Nonlinear Static Pushover Analysis of Multistory R.C. Building with or without Shear Wall: A Review

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Abstract— A large number of multi-storey reinforced concrete frame building structures in urban India are constructed with masonry infill for architectural, aesthetic or economic reasons, but they are weak in resisting the lateral loads due to wind or earthquake. In recent decades, shear wall structures are the most appropriate structural forms, which have caused the height of concrete buildings to be soared. The dual structural system consisting of special moment resisting frame (SMRF) and concrete shear wall has better seismic performance due to improved lateral stiffness and lateral strength. Seismic loads are occasional forces that may occur during the life time of a building. Building should be able to withstand seismic loads due to minor earthquake without any structural damage and major earthquake without total collapse. The present paper work was made in the interest of studying various research works involved in analysis of multi-storey R.C. Building with or without shear wall with the help of Nonlinear Static Pushover Analysis.

Key words: Masonry In-fills, Shear Wall, Nonlinear Static Pushover Analysis, Dual Structural System

I. INTRODUCTION

The nonlinear static analysis where the lateral loads is increased, to maintain a predefined distribution pattern along the height of the building, until a collapse mechanism develops. The performance based approach requires a lateral loads versus deformation analysis. The pushover analysis is a static method of nonlinear analysis. The pushover analysis is a method to observe the successive damage states of a building. The nonlinear static analysis or pushover analysis has been developed over the past twenty years and has become the preferred analysis procedure for design and seismic performance evaluation purposes as the procedure is relatively simple and considers post elastic behavior. However, the procedure involves certain approximations and simplifications that some amount of variation is always expected to exist in seismic demand prediction of pushover analysis.

Reinforced concrete (RC) structural walls, conventionally known as shear walls are effective in resisting lateral loads imposed by wind or earthquakes. They provide substantial strength and stiffness as well as the deformation capacity needed for tall structures to meet seismic demand. It has become increasingly common to combine the moment resisting framed structure for resisting gravity loads and the R.C. shear walls for resisting lateral loads in multistory building structure.

Shear wall is one of the excellent means of providing earthquake resistance to multi-storeyed reinforced concrete building. Behaviour of structure during earthquake motion depends on distribution of weight, stiffness and strength in both horizontal and vertical planes of building.

To reduce the effect of earthquake reinforced concrete shear walls are used in the building. These can be used for improving seismic response of buildings. Structural design of buildings for seismic loading is primarily concerned with structural safety during major Earthquakes, in tall buildings, it is very important to ensure lateral stiffness to resist lateral load. The provision of shear wall in building to achieve rigidity has been found effective and economical. Shear walls are usually used in tall building to avoid collapse of buildings. When shear wall are situated in advantageous positions, they can form an efficient lateral force resisting system.

Generally few shear walls are located symmetrically in the building plan as per the architectural requirements of the buildings or concentrated centrally as core wall to provide the lateral load resistance and lateral stiffness required to limit the lateral deformations to acceptable levels. Many choices exist with multiple shear walls or shear wall cores in a multistory building with regard to their location in plan, shape, number, and arrangement.

II. LITERATURE REVIEW

Mario Rodriguez and Victor Rodriguez (2000) [17] using results from the literature, lateral strength and deformation capacity of confined masonry units subjected to reversed cyclic lateral loading was analysed in this paper. These units were built with fired clay solid bricks and are representative of typical confined masonry in Latin America. The analysis showed a significant higher variability on strength prediction as compared to deformation capacity prediction given by a simple procedure proposed in this paper, which suggests that a Performance-Based Design (PBD) based on lateral deformations of confined masonry construction, is a promising approach for carrying out a seismic design. Based on the above finding, guidelines for implementing a PBD approach for confined masonry construction in seismic zones is given in this paper. The procedure proposed here is targeted only to a collapse prevention performance level.

