

Use of Shear Wall Member at Corners to Enhance the Stability Using Different Grades: An Immense Review

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Abstract— The use of the shear wall at corners focuses the view of structural stability in present era and its use as dual system in a multistoried structure, since the major focus is to reduce the lateral loads acting on it. The research topic to reduce the lateral load in the current trend has increasing day by day. This trending expansion leads to the result in safe high rise structures. To contribute something in this, the current work shows the survey of the research works presented in shear wall usage and concrete core topics in dual structures as per Indian Standards. This study deals with the comparative analysis of the research trend on the current topic and after the survey, comprehensive outcomes are provided in conclusions that forms the objectives of the additional study.

Keywords— Concrete Grade, Dual system, Lateral load capacity, Optimization, Shear Wall.

I. INTRODUCTION TO SHEAR WALL

To reduce the lateral load over the structure and to optimize the structures has now been the new and latest ways to make the structure stiff and efficient. The trend follows all the economic customs to make cost effective structures. Stability of the structures is a tough task and it loose the above economic trend, since it requires heavy sections, it needs some additional stiffness resisting members and also need extra cost to make the same seismic free. Shear wall is the basic need of the modern tall structures. It not only stabilizes the tall structures but also protect the same from seismic disasters; on the other hand, it is a heavy R.C.C. additional component that increases the overall weight of the structure along with its base shear. Overall project cost ultimately increases with the usage of shear wall.

An additional structural component used to resist lateral force effects on a structure consist of a stiff R. C. C. wall. This R.C.C. vertical wall starts from foundation base to the top of the building. As per Indian Standard, the Shear wall is classified into two types viz. Ordinary RC structural walls and Ductile RC structural walls. The former one doesn't meet the special detailing requirements for ductile behavior as per IS 13920 and the later one meet the special detailing requirements for ductile behavior as per IS 13920.

II. TYPES OF SHEAR WALL

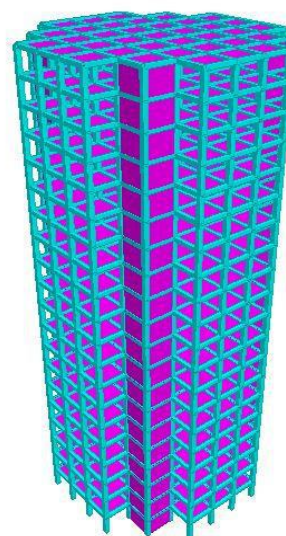


Fig. 1: Structure with Simple Rectangular type Shear Wall at Corner

There are various types of shear wall each of them has its own importance. The various types of shear wall are as follows:-

- 1 Simple rectangular type shear wall
- 2 Coupled shear wall
- 3 Rigid frame shear wall
- 4 Framed walls with infill frame

5 Column supported shear wall

6 Core type shear wall

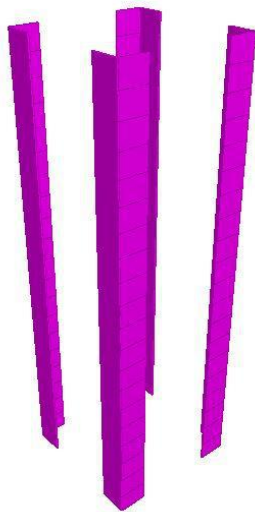


Fig. 2: Simple Rectangular type Shear Wall

III. REVIEW OF LITERATURE

Emphasize given on the opening effect of core type shear wall had been become a main criteria in structural engineering. Researchers made an effort to obtain the best building with opening area effect of shear wall. They have taken 11 cases which were divided into two parts; the former one consisted of five cases abbreviated as Core 1 to Core 5 under single core usage head. The latter one was consisted of six cases abbreviated as Dual Core 1 to Dual Core 6 under dual core usage head. All the eleven cases have rested on medium soil under seismic Zone III. They have analyzed their structural cases by software approach and also provided the views of the structure. For each head conclusions have drawn separately. For single core usage, Core case 5 had evolved as best case among all 5 cases. For dual core usage, Core case 6 evolved as the best case among all the 6 cases. (Gagan Yadav et. al.).

The authors in this work put emphasis on the usage of wall belt supported system used in multistoried building. This work compares the various possibilities of the demand and supply of stability enhancement system, since review has done. The lateral load handling capacity has evolved as the main criteria in this work. They secretly revealed their upcoming work with total 14 cases with the usage of response spectrum analysis will be used under Zone 5 with zone factor 0.36 respectively. The Shear wall at corners with belt connecting over its periphery column members was the main idea of their research. After reviewing the various researchers they conclude that their main focus will

be shear strip which was the modified part of the concrete wall system. After than their outline of the proposed work was pointed out. In this, they pointed out if the width and thickness were kept fixed and if the height at which the shear strip behaves effective will be their optimum case (Neeraj Patel et. al.).

The research work draws attention to again the stability enhancement system consists of outrigger and belt truss supported system. They have shown the results in technical point of view. The figure in their work shows the effective approach to the stability system applied over a multistoried building. They have performed a software approach with total seven cases created and abbreviated as Case S1 to Case S7 respectively. Fundamental Natural period for the structures were taken as 1.2978 seconds with subjected to the structure rest over hard soil with importance factor is equal to 1. Response spectrum method was used in this approach of earthquake analysis. Their tabular representation was really good since in each of the tables, worst case has shown subjected to the maximum values of the parametric case. After the results performed and showed as per various objectives, conclusions have been drawn. They conclude Case S4 shows the least values among all the seven cases and should be recommend the same (Archit Dangi et. al.).

