

STUDY OF PUSHOVER ANALYSIS OF G+10 RCC BUILDING WITH SHEAR WALL

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Abstract –

The structure in high seismic areas could also be prone to serve damage. conjointly the high rise structures, it becomes vital to adopt each linear & non-Linear analysis procedure for style of structures. thus considering effects of building during this article used pushover analysis to estimate demand of symmetrical buildings.

Seismic loads taken IS 1893 (part I) victimization ETABS software package is employed model & analyze 10 floor, Building with completely different Position of shear wall. this text also highlights best positioning system of shear wall. conjointly the parameters base shear, storey drift & Story displacements are been evaluated.

1. INTRODUCTION

Design of civil engineering structures is usually based mostly on prescriptive strategies of building codes. Normally, loads on the ones structures are low and result in elastic structural behavior. However, below a sturdy seismic event, a form may additionally clearly be subjected to forces beyond its elastic limit. Although building codes can provide reliable indication of actual average overall performance of man or woman structural elements, it's miles out of their scope to give an explanation for the anticipated average overall performance of a designed form as a whole, below large forces. Several industries consisting of vehicle and aviation, mechanically assemble full-scale prototypes and perform big testing, in advance than manufacturing plenty of identical structures, that have been analyzed and designed with interest of test results. Unfortunately, this option is not available to building corporation as due to the distinctiveness of conventional man or woman buildings, financial device of large-scale production is unachievable. With the deliver of fast computers, so-known as average overall performance based completely seismic engineering (PBSE), in which inelastic structural assessment is mixed with seismic hazard assessment to calculate anticipated seismic average overall performance of a form, has emerge as increasingly greater feasible. With the help of this tool, structural engineers too, no matter the truth that on a laptop and now now not in a lab, may have a examine anticipated average overall performance of any form beneathneath large forces and regulate format accordingly.

Nonlinear response statistics assessment is a likely method to calculate structural response beneathneath a strong seismic event. However, due to the large amount of statistics generated in such assessment, it is not considered practical and PBSE generally consists of nonlinear static assessment, moreover referred to as pushover assessment. From research viewpoint, whilst PBSE stays in developmental degree in which advanced assessment techniques are being researched.

METHODOLOGY

Following method are using for proposed work,

- Collection of relevant research data from national internal journal, books web source etc.
- software validation
- Preparation of different models of structure which will be analyze
- Result and Discussion
- Conclusion.

2. LITERATURE REVIEW

Boria Anya¹, Tamal Ghosh² [2022] [1]

Earthquake may be a phenomenon that takes region manner to the relative displacement of the tectonic plates on and all through plate barriers. Plate barriers may be labeled as convergent, divergent and rework. Merging plate barriers and redecorate plate barriers purpose huge harm even as divergent barriers purpose lesser damage. Associate in nursing earthquake of a given significance reasons virtually specific ranges of intensities of shaking with inside the neighboring locations of its attentiveness and for this reason the structural damage iatrogenic with inside the homes differs from region to region. In earthquake resistant format, due to the random motion of ground the building can reacts otherwise which might be labeled into 3 virtually specific times as (i) minor shaking without a structural harm, (ii) slight shaking with minor structural damage and (iii) intense earthquake with each structural and non-structural damage (Figure 1). Ground

motion induces inertia strain with inside the building in terms of a displacement-kind loading. Among the structural additives columns and partitions are the maximum essential in shifting the masses, for this reason for life-style manufacturing planning of the ground block and beam need to get preserve of masses of important. Poorly styled ferroconcrete columns may be disastrous. It clearly was determined that sooner or later of the BHUJ earthquake in 2001 (India), several houses folded manner to the failure of the ground floor column. for this reason engineers have taken off with many techniques to face up to the lateral forces thru developing the stiffness thru offering shear partitions, bracing system, and 2nd resisting system. Nowadays, structures are unremarkably format supported the general overall performance of the building or structure.

