

A Review on Analysis of Soft Story at intermediate Levels in a Multi-Story Building

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Abstract - A soft story building is multi-story building in which one or more than one floor has windows, doors which are wide, large and also unobstructed spaces of commercial, or various openings in places where a shear wall normally be required for the stability as a matter for engineering of earthquake design. A typical building of soft story is of either three or more stories and might be located over a ground level with large openings, such as series of businesses with large window and also parking garage. It is a building of irregular structural configurations that are significant source of some serious earthquake damage. These configurations of structure that are essentially originated because of decisions have been recognized by study of earthquake engineering. These buildings mostly perform badly in earthquakes. Usually buildings located above ground level with large openings, like series of retail businesses and parking garages with large doors. In this study we will carry out preventive techniques & these are suggested to improve seismic performance of a building to reduce the effect of soft story in building at intermediate levels.

Key Words: *Soft Story, Large Openings, seismic performance, earthquake, response spectrum analysis.*

1. INTRODUCTION

A building of a story significantly less stiff than adjacent stories is termed 'soft story'. In the design of earthquake resistant, the soft story irregularities are reciprocal to a significant difference between the stiffness and the resistance of one of the floors of a building and the rest of them. Both the configurations are known in architectural terms as the open floor. The various of advantages given by this concept of modern architectural design, both aesthetical as functional, is the real reason why it has been encouraged all around the world since the 20th Century. These present conditions are, when the first story of a frame structure, known in many countries as "ground floor", is free of walls, while non-structural stiff walls are there present in upper ones, or when shear walls are also located in the upper stories and they don't follow down to the foundations, but they interrupt at the second floor. But in the seismic zones, from the beginning of the 20th Century this configuration of buildings been attributed as one of the important factor to the generation

of seismic vulnerability in modern buildings. The irregularity of soft story, refers to the existence of a building floor that presents a significantly lower stiffness than the others, hence it may also be called as flexible story.

1.1 Soft Story

The building in which ground storey consist of open space for parking area is known as stilt building and parking storey is called as Soft-Storey. When the sudden change of stiffness takes place along the building height, the storey of which the drastic reduction of stiffness is observed is known as soft storey. A building of Soft story is a multi-story building with wide doors, large unobstructed commercial spaces, or the ground storey is left open for the purpose of parking, namely, columns in the ground storey do not have any partition walls or of either masonry or RC between them.

1.2 Soft Story Failure

Due to shortage of land and for effective use of the sites for new constructions, multi-purpose buildings have been built. Most common structural system for lower stories of these buildings has been moment-resisting space frame because it can usually accommodate a parking area, commercial space, open spaces or gardens for architectural reasons. Due to these kinds of provisions, the lateral displacement of the whole structure is governed mostly by the deformation at the lower stories. Hence, it may be essential to estimate the demand and supply in the force and deformation of the members at this part of the building to achieve a reasonable design of these structures.

2. LITERATURE REVIEW

Niloufar Mashhadiali, et al (2018)⁽¹⁾ - In this author said that with title, Seismic performance of concentrically braced frame with hexagonal pattern of braces to mitigate soft story behaviour. This study presents a description of the proposed hexa-braced frame as a new seismic-resistant bracing system. A simple static analysis methodology is presented to determine the column

bending moment. Different structural models are designed to evaluate the seismic behaviour of the hexa-braced frame compared to similar X-braced frame models as the benchmark.

Achyut S. Naphade, et al (2018)⁽²⁾- He studied the Pushover Analysis of RCC building with soft Storey At Different Levels. In this study, he understand the behaviour of soft storey when provided at ground level but very few papers are available when soft storey is provided at upper level. However there is little work carried out by researcher related to finding vulnerability of existing RCC building with soft storey at different levels in multi-story building using pushover analysis. Hence it is proposed to study vulnerability of existing RCC building with soft storey at GL along with at intermediate floor using nonlinear static analysis As we shifted soft storey to higher level, yielding is less than lower level soft storey and lower intensity hinges are forming after maximum number of pushover steps.. at 8th floor soft storey.