Research revealed that the interaction of shear wall in connection with the multistoried building under seismic loading was the main criteria of the research. They have described the various possibilities of the location of the shear wall along with the criteria of shear wall type. This increases the stability of the structure with only shear wall at a particular location. The research done with the aim of taking G+9, G+18, G+27 and G+36 storied models conducted over a software approach. They have selected 20m x 20m plan area just to perform the analysis with frames abbreviated as Frame 1 to Frame 12 in each storey. Firstly they showed that what is the meaning of shear wall with its types. Total 48 frames have been constructed and all the structures are supposed to be rested over medium soil at earthquake zone V. After the analysis, conclusions have been drawn. The result proves that the frame 10 i.e. + shaped shear wall at center with flab slab proves to be the best of all (Sagar Jamle et. al.).

Researchers in this research work points out the reviewed approach on the effect of the different concrete grade in outrigger and wall belt supported dual structural system. Since same grade approach has been a major part of the work now a days but this kind of approach have been proved the numerous possibilities of the research work in different grades of concrete. Firstly they have shown the concept of multistoried buildings in the urban

areas. Then they described the value of outrigger system and after than the belt supported system and the combined effective approach to the general building as per stability point of view. They have conducted numerous literature review related to the same topic and after than conclusions have drawn. The conclusion part has combined with an approach to the outline of the proposed work. They proposed that grade change in outrigger and wall belt supported system will become the major technical part of their study and will going to be major research work (Mohammad Bilal Rasheed et. al.).

This particular work brings out the review effort drafted on shear wall opening criteria of a multistoried building. In introduction, the author described the criteria's to fulfill the earthquake requirements is to make a dual system building which was considered in Indian Standardization too. Shear wall description with its types have also been discussed. The main emphasize has done to classify the core type shear wall viz. single core shear wall and dual core shear wall. Then he clearly described the types of opening in shear wall provided with figuratively approach. After then the numerous reviews on the shear wall usage, its importance and the opening criteria of shear wall was discussed. Lastly, they draw the conclusions and outline of the proposed work, that there should be a criterion describing the percentage deduction of the shear wall area and the percentage usage of the wall area. Their technical work will show the percentage elimination of the same (Gagan Yadav et. al.).

The Exposure of extra load beyond the calculated load over the multistoried building under seismic loading was the worst case taken in their analysis. The authors suggested the optimum location of rooftop telecommunication tower along with its various fixtures and attachments. In introduction, they have suggested the importance of rooftop telecommunication tower in urban areas. Since the working approach was technical findings, they have discussed and set an aim by the various objectives consist of Base shear, axial forces, shear forces, moments and displacements. These parameters selected for both X and Z direction. Then they have described the methodology adopted for seismic analysis. After than the structure modeling has performed with total 5 cases selected and abbreviated as CASE A to CASE E with different telecommunication tower location. G+ 12 storied residential apartments have selected and all the structures have rested over medium soil at seismic zone 4. After the results, conclusions have been drawn suggested that on comparing all the cases, case D shows optimum amongst all (Suyash Malviya et. al.).

The paper highlights the insight of concrete which can cure itself where the shortage of the water in such areas. The agent used in their research work was polyethylene glycol abbreviated as PEG 400. This particular chemical was replaced by the percentage of cement in their research by 0%, 0.8%, 1.5%, 2.4% and 3.2%. The grade of concrete chosen was M20 and M25 grade of concrete. Both compressive and flexural strength test have been performed since this research work has done first in lab then the results were computed in tabular form and represented by graphical form. The work specially emphasize on 28 days curing results. Total 5 types of replacement mixed have made by replacement of cement and abbreviated as Mix-1 to Mix-5. They have concluded that For M25, 1.6% PEG Mix is efficient and for M20 Grade, 2.4% PEG Mix suited the best (Prakash Mandiwal et. al.).

This particular work give emphasis to the analytical approach of multistorey building wen shear wall is used at different locations and also for different heights. Authors in this work firstly show why we have to implant the structural stability feature when different height of the structure used. UBC analysis was also described in it. Also, they described the importance of providing the shear walls with stiffness and aspect ratios. Advantages of shear wall have also discussed. In methodology section, they provided various input parameters that were used in their work. There were basically three structures viz. G+10, G+20 and G+26 structures rested over medium soil for the analysis. Finite element approach in calculation of stresses of only shear wall have discussed in their approach. Different approached were found out and finally future scope has provided (Priyanka Soni et. al.).

IV. CONCLUSIONS AND OUTLINE OF PROPOSED WORK

The conduction of the literature survey has done by reviewing and learning data objectives of various research papers it has now cleared that there should be a proper analysis before going further in any topic to find out the current research done. The current trend has also been obtained in dual configuration structures. Therefore it is necessary to increase the stiffness at particular locations in the building to make an optimized one to resist the same from lateral loading.

The conclusive outcomes drawn from the study are enlisted below:

1. The study is conducted for both the directions viz. lateral and longitudinal direction.

2. The dual structural configurations should be necessary to overcome the lateral effects in the form of displacements to any tall structures.
3. Strength criteria of the soil also play an important role in structural stability. Soil type should also be checked as per Indian Standardization IS 1893-2016 (part 1).
4. Earthquake analysis should be checked in particular zones or cities to analyze the data in different manner.
5. Checking of the analysis of different parameters and its validation as per Indian Standards is necessary along within the limits.

The main focus is to check the dual system with grade change in concrete with fixed thickness of shear wall members at corners that has going to be a major part of the study for upcoming proposed work.

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