seismic danger. In spite of the fact that these strides are district particular, certain institutionalization of the methodologies is profoundly vital to that sensibly tantamount appraisals of seismic risks can be made around the world, which are reliable over the local limits. The National Geophysical Research Institute (NGRI), Hyderabad, India was recognized as one such focus, in charge of assessing the seismic peril for the Indian district. As it is surely understood, quake indexes and information bases make the first crucial inputs for the depiction of seismic source zones and their portrayal.

Nonlinear static (sucker) investigation is utilized to measure the resistance of the structure to sidelong misshapening and to gage the method of disfigurement and force of neighbourhood requests. The static sucker investigation is turning into a well known instrument for seismic execution assessment of existing and new structures. The desire is that the sucker examination will give satisfactory data on seismic requests forced by the outline ground movement on the basic framework and its parts. The current building can turn out to be seismically lacking subsequent to seismic outline code necessities are continually redesigned and headway in designing learning. Further, Indian structures constructed over recent decades are seismically inadequate in view of absence of mindfulness with respect to seismic conduct of structures. The across the board harm particularly to RC structures amid quake uncovered the development works on being embraced far and wide, and produced an extraordinary interest for seismic assessment.

The target of this paper is to think about the execution of the building outlined without considering tremor powers and by considering the quake powers.

II. PUSHOVER ANALYSIS

2.1. Methodology

Pushover analysis is an approximate analysis method in which the structure is subjected to monotonically increasing lateral forces with an invariant high-wise distribution until a target displacement is reached. Pushover analysis consists of a series of sequential elastic analysis, super imposed to approximate a force-displacement curve of the overall structure.

2.2. Objective

The different parts of weakling examination and the exactness of sucker examination in foreseeing seismic requests is explored by a few analysts. On the other hand, a large portion of these scientists made utilization of particularly composed structures in the setting of the study or particular types of sucker method. Firstly, the prevalence of sucker examination over flexible techniques in assessing the seismic execution of a structure is talked about by recognizing the favourable circumstances and impediments of the methodology. At that point weakling examinations are performed on existing building utilizing Etabs programming.
Additionally, the examination for the flexible and non-pliable casings be made and using the sucker investigation to foresee the conduct interest of the structure. For the examination reason, disfigurement levels speaks to a top rooftop removals the limit bend of the casings are firstly foreordained and the reaction parameters, for example, story relocations, between story floats, story shears, plastic pivot areas are then assessed by performing an enhanced sucker systems on the chose outlines.

2.3. Description of the structure

The existing G+2 structure is analyzed by adopting ductile and non-ductile frames. The structure is located at moderate seismic zone III in India. Number of bays in X and Y direction is 4. Column dimension is 380mmX600mm and the beam dimension is 230X300 at plinth level and 230mmX510mm at story levels. All slabs are 2way slabs with 130mm thick. Grade of concrete is M25 and steel is FE415.

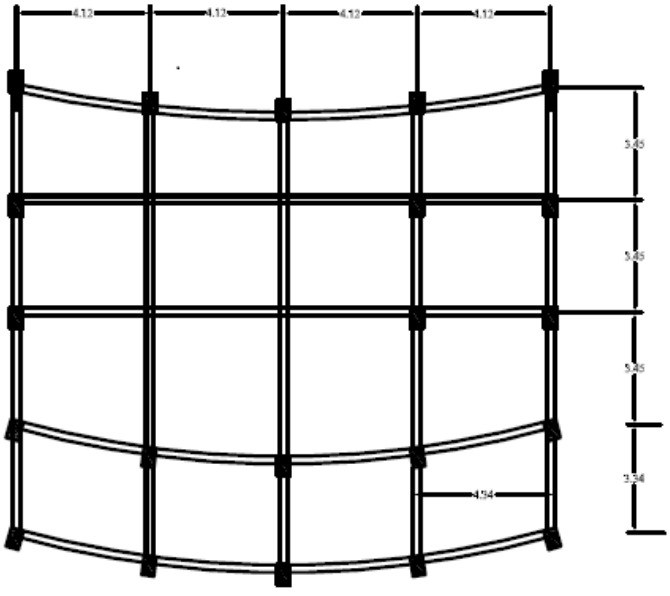

Fig.1. Plan of the building (all dimensions are in mm)

2.4. Load combinations

Load combinations are considered as per IS456:200. EQX implies the earthquake loading in X direction and EQY stands for the earthquake loading in Y direction. The emphasis here is on showing typical calculations for ductile design and detailing of building elements subjected to earthquakes. In

practice, wind load should be considered in lieu of earthquake load and the critical of the two load cases should be used for design.

2.5. Modelling approach

Investigations have been utilizing Etabs programming, which is universally useful auxiliary examination program for static and element examinations of structure. A depiction of the demonstrating points of interest is given in the accompanying.
A three dimensional of the structure is made in Etabs to do the nonlinear static examination. Shaft and section components are demonstrated as nonlinear edge component by characterizing plastic hinges.
Etabs executes the plastic hinge properties portrayed in FEMA-356 or ATC-40. There will be five focuses marked A, B, C, D and E characterized in the power distortion conduct of the plastic hinges. The qualities doled out to each of these focuses shift contingent upon the sort of the component, material properties, latitudinal and transverse steel content, and the hub burden level on the component.
Etabs gives default-hinge properties and prescribes PMM hinge for segments and M3 hinges for bars. When the structure is demonstrated with segment properties, steel substance and the heaps on it, default pivots are allocated to the components and there is no augmentation computation for the components.

