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Analysis of A High Rise Building Frame with Bracing and Shear Links at the External Members Using Analysis Tool Staad : A Review

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ABSTRACT

Vertical shear-links in characteristic bracing systems, not similar to one located in the structure and can be easily changed or modify therefore, after the seismic effects, considering that other frame elements will remain elastic, only the vertical shear-links should be change, and then frame structure can function normally. a X type bracing system will be designed and fit with high accuracy and a small change in its characteristics reduce the ductility without increasing the stiffness, but unlike knee brace, vertical shear-link can be easily designed and implemented. In this review paper I am elaboration the past research work done related to lateral load resisting members, seismic forces and high rise building analysis using STAAD. Pro.

Keywords: STAAD. Pro, Reinforced Concrete, Aluminum Plates, ETAB/SAP 2000, HSS

I. INTRODUCTION

It has been seen in past seismic tremors that the structures on slants serve more fiendishness and fold. Shudders cause valid harm to structures, for case, disappointment of individuals in the building and if the power of tremor is high it prompts breakdown of the structure. In past years populace has been developed undeniably and as a consequence of which urban zones and towns began spreading out. In light of this reason different structures are being inborn slanting zones. India has a broad shoreline bleeding edge shown in figure 1.2 which is secured with mountains and inclinations. Different resorts are being delivered in uneven zones to give strategies to visitors. The structures in these zones are made on slanting grounds. An enormous part of the harsh reaches in India go under the seismic zone II, III and IV zones in such case working in perspective of inclining grounds are exceedingly slight against seismic tremor. This is an eventual outcome of the way that the bits in the ground floor contrast in their statures as appeared by the inclination of the ground. Sections toward one side are short and on flip side are long, by virtue of which they are exceedingly fragile. Seismic powers acts more separate in sloping areas because of the auxiliary anomaly. Likewise it has been contemplated that the earthquake activities are inclined in sloping ranges. In India, for instance, the north-east states.

To provide a detailed review of the literature related to bracings and shear links in its entirety would be difficult to address here. Although there has been a lot of work modeled as braced system in reinforced concrete structures ranging from analysis assumptions to design recommendations - none provide in-depth understanding of the seismic response of reinforced concrete (RC) buildings contributions related to shear link and past efforts most closely related to the needs of the present work. A brief review on shear link in braced system and code provision of previous studies is presented here. This literature review focuses on bracing system used in reinforced concrete structures and some code provisions will be addressed by area.

II. LITERATURE SURVEY

Akshay Sonawane et. al. (2016), focuses on the effect of bracing system on the storey that is critical in the structure. They studied on bracing systems like cross bracing, diagonal bracing, inverted V bracing and V bracing systems and results on components like storey drift and bending moment in columns and storey displacement were calculated.

Vishwanath B. Patil (2016), studied on stability analysis of multistory building with underneath satellite bus stop having Service soft storey and floating columns. In this investigation, the study of analysis of columns, shear walls, coupled component, single and multistory structure was done. For the stability of the building, arrangements like bracing system and shear system is provided or combination of both was used.

The stability analysis was done in the computer software like STAAD Pro and ETAB/SAP 2000 with addition of P-Δ analysis. They concluded that, when lateral stiffness decreases, there was reduction in extreme frame building loads and square columns gives better result in parameters like storey drift, base shear and roof displacement as compared to rectangular column.

Ranjit V. Surve et. al. (2015), analyzed the multistoried building with soft storey at different levels. In this study, they concentrated mainly on the finding of best place in high rise structure for the soft storey with ground level as soft storey as well as they find the natural time period of multistory building. They concluded that, number of hinges reduced by shifting of soft storey to the higher level of the building. With this, displacement as well as base shear gets increased. Yield occurrence gets reduced with the shifting of soft storey at higher level and there is formation of low intensity hinges after number of pushover steps gets maximum. The result for the time period was seen that, teff gets decreased as the shifting of soft storey at higher level; it reduces from 2.571sec for 4th floor to 2.366sec for 16th floor as soft storey i.e. they conclude that soft storey gives safe result at higher level in high rise structure.

Rashmi sakalle et. al. (2015) Studied the effect of bracings at different position of the structure and compared it with rigid diaphragm structure under dynamic loading, using analysis tool staad.pro and concluded that rigid diaphragm is comparatively more effective in reducing lateral forces also making the structure cost effective in terms of reinforcement steel.