Vidhya K1 and SivakumarC.G.2 (2021) [2]

Earthquake is one of the maximum devastating herbal calamities which purpose sudden shaking of the earth surface. It majorly reasons harm to homes and different systems. Further, Indian homes constructed over beyond many years are seismically poor due to lack of information concerning seismic conduct of the systems. Designing systems as earthquake resistant is one of the demanding situations for maximum of the engineers of the development industry. Thus, systems to face up to seismic forces is indispensable. Generally, homes own masonry partitions which might be without difficulty vulnerable to lateral wind and seismic forces however homes with shear partitions which might be well designed and particular are proven excellent overall performance in beyond earthquakes. These partitions are greater crucial in seismically energetic zones whilst shear forces at the shape will increase because of earthquakes. Due to surprising slip on a fault. The tectonic plates are usually slowly moving, however they get caught at their edges because of friction. When the pressure on the brink overcomes the friction, there's an earthquake that releases electricity withinside the shape of waves that tour via the earth's crust and purpose the shaking of ground. These complicated shaking effects in horizontal and vertical vibrations in systems referred to as as responses along with displacements, velocities and accelerations.

Kulkarni Aniruddha Shailesh1, Dr. M. R. Shiyekar2 (2021) [3]

The pushover evaluation is a overall performance-primarily based totally layout method for assessment of the seismic overall performance of latest designed and additionally current structures. Pushover evaluation also can be termed as nonlinear static evaluation and offers a widespread records of the seismic pressure resisting potential of the shape vis-a-vis the seismic call for imposed

with the aid of using the earthquake at the shape. The motive of nonlinear static evaluation is to assess the seismic overall performance of structural structures with the aid of using computing its power and deformation potential in layout earthquakes with the aid of using use of inelastic evaluation, and evaluating those capacities to the imposed needs on the overall performance levels. The evaluation is primarily based totally at the assessment of critical overall performance parameters, along with average drift, inter-storey drift, inelastic detail deformations, deformations among factors, and detail connection forces specifically for factors and connections that can't preserve inelastic deformations. In case of main changes to be achieved in an current constructing, the seismic overall performance of structurally changed constructing may be without difficulty evaluated with the aid of using pushover evaluation

PatraVenkata Naga Jyothi1 ,Dr. Dumpa Venkateswarlu2 Jami Lakshmi Sudha3 (2018) [4]

Seismic evaluation is a subset of structural evaluation and is the calculation of the reaction of a constructing (or non-constructing) shape to earthquakes. It is a part of the manner of structural design, earthquake engineering or structural evaluation and retrofit in areas wherein earthquakes are prevalent.As visible withinside the parent, a constructing has the ability to 'wave' from side to side at some stage in an earthquake (or maybe a extreme wind storm). This is known as the 'essential mode' and is the bottom frequency of constructing reaction. However, maximum homes have better modes of reaction, which might be uniquely activated at some stage in earthquakes. The parent simply suggests the primary and 2nd mode, however there are better 'shimmy'

Narayana Maddela1, Prasad Bollini2, VenkataNiranjan. Dindi3 (2017) [5]

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J.Parishith1 V. Preetha2 (2017) [6]

There has been boom in production of tall homes each residential and industrial and the fashion is transferring closer to tall and narrow structures. This will increase the impact of lateral hundreds like wind hundreds and earthquake hundreds at the structure. Hence designers are supplied with a obligation to make sure ok power and balance towards lateral hundreds. For this purpose, shear partitions are brought into the system, they are able to shape an green lateral pressure resisting system. Structural conduct below seismic loading calls for an knowledge of the conduct below massive inelastic deformations. Pushover Analysis (Non-linear Static Analysis) is a process this is used to assess the constructing loaded past elastic range.

