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Review Paper on Seismic Performance Of Multistory Building Of Underground Multiple Storeys Parking With Shear Wall

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Abstract: ***As per the previous records of earthquakes, there is an increase in the demand of use of earthquake resisting structures. So it is necessary to design and analyse the structures by considering seismic effect. The present paper gives an overview of different research works to be done regarding the study of multi-storey RC frame structure with lateral load resisting systems such as shear wall. The present work of analysis of multi-storey structure of different shear wall locations and heights and proper location of shear wall in the multi-storey building etc. The present paper gives the knowledge about the seismic behavior of Multi-storey building of underground Multiple storeys parking with ideal location of shear wall.***

Index Terms **– Shear wall, Multi-Storey Building, Seismic Effect, Underground multiple storeys**

I INTRODUCTION:

Due to increase in population there is increase in vehicle demand and we require more parking space thus in control by constructing underground parking.

Up to the present day, underground parking are an important component of new urban building construction. The integration of underground parking into major, new building projects in urban environments can enhance the aesthetic and economic values of the overall development.

The properties of these seismic shear walls dominate the response of the buildings, and therefore, it is important to evaluate the seismic response of the walls appropriately

Shear wall systems are one of the most commonly used lateral load resistance system in high rise buildings. Shear wall is considered as better in plane stiffness and strength which can be used to simultaneously resist large support gravity and horizontal loads. Incorporation of shear wall has become inevitable in multi-storeys buildings for resisting large lateral forces. Positioning of shear wall has influence on the overall behaviour of the building. For effective and efficient performance of building it is very necessary to determine effective essential to position shear wall in an ideal location, also incorporates how the bending moment, shear force for beam and axial force for column vary with change in positioning of shear wall.

II LITERATURE REVIEW:

Anshuman S. et al.[1] (2011) have determined solution of shear wall location in multi-storey building based on its both elastic and elastoplastic behaviors'. An earthquake load is calculated and applied to a building of fifteen stories located in zone IV. Elastic and elastoplastic 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. It has been observed that the in inelastic analysis performance point was small and within the elastic limit. Thus result obtained using elastic analyses are adequate. Hence, concluded that shear wall can be provided in 6th and 7th frames or 1st and 12th frames in the shorter direction.

Rajesh Jayarambhai Prajapati et al.[5] (2013) have studied effect of different positions shear wall on deflection in high rise building. The 4 models 30 storey buildings have developed using ETABS V9.5 software. They have introduced shear walls at different location on plan of building like side center shear wall, corner shear wall, shear wall at near to center of building plan. The effect of shear wall on deflection is studied in A1, B1, C1& D1 models of 30 storied building. Seismic zone III is considered for analysis. They have also discussed importance of the lateral stiffness of a building on its wind and seismic design. It has been concluded from discussion and study that there was marginal reduction in deflection, by introducing side center shear wall, shear wall at center but the deflection is reduced drastically by introducing shear wall at corner along both directions. Width of building was too small compare to length of building in plan in present work therefore wind case was governing case in their building.

Syed Ehtesham Ali et.al.[9] (2014) have performed Shear wall systems are one of the most commonly used lateral load resisting systems in high-rise buildings. Shear walls have very high in plane stiffness and strength, which can be used to simultaneously resist large horizontal loads and support gravity loads, making them quite advantageous in many structural engineering applications. There are lots of literatures available to design and analyze the shear wall. However, the decision about the location of shear wall in multi-storey building is not much discussed in any literatures. In this paper, therefore, main focus is to determine the solution for shear wall location in multi-storey building. A RCC building of six storey placed in HYDERABAD subjected to earthquake loading in zone-II is considered. An earthquake load is calculated by seismic coefficient method using IS 1893 (PART–I):2002. These analyses were performed using ETABS. It has been concluded that

1. Among all the load combination, the load combination of 1.5DL+1.5EQX is found to be more critical combination for all the models.
2. The lateral deflection of column for building with type 2 shear wall is reduced as compared to all models.
3. The shear force is maximum at the ground level for model III as compared to model II and IV.
4. The shear force of model IV at middle level is more as compared to model III.
5. The bending moment is maximum at roof level for model III.
6. It has been observed that the top deflection is reduced after providing type 2 shear wall of the frame in X-direction as well as in Y-direction.

Chetan Vaidya et.al.[3] (2014) have performed the plan layout of the underground RC frame building, chosen for SAP2000. The overall plan layout of the building is 58.5m X 34.5m and external circular ramp with an inner diameter of 5.5m and outer diameter of 10.5m. The number of underground storeys considered in this study is 3. All the buildings are assumed to be fixed at ground level and the storey heights is 3.5m. Taking concrete grade M30, Steel of grade FE. It has been concluded that.