Silvia Bruno, Luis D Decanini and Fabrizio Mollaioli (2000) [41] four and eight story building belongs to housing complex at Catania was analyzed and aims to extend and increase the current knowledge about the evaluation of seismic vulnerability of existing RC buildings and concluded that: a) The seismic performance of buildings without resisting masonry panels is very poor, and the EPA corresponding to collapse conditions doesn’t exceed 0.1g; b) The presence of infilling continuous in elevation reduces the vulnerability level. The EPA corresponding to collapse conditions reaches to 0.2g, but no difference in the collapse mechanism was detected; c) If not adequately located and distributed, concentrated inelastic strain may raise due to
masonry panels, though with a strength growth with respect to the bare frames; d) The attitude to energy dissipation globally displayed by the typologies under investigation is extremely scarce; e) The collapse occurs as a consequence of the base columns yielding for concrete crushing; f) a comparison of the results of dynamic and pushover analysis allows to conjecture that, depending on different ductility demands correspond to substantially identical collapse mechanisms, the energy characteristics of the seismic input; g) Seismic retrofitting of such existing buildings is of problematic realization and doubtful effectiveness. In the introduction of shear walls and dissipative bracings satisfactory solutions may consist.

M.J.N Priestley (2000) [11] discussed and compared 3 methods that are direct displacement based design, capacity spectrum and N2 method and concluded that in the current argument, most suggested design procedures require the addition of a displacement, or damage, check to an essentially force-based design procedure.

Peter fajar, M.eeri (2000) [33] the accuracy of the results of the N2 method was checked and concluded that this method and the procedure in the FEMA-273 are quite similar and can yield the same result if same lateral load distribution and same displacement shape are assumed.

R. Hasan, L. Xu, D.E. Grierson (2002) [35] presented a simple computer-based pushover analysis technique for performance based design of building frameworks subject to earthquake loads. This technique was based on the conventional displacement method of elastic analysis.

Rahul Rana, Limin Jin and Atilla Zekioglu (2004) [36] had discussed the importance of Pushover analysis as a useful tool of performance based seismic engineering to study post-yield behavior of a structure which requires less effort and deals with much less amount of data than a nonlinear response history analysis.

Trevor Kelly (2004) [48] describe the development of finite element procedure for the nonlinear static and dynamic analysis of shear wall structure of arbitrary configuration. The procedure is based on macro modeling which produces complete building models of sufficient simplicity to permit nonlinear time history analysis.

Mehmet Inel, Hayri Baytan Ozmen (2006) [19] this paper studies the possible differences in the results of pushover analysis due to default and user-defined nonlinear component properties. Four- and seven-story buildings are considered to represent low- and medium-rise buildings for this study. Plastic hinge length and transverse reinforcement spacing are assumed to be effective parameters in the user-defined hinge properties. Observations show that plastic hinge length and transverse reinforcement spacing have no influence on the base shear capacity, while these parameters have considerable effects on the displacement capacity of the frames. Comparisons point out that an increase in the amount of transverse reinforcement improves the displacement capacity. Although the capacity curve for the default-hinge model is reasonable for modern code compliant buildings, it may not be suitable for others. Considering that most existing buildings in Turkey and in some other countries do not conform to requirements of modern code detailing, the use of default hinges needs special care. The observations clearly show that the user-defined hinge model is better than the default-hinge model in reflecting nonlinear behavior compatible with the element properties. However, if the default-hinge model is preferred due to simplicity, the user should be aware of what is provided in the program and should avoid the misuse of default-hinge properties.

M.J.N. Priestley, G.M. Calvi and M.J.Kowalsky (2007) [15] discussed that to assessment of designed structures a broad based probability approach is more appropriate than to the design of new structures and described major coordinated research project in the study which present an alternative approach to current force based design.

A. Kadid and A. Bournrik (2008) [01] using Algerian code, five, eight and twelve storey buildings were analyzed and studied and concluded that results obtained in terms of capacity, demand and plastic hinges which gives the real behavior of structures. And also found that building failed at Boumerdes was due to use of low quality construction material and strong column weak beam mechanism.

M. Seifi, J. Noorzaei, M. S. Jaafar and E. Yazdan Panah (2008) [13] in this study nonlinear static pushover (NSP) analysis to nonlinear dynamic time-history analysis was compared and concluded that:

- For estimating the capacity and deformation problems for certain types of structures pushover analysis is a good solution.
- More investigation is required for steel structures, 3D structures and high rise frames.
- NSP method is a well known method in the society of civil engineers but the conventional code based method has many deficiencies
- Several methods such as MPA (modal pushover analysis), APA, N2, MT, MMC etc. were proposed to overcome the deficiencies of the conventional method in recent decade.