III. ANALYSIS RESULTS

3.1 Non-ductile detailing pushover curve

In this case was studied for the non ductile detailing of structures. The members were designed according to IS: 456 and reinforcement details. Ductile detailing is not considered in this frame. Pushover analysis is performed on this frame using displacement pushover approach. Maximum displacement applied at top of roof element as 0.48m and its collapse behaviour as shown in figure. Maximum base shear occurred at 1406KN.

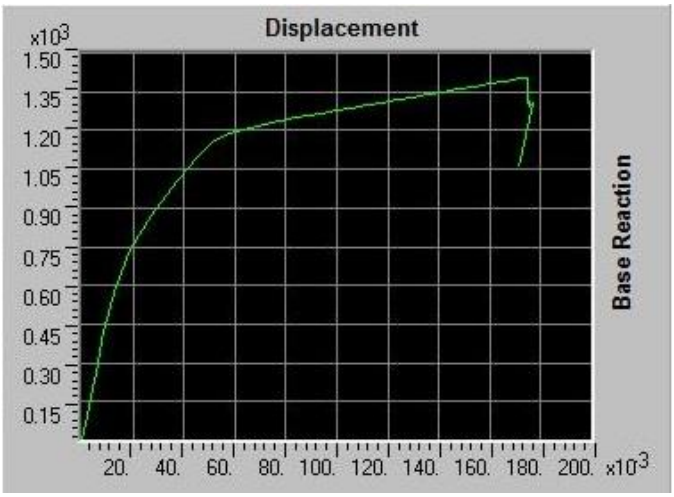

Fig.2 Non-ductile detailing load versus displacement curve

3.2 Ductile detailing pushover curve

Here in this we consider the ductile detailing according to the code IS: 13920. Pushover analysis has been performed. It can clearly be seen from the results that ductile detailing is increasing the capacity of the frame significantly. Upto significant deformation, structure is not losing it load carrying capacity. The maximum base shear was obtained as 1751KN.

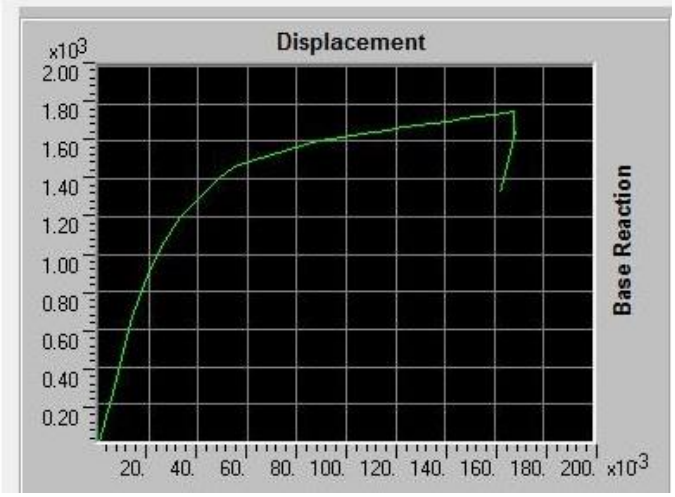

Fig.3. Ductile detailing load versus displacement curve

3.3. Comparison of Ductile and Non-ductile load versus displacement curve

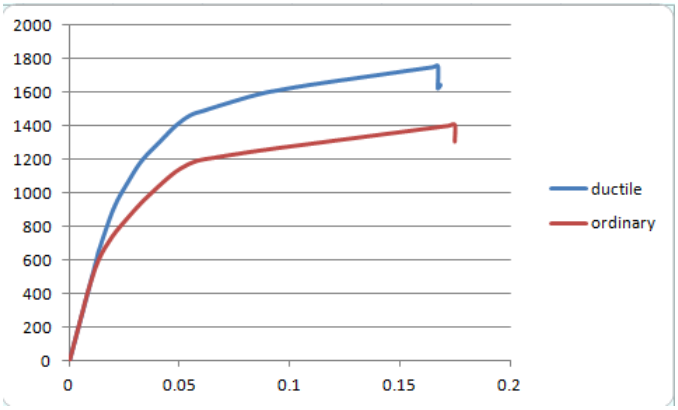

Fig.4. load versus displacement curve for Ductile and Ordinary frames

IV. CONCLUSIONS

In the present study a existing structure is modelled and analyzed in pushover analysis using Etabs software. Gravity loads and lateral loads are applied as per IS 1893-2002 on the structure and designed according to the IS 456 and IS 13920. Displacement control pushover analysis is carried out in both cases and the pushover curves are compared. As an observation it is found that capacity of the building significantly increases when ductile detailing is adopted. Also, it is found that affect on concrete grade and also steel are not that significant.

ACKNOWLEDGEMENT

I thank my lecturers and my friends who supported me for the inspiration that they given during the time of work.

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