During seismic vibrations the underground structure act as a closed box structure and experience less damage during seismic effects. The temperature movements are restrained by the lateral stability systems. To avoid the large forces being generated by restrained thermal movement careful consideration should be given to the

location and interaction of the systems. The dynamic effect due to moving vehicles on the deck is mainly a function of vehicle speed, and is less than two times that of the static deflection for a single moving vehicle. The net effects of moving vehicles are found to be not higher than in

Anil Baral et.al.[2] (2015) have performed seismic analysis of RC framed building for the different positions of shear wall. The response of building with different positioning of shear wall using both equivalent static method (seismic coefficient method) and response spectrum analysis. For analysis, G + 9 storey's with storey height 3m in all floor including the ground floor and plan area 17m X 17m which is located in zone V is considered. Five different Models of RCC building, one with no shear wall and other four models with different position of shear wall which is subjected to earthquake load in zone V has been studied. This study also incorporates how the bending moment, shear force for beam and axial Force for column vary with change in positioning of RC shear wall. Building are modeled and analyzed using standard package ETABS 2013. It has been concluded that

1. Fundamental Period of vibration was lower For Model 3 having shear wall along the corner edges and higher time period was observed in model 1 having no shear wall in building.
2. From both Equivalent Static analysis and Response Spectrum analysis displacement was higher in case of model 1 and lower in case of Model 3.Static analysis yield higher Value of displacement compared to RSA for all the five Models analysed.
3. Storey drift is highly influenced by the presence of shear wall in the building. Model 3 showed Lower value of storey Drift in comparison to other models. The value of Storey drift obtained for Static analysis was found to be more than the storey Drift obtained From Response spectrum analysis for all the models of 10 storey Building.

Suchita Tuppad et al. [8] (2015) [12] have analyzed multi-storey building subjected to seismic behavior to found out optimum location of shear wall by using genetic algorithm. The building is analyzed for various positioning of reinforced concrete walls (shear walls) and found the constraints such as lateral displacement using equivalent static method which are carried out as per IS: 1893 (part 1)-2002 using finite element analysis software ETABS2015 for earthquake zone V in India and MATLAB for Genetic Algorithm. Six models are prepared, first model has the building without shear wall and remaining five models have the buildings with shear wall at different locations. It has been concluded that by providing shear wall to the high rise buildings, Structural seismic behavior will be affected to a great extent and also the stiffness and the strength of the buildings will be increased

Priyanka Soni et.al [4] (2016) have analyzed multi-storey building of different shear wall locations and heights and studied the analysis of various research works involved in enhancement of shear walls and their behavior towards lateral loads. Six models of G+10, G+20 and G+ 26 storeys with storey height 3.5m, earthquake zone II are prepared by using STAAD.Pro V8i software and two locations of shear wall are considered. The different parameters such as inter-storey drift, base shear and lateral displacement for all models have studied. From the results, it is concluded that the deflection of the multi-storey building structure of location 2 is more as compare to location 1 for G+10, G+20 and G+26 storey building. Therefore location 1 of shear wall is more efficient than location 2.

V. Abhinav et al. [11] (2016) have performed seismic analysis of multi-storey building with the shear wall using STAAD Pro. an RCC building of 11 floors placed exposed to earthquake loading in zone V is considered and earthquake load has calculated by a seismic coefficient method using IS 1893 (Part I): 2002. The three models of an 11-floor building have been made with the shear wall at corner, shear wall along periphery and shear wall at the middle of the building. The comparative study of deflection of building with and without a shear wall is carried out in X and Z directions. The lateral deflection for building with the shear wall along

periphery is reduced in comparison to other models. Hence, it has been concluded that the building with the shear wall along periphery is much more efficient than all other models with a shear wall.

Tarun Magendra et al.[10] (2016) have performed the principle objective of this project is to analyze different models with Shear walls and compare them using ETABS, to get the optimum positioning of Shear walls inside the structure. Four different cases of shear wall position for G+10 storey building with keeping zero eccentricity between mass center and hardness center have been analyzed and designed as a frame system by computer application software ETABS. The design involves load calculations and analyzing the whole structure by modelling software and the design method used for analysis is Limit State Design conforming to Indian Standard Code of Practice.
It has been concluded that

1. The frame with Shear Walls clearly provides more safety to the designers and although it proves to be a little costly, they are extremely effective in terms of structural stability.
2. Due to the falling of the zone, the earthquake hazard will also increase. In such cases, use of shear walls become mandatory for achieving safety in design.
3. In all the systems, the storey Drift is within the permissible limits as per IS:1893 (Part 1). However CASE 4, closely followed by CASE 2, showed better results when compared to other models. This lead us to believe that when Shear Walls are placed at the center of the geometry in the form of a box or at the corners, the structures behave in a more stable manner. This practice of providing Box-type Shear Walls is becoming more popular now-a-days as high rise structures generally have a lift system and these box-type shear walls serve the dual purpose of Shear walls and also as a vertical duct or passage for the movement of the lifts.
4. Overturning Moments are minimum in conventional buildings. However the lower performance of CASE 1 in terms of Storey Drifts, Storey Displacements and Lateral Loadings make it unfit for use in higher seismically active zones.