Hanafiah1 , Saloma2 , Yakni Idris3 , Julius Yahya4 (2016) [7]

In this have a look at, bolstered concrete constructing systems with one-of-a-kind positions of shear partitions had been analyzed with pushover technique primarily based totally on ATC-40. The constructing become ten flooring placed in Palembang. Each ground has four m high. There are 4 fashions of the constructing, i.e. the constructing without a shear wall and 3 versions of shear wall one-of-a-kind positions. The goal of this have a look at is to research structural reaction due to an earthquake at the constructing with shear wall function variation, to decide overall performance factor overall performance degree of constructing shape throughout plastic condition, to decide plastic hinge function on constructing shape, and to decide best shear wall function primarily based totally on pushover evaluation. Pushover evaluation is a static nonlinear evaluation wherein earthquake impact to the constructing is seemed as static load, and the values had been elevated steadily past the imposition prompted plastic hinge.

Ashish Daga1 and Dr. A.S.Santhi2 and Dr. G Mohan Ganesh3 (2012) [8]

Several current methods are taken to address the issues related to the overall performance-primarily based totally earthquake engineering. In brief, overall performance primarily based totally engineering offers with the estimation of portions which includes seismic potential and seismic needs for unique overall performance tiers of the shape. Generally, the techniques which might be to be had to calculate seismic needs are both dynamic time records analyses or pushover evaluation. Pushover evaluation is turning into a famous device for seismic overall performance because it gives facts on seismic needs imposed through layout floor movement at the shape. Pushover evaluation is a

nonlinear approximate evaluation approach wherein the shape is subjected to growing lateral forces with non-stop peak sensible distribution till the goal displacement is reached. Pushover evaluation includes collection of sequential elastic evaluation to approximate force-displacement curve of the general shape. A structural version is created and lateral forces are carried out and accelerated till the participants yield. The roof displacement is plotted with base shear to get the worldwide potential curve. The pushover evaluation of a shape is a static non-linear evaluation below everlasting vertical hundreds and progressively growing lateral hundreds. The equal static lateral hundreds about constitute earthquake triggered forces.

N.M.Nikam1 , L.G.Kalurkar2 (2016) [9]

The Concept of seismic layout is to offer constructing shape with enough electricity and deformation capability to maintain seismic needs imposed with the aid of using floor movement with good enough margin of safety. Even if the chance of incidence of earthquake in the lifestyles span of systems could be very much less, robust floor movement could normally purpose more harm to the shape. For designing the systems for this mixture having much less chance and extreme loading, a criterion is followed in this type of manner that a first-rate earthquake, with a exceedingly low chance of incidence is expected to purpose huge harm which might not be repairable however now no longer related to lack of lifestyles Performance primarily based totally seismic layout is gaining reputation from closing many years The pushover evaluation of shape is static non-linear evaluation below everlasting vertical load and step by step growing lateral load. This lateral load represents forces precipitated with the aid of using earthquake. The shape overall performance degree is primarily based totally at the roof drifts. The overall performance tiers of a structural detail are represented withinside the load as opposed to deformation curve. The reason of the pushover evaluation is to assess the predicted overall performance of a structural System in earthquake floor movement.

MasoumehGholipour, Mohammad MehadiAlinia (2015) [10]

In the beyond 3 decades, the metal plate shear wall (SPSW) configuration has been broadly sists of infill metal plates linked to the beams, called the horizontal boundary factors (HBE); and to the columns, because the vertical boundary factors (VBE). All HBE-VBE connections are of second resisting type. Many numerical researches had been and are being completed to have a look at the conduct of SPSW structures through the 4 to be had techniques of analysis. Two techniques are linear, called Linear Static Procedure (LSP) and Linear Dynamic

Procedure (LDP); and techniques are nonlinear, called Nonlinear Static Procedure (NSP) and Nonlinear Dynamic Procedure (NDP). The linear methods are suitable while the predicted stage of nonlinearity is low. In the SPSW system, the cloth nonlinear- it is widespread as infill plates yield extensively. Therefore, nonlinear techniques are right equipment to have a look at the seismic conduct of such system. The nonlinear dynamic procedure, additionally called the nonlinear time records analysis, is deemed to be the maximum correct method; however it's miles complex, high-priced and time consuming, mainly while there are a massive range of factors involved earthquake turned into enormously decreased via way of means of use of bracing and base isolators to structure.