Mahesh Bagade (2015), studied the seismic evaluation of high rise structure by using steel bracing system. For the seismically inadequate reinforced concrete frames, the use of steel bracing systems is done for strengthening. In this study, different types of bracing systems are used and seismic analysis is done for seismic zone III as per IS1893:2002. Lateral displacement, storey drift, axial force and base shear are the main parameters which are studied.

It was seen that, the structural stiffness was contributed by the X type of steel bracing and maximum interstorey drift of the frames also gets reduced. The bracing system gives best results in lateral stiffness, strength capacity as well as in displacement capacity. They conclude that, reduction in lateral displacement of the structure occurs up to 65% by the use of X type of bracing system. Storey drift gets reduced in X type of bracing system. There was increase in axial force for X bracing system up to 22%.

Kiran Kamath et. al. (2015) performed a comparative study on a circular plan with different angels of diagrid are considered as 64.00°, 72.00°, 76.30° and 90.00°. the geometry of circular plan is G+36 storey tall structure with 3.6 m each floor height and 36 m diameter of lateral dimensions are provided, considering wind load as per 875 part3 and seismic zone III as per 1893 part-1. Compared the structure in terms of base shear, top storey displacement, concluded that As the angle of diagrid increases, axial rigidity of the diagonal columns decreases, time period is minimum for 72° whereas top storey displacement is minimum for angle of 64.0°.

Giulia Milana et. al. (2015) analyzed a G+40 tall structure with Different diagrid structures were considered, namely, three geometric configurations with inclination of diagonal members of 42°, 60°and 75°, and geometry considered is 36 x 36 m in lateral dimensions, and 160 m tall structure with circular shape. In this work the consider seismic Zone IV and did pushover analysis and concluded that providing diagrid is not only making economical building but also much stable in terms of safety.

Anuj K. Chandiwala et. al. (2014) studied on seismic response of RC building with soft stories. The strong column and weak beam construction is done for the safety of building during earthquake. Because of this concept, beams yield before columns collapse. In this research, different models are analysed with soft storey for proper assessment of the stiffness of the storey. They concluded that displacement would be more at upper stories and less at lower stories.

Raut Harshalata et. al. (2014) studied the effect of steel plate shear wall on behaviour of structure. In this paper, design and analysis of steel building is done with and without steel plate shear wall. G+6 storey building for seismic zone III is studied and static analysis is done using STAAD Pro software. The main components which were fond out for the seismic performance are bending moment, shear force, deflection and axial force and comparison is done. The effect of shear wall is also considered.

Ravi K Revankar et.al. (2014) analyzed a G+12 storey structure which consist of diagrid members, the geometry of structure consider in his study was 27 X 27 m in lateral dimensions and 48 m in height consist of 12 storey considering 4m each storey height. Modelled and analysed the structure using analysis tool SAP2000, considering dead, live and seismic loads as per Indian Standards and conducted non linear analysis (pushover analysis), designed the structure as per specifications, and concluded that structure with diagrid are more stable and resistable during collapse and found more durable to counteract forces in terms of displacement.

Tejas D. Joshi (2013) studied on bracing systems on high rise steel structures. For this investigation, G+15 storied steel frame structure models with same sections and different bracing arrangements like X bracing, double X bracing, Single diagonal, K bracing and V bracings are used. STAAD Pro V8i software is used for the seismic analysis and comparison is done with different parameters. The reduction in displacement is higher in case of V bracing and K bracing compared to un-braced building due to irregularity in shape of the building. Storey drifts may increase or decrease in braced building compared to un-braced building structure.

Zasiah Tafheem et. al. (2013) studied on structural behaviour of steel building with concentric and eccentric bracing. Analysis is done due to wind load, earthquake load, dead load and live load. Different bracing types such as concentric X bracing and eccentric V type bracings are used for the investigation using HSS sections. They concluded that there is reduction in lateral displacement as compared to un-braced building. From this study, they found that concentric X bracing gives less lateral displacement as compared to eccentric V type bracing. In presence of bracing system, the inter-storey drift reduction gets increased.

Due to increase in lever arm of peripherial diagonal columns, diagrid structural system is more effective in lateral load resistance. Lateral and gravity load are resisted by axial force in diagonal members on periphery of structure, which make system more effective. Diagrid structural system provides more flexibility in planning interior space and façade of the building.