Rahiman G. Khan,et al (2017)⁽³⁾ – He worked on Push Over Analysis of Tall Building with Soft Stories at Different Levels So in this RC frames buildings which are known to perform poorly during strong earthquake shaking, the presence of masonry infill wall which influences the overall behaviour of the structure when subjected to lateral forces, when the masonry infill are considered for interact with their surrounding frames the lateral stiffness and lateral load carrying capacity of structure largely increase. In this the seismic vulnerability of building is shown with an Example of a G+20. Earthquake analysis would be carried out on the RCC moment resisting framed tall building without Infill wall on a different stories with the help of Software ETABS.

Singh Shailendra,et al (2017)⁽⁴⁾ –He studied the Seismic Response of Soft Storey on High Rise Building Frame. The study have been carried out on Four standard procedures are commonly used for seismic analysis of buildings, two linear procedures, and two nonlinear procedures. The various linear procedures are termed the Linear Static Procedure and the Linear Dynamic Procedure (LDP). The nonlinear procedures are termed as the Nonlinear Static Procedure (NSP) and Nonlinear Dynamic Procedure (NDP). This Study Concludes, Linear seismic performance based analysis and design procedures are necessary to be incorporated in Indian codes. The maximum of displacement observed in soft storey fourteen floor and minimum displacement in soft storey first floor.

Pradnya V. Sambary,et al (2017)⁽⁵⁾ –He Studied on Evaluation of seismic response of a building with soft story. In this study, he aims at studying the effect of introducing a soft story in a multi-storey building. The objective includes carrying out the seismic analysis of following three models of G+15 RC building in ETABS software using response spectrum method. Various

seismic responses like as modal time period, story stiffness, story drifts, and lateral displacements are computed. The different column forces of open ground story are also evaluated. Based on these responses, behaviour of soft storied building is compared with a fully infilled frame building.

Pramod M Gajbe,et al (2016)⁽⁶⁾ He works under the title, analysis of soft story multi-storey steel structure building. focusing on soft storey Multi-storey steel structure buildings. From The Limited Study Done An Attempt Has Been Made To Draw The Following General & Specific Conclusion. The result of the present study shows that soft-storey floor will have very determinant effect on structural behaviour of building floor wise and structural capacity under lateral loads. Relative story, displacement and drifts are affected at the top storey by the structural regularities.

Vipin V Halde, et al (2016)⁽⁷⁾ – He works On study is Effect of Soft Storey on Structural Response of the High Rise Building. The attempt has been made in this to study Lateral displacement of a story is a function of stiffness, mass and lateral force distributed on that story. It is known as the lateral force distribution along the height of a building is directly related to mass and stiffness of each story. Hence displacement is more in soft storey. From the analysis of this it is seen that, deflection is more in case of bare frame as compare to that of infill frame, because presence of infill contributes to the stiffness of building.

Ari Wibowo,et al(2015)⁽⁸⁾- He carried out for Collapse behaviour assessment of precast soft storey building. The major aim of this is to study the load deflection behaviour of soft storey buildings when subjected to lateral loading. Soft-storey consists of the precast concrete columns with relatively weak connection at each end. The objective of this experimental investigation was to study the load-deflection behaviour and the collapse modelling of soft storey buildings when subjected to lateral loading.

Ranjit V. Surve,et al (2015)⁽⁹⁾-He had an Observation on Performance based Analysis of Multistoried building with soft stories at different levels. The pushover is expected to provide information on the many of responses characteristics that cannot be obtained from an elastic static or dynamic analysis. As we shift soft storey to higher level yielding occur less than the lower level soft storey and lower intensity hinges are forming after maximum number of the push-over steps.

3. SUMMARY

From Study of above literature it is seen that, the study has been carried out to reduce the effect of soft story by different techniques such as infill walls, stiffening of

columns, bracing systems & with the use of that we will reduce the seismic effect on soft story building.

4. CONCLUSION

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