O. Esmaili, S. Epackachi, M. Samadzad and S.R. Mirghaderi (2008) [30] they studied the structural aspects of one of the tallest RC buildings, located in the high seismic zone, with 56 stories. In this Tower, shear wall system with irregular openings are utilized under both lateral and gravity loads, and may result some especial issues in the behavior of structural elements such as shear walls, coupling beams and etc. To have a seismic evaluation of the Tower, a lot of nonlinear analyses were performed to verify its behavior with the most prevalent retrofitting guidelines like FEMA 356. In this paper; some especial aspects of the tower and the assessment of its seismic load bearing system with considering some important factors will be discussed. Finally after a general study of ductility levels in shear walls; we will conclude the optimality and conceptuality of the tower design. Finally, having some technical information about the structural behavior of the case would be very fascinating and useful for designers.

Mingke Deng and Xingwen Liang (2008) [20] based on the seismic fortification level in Chinese Code for Seismic Design of Buildings, the performance of shear wall structures is divided into three levels: fully operational, performance interruption and collapse prevention. Applying the inverted triangular distribution of lateral force to the
cantilever wall with identical section, the displaced curve is regarded as the initial lateral displacement mode. By employing the design parameter of destructive story drift ratio, the determining method of target lateral displacement for shear wall structures is demonstrated and a destructive story drift-based seismic design method is presented. They also discussed that in the “fully operational” performance level, the target lateral displacement is determined by the corresponding drift curve when the shear wall structure reaches the target destructive story drift ratio. Afterward, the equivalent parameters of single-degree-of-freedom system can be calculated, and the base shear and horizontal earthquake action of every mass of multi-degree-of-freedom system can be estimated. In the “performance interrupt” and “collapse prevention” performance levels, the designed structure is adjusted based on the relationship between pushover curve and demand curve and the ductility demands of structure.

Ioannis P. Giannopoulos (2009) [08] typical five storey non-ductile RC frame building was designed with past seismic regulations in Greece and analyzed using a nonlinear static (pushover) analysis. Few critical sections were selected and the rotational ductility supply at various limit states as predicted by FEMA 356 and Annex A of EC8 Part 3 was calculated and observed that for beams the EC8 limit states are increasing with roof displacement, while in columns they remain almost constant.

Y.M. Fahjan and J. Kubin & M.T. Tan (2010) [51] in their study, different approaches for linear and nonlinear modeling of the shear wall in structural analysis of buildings are studied and applied to RC buildings with shear walls. The analysis results of different approaches are compared in terms of overall behavior of the structural systems.

Pwint Thandar Kyaw Kyaw (2010) [34] studied pushover analysis (Static Non-linear Analysis). Seven types of case study were considered which were depending on construction practice and detailing. 3D frame buildings were modeled located in seismic zone 2A. As target displacement at each case study different percentages(%) of building height of displacement magnitude were used and concluded that displacement amplification factor Cd varied mostly with the changes in system ductility factor i.e. (the extent of yield displacement and maximum inelastic deformation).

S.V. Venkatesh and Dr. H. Sharada Bai (2011) [38] in their study, an attempt is made to study the difference in structural behavior of 3-dimensional (3D) single-bay three-bays 10 storey basic moment resisting RC frames when provided with two different types of shear walls as LLRS. The detailed investigations are carried out for zone V of seismic zones of India as per IS 1893(part 1):2002 considering primary loads and their combinations with appropriate load factor. Altogether 15 models are analyzed which consist of one basic moment resisting RC frame with three different sizes/ orientation of columns and other two include basic moment resisting RC frame with the same sizes/ orientation of columns as in bare frame with internal and external shear wall of two different thicknesses. The results obtained from linear static analysis are thoroughly investigated for maximum values of joint displacements, support reactions, columns forces and beam forces. Along with these parameters, the study on the principle and shear stresses in shear wall is carried out.

Mrugesh D. Shah, Atul N. Desai and Sumant B Patil (2011) [25] to cover the broader spectrum of high rise and low rise building construction G+4 and G+10 storey R.C.C. buildings were analyzed. Through nine model for G+4 storey and G+10 storey comparative study made for bare frame (without infill), having infill as membrane, replacing infill as a equivalent strut and concluded that G+4 and G+10 storey’s in bare frame without infill having lesser lateral load capacity (Performance point value) compare to bare frame with infill as membrane and bare frame with infill having lesser lateral load capacity compare to bar frame with equivalent strut. Also conclude that as the no. of bays increases lateral load carrying capacity increases but with the increase in bays corresponding displacement is not increases.