D.K. paul et. al. (2012) presented a practical implementation on a earthquake resistance building to resist non linear (pushover) lateral seismic forces. Retrofitting is introduced in which chevron bracing and aluminium shear link as a beam is introduced to improve its performance and concluded that with the use of bracing and shear link building becomes more responsive and capable of bearing lateral forces.

Dipti r. Sahoo et. al. (2010) presented an experimental study is conducted on a reduced-scale non-ductile RC frame to investigate the effectiveness of the strengthening system under constant gravity loading and gradually increasing reversed cyclic lateral displacements. The strengthened specimen exhibited enhanced lateral strength, stiffness and energy-dissipation potential as compared to the RC (bare) frame. lateral load on the frame is allowed to transfer to the shear link through a load-transferring system consisting of a shear collector beam and chevron braces so as to cause shear yielding of aluminum plates. No extensive strengthening of the existing RC columns is carried out in the proposed technique. Concluded that the energy-dissipation and damping potential of the shear link significantly reduced the damage levels in the existing RC members of the strengthened specimen up to 3.5% drift level.

K. moon (2009) compared different stories tall structure of 60 and 80 storey heights with same lateral geometric aspects and loadings with considering diagrids of 63o, 69o and 73 o and determine that The structural efficiency of dia-grids for tall buildings can be maximized by configuring them to have optimum grid geometries. Though the construction of a diagrid structure is challenging due to its complicated nodes, its con-structability can be enhanced by appropriate prefabrication methods.

Kyoung-sun moon (2007) presented a comparative study on tall structures ranging from 20 to 60 stories. And compare bracings and diagrid works in terms of forces and economical sections, presenting diagrid range from 65 to 75 degrees and concluded that diagrid structure is more economical and resisting as also removing the requirement vertical columns at the outer side.

III.CONCLUSION

The researchers have tried to find the variation in forces which occurs due to bracing system and shear link, following are the outcomes of literature review:

- Frame with bracings results in less lateral forces in beam and columns.
- Structure with links become more stable.
- Bracings in tall structures reduces the effect of storey drift.

IV. REFERENCES

[1]. E. Fehling, W. Pauli and J. G. Bauwkamp, "Use of vertical shear-Link in eccentrically braced frames" Earthquake Engineering , 10th World Conference 1992 Balkema , Rotterdam.

[2]. Y. Mahrozadeh, "The application of shear panels in passive control conventional steel structures" Master's thesis, Faculty of Engineering, Tehran University, 2005, Tehran, Iran.

[3]. S. M. Zahrai, "Behavior of Vertical Link Beam in Steel Structures. Building & Housing Research Center, BHRC Publication No.R-515, 2009.

[4]. P. Dusicka, A. M. Itani and I. G. Buckle, "Evaluation of Conventional and Specialty Steels in Shear Link Hysteretic Energy Dissipaters." Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver B.C, Canada, 2004.

[5]. P. Dusicka, A. M. Itani, "Behavior of Built-Up Shear Links Under Large Cyclic Deformations." Proceedings of the 2002 Annual Meeting of the Structural Stability Research Council, Structural Stability Research Council, Gainesville, FL.

[6]. M. D. Engelhardt, E. P. Popov, "Experimental performance of long links in eccentrically braced frames." J. Struct. Engrg., ASCE,1992, Vol. 118, No.11, PP. 3067-3088.

[7]. American Institute of Steel Construction, AISC 2002, "Load and resistance factor design." Manual of Steel Construction.

[8]. International building code, IBC2003, Whitier, California.

[9]. J. G. Boukamp, M. G. Vetr, "Design of Eccentrically Braced Test Frame With Vertical Shear Link Proceedings of the 2nd Int", Con, On Earthquake Resistant Construction and Design, Berlin, June, 1994.

[10]. M. G. Vetr, "Seismic behavior and design and analysis of crosswise braced frames with vertical shear joint" Journal of Earthquake Engineering and Seismology, Tehran, 1999.

[11]. J. G. Boukamp, M.G. Vetr, "Design of Eccentrically Braced Test Frame with Vertical Shear Link." Proceeding of the Second Int., Con. On Earthquake Resistant Construction and Design, Berlin, 1994.

[12]. American Institute of Steel Construction, AISC 2002, "Load and resistance factor design." Manual of Steel Construction.

[13]. UBC, "Uniform Building Code", International Conference of Building Officials, Whittier, Calif, 1997.

[14]. AISC, "Seismic Provisions for Structural Steel Buildings.", American Institute of Steel Construction, Chicago, IL, 1997

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