3. CONCLUSIONS

- 1) The high rise RCC building requires shear wall is to be find out.
- 2) How to effects of parameters such as base Shear, storey drift, storey displacement on RCC buildings.
- 3) Shear wall placed with at different Position & find out which is most Effective position.

REFERENCES

- [1] Boria Anya¹, Tamal Ghosh² "A Study on Effect of Shear Wall in Seismic Analysis of Building", Sikkim Manipal Institute of Technology, Sikkim Manipal University, Sikkim – 737136 (june-2022)
- [2] Vidhya K and Sivakumar C.G. "Pushover Analysis of RC Frame with Shear wall and Openings". Department of Civil Engineering PSG college of Technology, Coimbatore 641004 India, October-December, 2021 ISSN 0974-5823 October-December, 2021.
- [3] Kulkarni Aniruddha Shailesh¹, Dr. M. R. Shiyekar² "PUSHOVER ANALYSIS OF HIGH RISE RC BUILDING WITH VARIOUS ASPECT RATIOS OF SHEAR WAL", Dept. of Applied Mechanics, Government College of Engineering Karad, Maharashtra, India (oct2021)
- [4] PatraVenkata Naga Jyothi¹, Dr. Dumpa Venkateswarlu² Jami Lakshmi Sudha³ "Pushover Analysis of Multi-Storeyed Concrete Building with and Without Shear Wall Using Etabs Software". M.Tech (student) in structural Engineering, department of civil engineering, Godavari Institute of Engineering and Technology (Autonomous), Rajahmundry, Velugubanda Village, Rajanagaram (mandal) East Godavari, A.P, India, pin code: 533296. (Apr.2018)
- [5] Narayana Maddela¹, Prasad Bollini², Venkata Niranjana Dindi³, "PUSHOVER ANALYSIS FOR 5 X 5 BAYS CONCRETE BUILDING WITH AND WITHOUT SHEAR WALL", Volume 8, Issue 10, October 2017, pp.1792–1801, Article ID: IJCIET_08_10_180 Available online at <http://http://www.iaeme.com/ijciyet/issues.asp?JType=IJCIET&VType=8&IType=10> ISSN Print: 0976-6308 and ISSN Online: 0976-6316 (oct-2017)
- [6] J.Parishith¹ V. Preetha² "Pushover Analysis of RC Frame Buildings with Shear Wall: A Review" Department of Structural Engineering 1,2Bannari Amman Institute of Technology – Sathyamangalam, India IJSRD - International Journal for Scientific Research & Development| Vol. 4, Issue 12, 2017 | ISSN (online): 2321-0613. Abbashaghollahi, Mohsen B. Ferdous And Mehdi Kasiri 2012 "Optimization Of Outtrigger Location In Steel Tall Buildings Subjected To Earthquake Loads." World Conference Of Earthquake Engineering 2012
- [7] Hanafiah¹, Saloma², Yakni Idris³, Julius Yahya⁴ "The Behaviour Study of Shear Wall on Concrete Structure by Pushover Analysis". #Civil Engineering Department, Faculty of Engineering, Sriwijaya University, Jl.Raya Palembang-Inderalaya KM.32 Inderalaya, Oganllir, Sumatera Selatan, 30662, Indonesia. ISSN: 2088-5334, Vol.7 (2017) No. 4.
- [8] Ashish Daga and Dr. A.S.Santhi and Dr. G Mohan Ganesh "Study of Effective Positioning System of Shear Walls in RC Buildings using Pushpower Analysis". School of civil and Chemical engineering, VIT University. ISSN:2319-1058, April 2016.
- [9] N.M.Nikam¹, L.G.Kalurkar² "Pushover Analysis of Building with Shear Wall." Civil Engineering Department Jawaharlal Nehru Engineering College, Aurangabad Maharashtra, India. International Journal of Engineering Science and Computing, August 2016.
- [10] Masoumeh Gholipour¹, Mohammad Mehadi Alinia² "Considerations on the Pushover Analysis of Multi-Story steel Plate Shear wall Structures." 08/06/2015.