Anshuman S, Dipendu Bhunia, Bhavin Ramjiyani (2011) [02] in this paper, main focus is to determine the solution for shear wall location in multi-storey building based on its both elastic and elasto-plastic behaviors. An earthquake load is calculated and applied to a building of fifteen stories located in zone IV. Elastic and elasto-plastic analyses were performed using both STAAD Pro 2004 and SAP V 10.0.5 (2000) software packages. Shear forces, bending moment and story drift were computed in both the cases and location of shear wall was established based upon the above computations.

Dalal Sejal P., Vasanwala S. A. and Desai A. K. (2011) [04] observed that for various other different types of structures more research work is needed, especially for development of PBPD (Performance Based Plastic Design) method.

P. Poluraju, and P. V. S. Nageswara Rao (2011) [32] in the present paper the performance of reinforced concrete frames was investigated using the pushover analysis, concluded that the behavior of properly detailed reinforced concrete frame building is adequate as indicated by the intersection of the demand and capacity curves and the distribution of hinges in the columns and the beams. Hinges were mostly developed in the beams and few in the columns but with limited damage.

N. Choopool and V. Boonyapinyo (2011) [27] studied the effect on cost estimates and the investigation of seismic performance for nine-story reinforced concrete moment resisting frames with various ductility’s by the nonlinear static analyses and nonlinear dynamic analysis under seismic loadings in Bangkok according to the newly proposed seismic specifications of Thailand (DPT 1302-52).

T. Mahdi and V. Soltan Gharaei (2011) [47] in this paper, the seismic behaviour of three intermediate moment resisting concrete space frames with unsymmetrical plan in five, seven and ten stories are evaluated by using pushover analysis. In each of these frames, both projections of the structure beyond a re-entrant corner are greater than 33 percent of the plan dimension of the structure in the given direction. The performance of these buildings has been investigated using the pushover analysis. Results have been compared with those obtained from non-linear dynamic analysis.

Ehsan Salimi Firoozabad, Dr. K. Rama Mohan Rao, Bahador Bagheri (2012) [06] in the present study main focus is to determine the effect of shear wall configuration on seismic performance of buildings. Time history analysis
has been done to buildings with different number of stories and various configurations with same plan. The top story displacements have been obtained and compared to each other for all models to meet the effect of shear wall configuration on seismic performance of buildings. The analysis and design of models have been studied based on IS codes, and SAP 2000 software have been used for this purpose.

Sofyan. Y.Ahmed (2013) [42] analyzed a ten story five bay reinforced concrete frame (2D beams and columns system) subjected to seismic hazard of the Mosul city Iraq. Plastic hinge was used to represent the failure mode in the beams and columns and concluded that most of the hinges were formed in beams.

Sujin S. George, Valsson Varghese (2012) [44] in this paper the performance of reinforced concrete frames was investigated using the push over analysis also few cases of Bhuj earthquake are also discussed and the following conclusions are drawn from the analysis: The pushover analysis is a relatively simple way to explore the non-linear behavior of the buildings, the behavior of properly detailed reinforced concrete frame building is adequate as indicated by the intersection of the demand and capacity curves and the distribution of hinges in the beams and the columns. The causes of failure of reinforced concrete during the Bhuj earthquake may be attributed to the quality of the materials used and also the fact that most of buildings constructed in that region are of strong beam and weak column type and not to intrinsic behavior of framed structures.

Y. Fahjan B. Doran B. Akbas J. Kubin (2012) [50] this paper evaluates and comments on the consistency of different approaches for nonlinear shear wall modeling that are used in practice. For this purpose 3, 5 and 7-story reinforcement concrete (RC) frames with shear walls are analyzed using nonlinear two dimensional nonlinear finite element method under constant gravity loads and incrementally increased lateral loads. The analysis results for these models are compared in terms of overall behavior of the structural systems. Besides, definition of the plastic hinge properties which strongly affects the prediction of the capacity curve of RC wall in the pushover analysis is also discussed.