Upendra singh dandotia et al. [10] (2016) Car parking has been a serious issue due to rapid increase in vehicles and to cater this problem we require parking slots in important markets. We have limited land source so the construction of multilevel parking is very important as it accommodates large no. of vehicles at one place. In this project we have designed multi-level parking for capacity of 600 cars and 550 bikes. Multilevel parking is of G+2+2 Basement having 13 shops on ground floor and its design is based on framed structure. In this work we have designed different components of the multi-level parking i.e. raft foundation, retaining walls, beams, column and flat slab using STAAD-Pro, manual bases and AUTO-CAD software for making various structural drawings. For daily demand and fire demand we have also designed overhead tank and tank resting on ground. It has been concluded that

He designed the latest and economical multilevel parking building using concept of framed structure. Multilevel parking is of G+2+2 Basement having 13 shops on ground floor and its design is based on framed structure at Hazaratganj at Lucknow (U.P) india. Design (beams, columns, slabs and foundations) using STAAD PRO. Software. In this system can help the economy, popular and security based aspects of the society. It is a Currently, management information system Play an important part in the life, however many of rules are poor and need to be progress. This research have been focus on improving the lucknow parking system to be suitable for the life style , this paper also discuss how to use the information technologies and image processing to implement a high management parking system to reduce the problems and the weak that already appointed in the parking system.

Sayyed A.Ahad et al. [7] (2017) have analyzed and designed, Located in Latur, Maharastra with (B+G+10) storeys having a car parking facility provided at basement floor. The building has a shear wall around the lift pit. The modelling and analysis of the structure is done by using ETABS and the designing was done. Design

of slab, stair case and an isolated footing are done manually. The design methods involves load calculations manually and analysing the whole structure by ETABS. The design methods used in ETABS are limit state design confirming to IS code of practice. Hence, it has been concluded that
Analysis is done by using the software ETABS V15.2, which proved to be premium of great potential in analysis and design of various sections. The structural elements like RCC frame, shear wall and retaining walls are also provided. As per the soil investigation report, an isolated footing is provided. The design of RCC frame members like beam and column was done using ETABS. The analysis and design was done according to standard specifications to the possible extend. The various difficulties encountered in the design process and the various constraints faced by the structural engineer in designing up to the architectural drawing were also understood.

Venkatesh k et al. [12] (2018) have performed Analysis and design of a commercial building was done in ETABS(2016). It is a reinforced concrete framed structure consisting of G+4. And also we provide a two wheeler & car parking facility in the ground floor. IS 456:2000 codes is the basic code for general construction in concrete structures, hence all the structural members are designed using limit state method in accordance with the IS 456:2000 code and design aids. The planning of any building in India will be recognized by National Building Code (NBC), hence the building is planned in accordance with the National Building Code of India. The commercial building has proper ventilation, it is provided with sufficient Exits, Water supply and electrification are also provided. The ceiling height is provided as 1m, for assembly buildings as mentioned Building Code (NBC). This project also enables in establishing in sufficient water supply, electric power supply, proper sanitary system, and rain water harvesting facility are given

It has been concluded that:

He designed the multilevel parking building using concept of framed structure which will survive the purpose of traffic congestion. Multilevel parking is of G+5. Basement and half of ground floor will be accommodated by cars. Half of the ground floor will be accommodated by a commercial shops. 1st and 2nd floor will be accommodated by motor cycle parking. 3rd, 4th and 5th floors will be accommodated by commercial shops. This system can help in economy and security based aspects for the society. It is a currently, management information system Play an important part in the life, however many of rules are poor and need to be progress. This research have been focus on improving the Bangalore parking system to be suitable for the life style

III. Conclusion

This paper reports on research development on seismic performance of multistorey building of underground multiple storeys parking with shear wall. Some researchers have concluded that the shear wall, do not interfere in the vertical load resisting system for RC structure but they affects the lateral load resisting system of the same due to its stiffness and mass.

It is observed that the deflection at the different level in multi-storey building with shear wall is comparatively lesser as compare to RC building without shear wall. Some authors have concluded that by providing shear wall to the high rise building, seismic behavior will be affected to greater extend and also the stiffness and strength of building will be increased. All these topic require further research and it is essential to identify the ideal location of shear wall for improving the stability of the building.

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