M. K. Rahman, M. Ajmal & M. H. Baluch Z. Celep (2012) [12] this paper presents a 3D nonlinear static analysis for seismic performance evaluation of an existing eight-story reinforced concrete frame-shear wall building in Madinah. The building has a dome, reinforced concrete frame, elevator shafts and ribbed and flat slab systems at different floor levels. The seismic displacement response of the RC frame-shear wall building is obtained using the 3D pushover analysis. The 3D static pushover analysis was carried out using SAP2000 incorporating inelastic material behavior for concrete and steel. Moment curvature and P-M interactions of frame members were obtained by cross sectional fiber analysis using XTRACT. The shear wall was modeled using mid-pier approach. The damage modes includes a sequence of yielding and failure of members and structural levels were obtained for the target displacement expected under design earthquake and retrofitting strategies to strengthen the building were evaluated.

Kasliwal Sagar K., Prof. M.R. Wakehaure, Anantwad Shirish (2012) [09] in present work, two multi story buildings, both are sixteen storey’s have been modeled using software package ETABS and SAP2000 for earthquake V zone in India. Different position and location of shear walls are considered for studying their effectiveness in resisting lateral forces.

Misam Abidi, Mangulkar Madhuri. N. (2012) [21] this paper highlights the importance for immediate measures to prevent the indiscriminate use of soft first story in buildings, which are designed without regard to the increased displacement, ductility and force demands in the first story and this paper argues the importance of novel design approach which has an advantage of interaction between rigid frames and shear walls. A combination of the two structural components leads to a highly efficient system, in which the shear wall resists the majority of the lateral loads in the lower portion of the building, and the frame supports the majority of the lateral loads in the upper portion of the building.

N. JITENDRA BABU, K. V. G. D. BALAJI & S. S. S. V. GOPALARAJU (2012) [28] this paper deals with the non-linear analysis and asymmetric structures constructed on plain as well as sloping grounds subjected to various kind of loads. Different structures constructed on plane ground and inclined ground of 30° slope is considered in present study. Various structures are considered in plane symmetry and also asymmetry with difference in bay sizes in mutual directions. The analysis has been carried out using SAP-2000 and ETABS software. Pushover curves has been developed and compared for various cases.

Ms. Nivedita N. Raut & Ms. Swati D. Ambadkar (2013) [26] in their study they investigated the effect of the layout of masonry infill panels over the elevation of masonry in filled R/C frames on the seismic performance and potential seismic damage of the frame under strong ground motions using nonlinear static push-over analysis based on realistic and efficient computational models.

Shaik Kamal Mohammed Azam, Vinod Hosur (2013) [39] a comparison of structural behavior in terms of strength, stiffness and damping characteristics is done by arranging shear walls at different locations/configurations in the structural framing system. The elastic (response spectrum analysis) as well as in-elastic (nonlinear static pushover analysis) analyses are carried out for the evaluation of seismic performance. The results of the study indicate that the provision of shear walls symmetrically in the outermost moment resisting frames of the building and preferably interconnected in mutually perpendicular directions forming a core will lead to better seismic performance.

Kavita Golghate, Vijay Baradiya, Amit Sharma (2013) [10] this papers aims to evaluate the zone IV selected reinforced concrete building to conduct the non-linear static analysis (Pushover Analysis). The pushover analysis shows pushover curves, capacity spectrum, plastic hinges and performance level of the building.

M.D. Kevadkar P.B. Kodag (2013) [14] in this study R.C.C. building is modeled and analyzed in three Parts, I) Model without bracing and shear wall, II) Model with different shear wall system, III) Model with Different bracing system. The computer aided analysis is done by using E-TABS to find out the effective lateral load system during earthquake in high seismic areas. The performance of
the building is evaluated in terms of Lateral Displacement, Storey Shear and Storey Drifts, Base shear and Demand Capacity (Performance point). It is found that the X type of steel bracing system significantly contributes to the structural stiffness and reduces the maximum inter story drift, lateral displacement and demand capacity (Performance Point) of R.C.C building than the shear wall system.

Dr. S. N. Tande and Reshma M. Karad (2013) [05] the present paper deals with detailed discussions on non-linear static analysis methods various structural performance levels of building. Seismic evaluation followed by information about various strengthening techniques for beam and column. The study includes the Pushover Analysis of G+6 storey building using SAP 2000 with default and user-defined hinges. And conclude that model with user-defined hinge properties is more successful for capturing hinging mechanism.

P. B. Oni, Dr. S. B. Vanakudre (2013) [31] in the present work three storey and six storey building models with plus shape Shear wall have been considered. Equivalent static and response spectrum methods are carried out as per IS: 1893 (Part 1) -2002 using finite element analysis software ETABS v9.1.1. Seismic performance is assessed by pushover analysis as per ATC-40 guidelines for earthquake zone V in India. The paper also deals with the effect of the variation of the building height on the structural response of the shear wall. This paper highlights the accuracy of Push over analysis in comparison with the most commonly adopted Response Spectrum Analysis and Equivalent Static Analysis.

Shyam Bhat M, N.A. Premandand Shenoy, Asha U Rao (2014) [40] this paper presents the study and comparison of the difference between the earthquake behavior of buildings with and without shear wall using STAAD Pro. For this study, a 50 storey building with 3.5 meters height for each storey, regular in plan was modeled. The buildings are assumed to be fixed in the base. Models were studied in all four zones comparing lateral displacement and base shear for all structural models under consideration.

Syed Ahamed And Dr. Jagdish G.Kori (2013) [45] using ETABS 9.7 version G+3 and G+5 storey unsymmetrical building model was compared and summarizes the review in the performance based seismic analysis and concluded that base shear increases with the number of storey of building and increase in mass, also the base shear obtained from equivalent static analysis is much more lesser than base shear obtained from pushover analysis.

Mr. A. Vijay and Mr. K. Vijayakumar (2013) [22] for performance based design of steel building frame work study was focused on a computer based pushover analysis technique which was subjected to earthquake loading. 2D frames were modelled for solid and hollow sections, for various stories with constant bay width and storey height which was analyzed and concluded that:

1) When the no. of storey decreases corresponding base shear increases and also when the no. of stories increases corresponding displacement increases.

2) Drift to height ratio is limited to thirty five stories.

3) Comparing the results of solid and hollow sections base shear vs. displacement curve indicates that the hollow sections are far better than solid ones.

Venkata Sairam Kumar, N. Surendra Babu, R. Usha Kranti. J (2014) [49] this paper include study of various research paper on Shear wall. Research was carried mainly on application of cyclic load tests and behavior of different types of shear wall in cyclic application of loads. Researchers studied various parameters like enhancement of stiffness, drift, development forces in buildings and also to observe perfect location of shear wall in building frame for construction.

Nitin Choudhary , Mahendra Wadia (2014) [29] in this paper pushover analysis has been done on two multistoried R.C. frame building, in which plan of one building was taken symmetrical and it consist of 2 bay of 5m in x direction & 2 bay of 4m in y direction and second building having L shaped unsymmetrical plan. The shear wall is providing for studying their resisting lateral forces. In this paper highlight the effect of shear wall on R.C. frame building when shear wall providing along the longer and shorter side of the building. The base shear and displacement will decrease of building. The comparative study has been done for base shear, storey drift, spectral acceleration, spectral displacement, storey displacement.

Rajesh M N, S K Prasad (2014) [37] in the present study, RC walls are modeled and analyzed using SAP 2000’s pushover analysis capability on layered shell elements. Various parameters such as aspect ratio of walls, reinforcement detailing aspects and presence of openings are chosen to study the seismic performance of RC walled buildings. Results of analysis have revealed that incorporation of ductile detailing in the form of boundary element significantly improves the seismic performance of RC walls specially the displacement ductility of the wall and the effects are more pronounced when the bottom storey are strengthened with boundary elements. Presence of openings in RC walls significantly reduces base shear carrying capacity in the presence of boundary elements while it reduces both base shear capacity and ductility in the absence of boundary elements. Decrease in the aspect ratio of the wall reduces the base shear capacity of the wall while deformation capacities remain unaffected.

D. B. Karwar, Dr. R. S. Londhe (2014) [03] the main aim of their study is to understand the behavior of RCC framed structures by using nonlinear static procedure (NSP) or pushover analysis in finite element software “SAP2000” and the Comparative study made for different models in terms of base shear, displacement, performance point. To achieve this objective, two typical new R.C.C. buildings were taken for analysis: G+8 and G+12 to cover the broader spectrum medium and high rise building construction. Different modeling issues were incorporated through ten model for the same building were; bare frame having shear wall with and without considering soft storey, infill as X- type concrete bracing with and without considering soft storey.

Sachita Hirde and Ganga Tepugade (2014) [43] in this paper attempt has been made to study performance of a building with soft storey at different level along with at GL. The nonlinear static pushover analysis is carried out. The hinges formed in the basic models are seen at performance
point and to increase the performance, it is retrofitted with shear walls. Then the result obtained for basic models and retrofitted models are compared in the form of performance point and hinge formation pattern at performance point.

Manohar K, Dr. Jagadish Kori G (2014) [16] in this paper, study of 15 storey building in zone V is presented with some preliminary investigation which is analyzed by changing various position of shear wall with different shapes in different soil conditions, according to the IS code 1893 (Part 1): 2002 for determining parameters like storey drift, storey shear, lateral displacement and performance point of building by adopting a pushover analysis. This analysis is done by using standard package ETAB v9.7.4.

Syed Khasim Mutwali, Dr. Shaik Kamal Mohammed Azam (2014) [46] this study presents the procedure for seismic performance estimation of high-rise buildings based on a concept of the capacity spectrum method. In 3D analytical model of thirty storied buildings have been generated for symmetric buildings Models and analyzed using structural analysis tool ETABS. The analytical model of the building includes all important components that influence the mass, strength, stiffness and deformability of the structure. To study the effect of concrete core wall & shear wall at different positions during earthquake, seismic analysis using both linear static, linear dynamic and non-linear static procedure has been performed. The deflections at each storey level has been compared by performing Equivalent static, response spectrum method as well as pushover method has also been performed to determine capacity, demand and performance level of the considered building models.

Gayathri.H, Dr.H.Eramma, C.M.Ravikumar, Madhukaran (2014) [07] this paper is stressed on dual system combination of SMRF and shear wall systems and flat slab with shear wall system. By using these lateral resisting systems the 3D models are generated and analyzed with ETABS software. Equivalent static analysis is carried out to find natural period. Lateral displacement, storey drift and base shear of the structure and hence to conclude the best lateral load resisting system pattern which is efficient to resist the lateral loads.

Mr. Syed Owaise Showkath Peer, Khalid Nayaz Khan (2014) [23] the aim of this paper is to study the state of art of seismic evaluation of multi-storied reinforced concrete buildings. The focus of attention is to find the performance level of the building with the help of capacity and demand of the building for designed earthquake using nonlinear static pushover analysis.

Mr.K.LovaRaju, Dr.K.V.G.D.Balaji (2015) [24] this paper deals with the non-linear analysis of frame for various positions of shear wall in a building frame. In this present study, the focus is to identify effective location of shear wall in multi-storey building. Considering model one is bare frame structural system and other three models are dual type structural system. An earthquake load is applied to a building of eight storey is located in zone II, zone III, zone IV and zone V as per Code Provision IS1893-2002. The analysis has been carried out using ETABS software. Pushover curves have been developed and compared for various models. It has been observed that structure with shear wall at appropriate location is more significant in case of displacement and base shear.

Md Zibran Pawaar, Khalid Nayaz Khan, Syed Ahamed Raza (2015) [18] Present study includes linear-static and non-linear static analysis with different shear wall arrangements on dual systems such as flat slabs and shear walls & moment resisting frames and shear walls for different irregular plans using ETABS 9.7.4 software. Parameters such as point displacements, base shears, and pushover curves are studied.

III. CONCLUSION

Form the above literature, it is seen that the research are in interest of usage of different types of shear walls in construction of tall building structures. Research was carried mainly on application of cyclic load tests or lateral load analysis and behavior of different type of shear walls in different loading conditions. Researchers studied various parameters like enhancement of stiffness, drift, development forces in buildings and also to observe perfect location of shear wall location in building frame for construction. It was seen that any type of building which is tall and can be affected with lateral forces like earthquake and wind forces can be constructed with shear wall. Sheikh can be used as lateral load resisting systems and also retrofitting of structures. Few researches was carried out for the comparative analysis of multi storied building with shear walls and infill walls and there is much scope of study in this subject, where we can compare different parameter of buildings.

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