

A Review on Stability Improvement with Wall Belt Supported Dual Structural System Using Different Grades of Concrete

Durgesh Kumar Upadhyay¹, Sagar Jamle²

¹M. Tech. Scholar, Department of Civil Engineering, Oriental University, Indore, India.

²Assistant Professor, Department of Civil Engineering, Oriental University, Indore, India.

Abstract— In today's modern world tall structures like high-rise buildings, skyscrapers, towers are needed to be safe and stable. To provide stability to tall structures when shear wall is not enough to provide lateral support, therefore wall belt supported system is the one of the best technique to increase the stability of the same. Wall belt supported system is provided at the periphery of the tall structures throughout its height to increase the stability. The current work shows the literature survey of various researchers who have been contributing in this field. Conclusions with the outline of the proposed work are provided at the end of the work.

Keywords— Concrete Grades, Dual System, Stability Improvement, Tall Structures, Wall Belt.

I. INTRODUCTION

The new and the recent techniques with inventions of construction methods are currently in trend and Wall belt supported system is one of them. To increase the stability against lateral loads like wind and seismic loads wall belt supported system is used now a days. It is necessary to used modern construction techniques to improve construction quality and stability of the structure. In modern high rise building construction wall belt supported system is used to improve building stability against lateral loads. There are some examples of lateral loads they are:-

1. Seismic load
2. Wind load

Gravity loads on building:-

1. Snow load
2. Dead load
3. Imposed load

Special loads:-

1. Thermal load
2. Blast load
3. Impact load
4. Settlement load

II. BELT SUPPORTED SYSTEM

The lateral load resisting system is known as the belt supported system in which shear wall belt or truss belt is used. It resists the lateral loads on structure since in this system, the external columns are tied to the shear wall belt at one or more levels. It is the new lateral load resisting method of building construction.

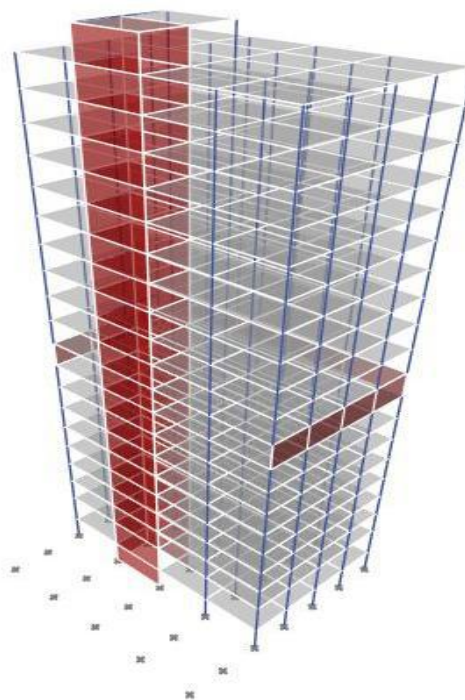


Fig. 1: 3D Sectional View of Belt Supported System

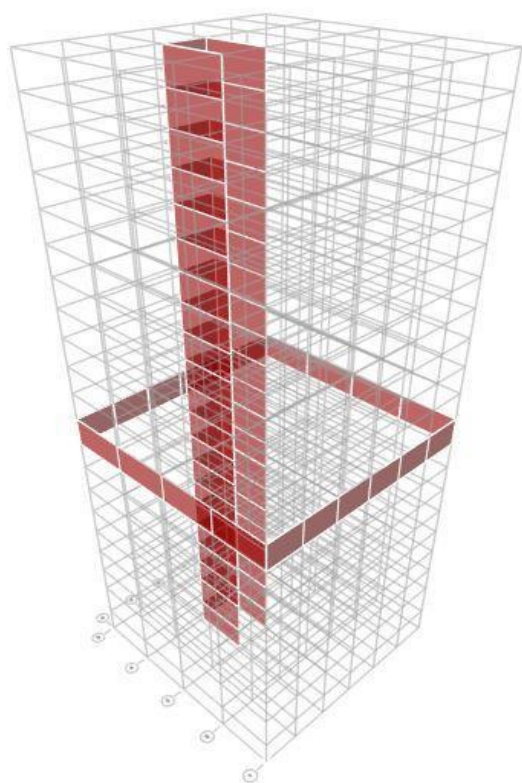


Fig.2: Dual System with Shear Belt

Advantages of belt supported system-

1. It provides more strength to the structure.
2. It provides stability to structure against lateral loads.

III. LITERATURE REVIEW

Due to the increase in the demand of high rise and fascinating structure with vertical & horizontal irregularity, different themes, and increasing height day by day leads to new challenges and requirement of new safety measures. To resist from earthquake and expressly wind effect due to increasing stature as the stiffness of the building is increases with increasing height we need to adopt some preventing structural system. Some of them are bracings, shear wall, outrigger system etc. In this study outrigger system is taken for analysis due the fact that is found the most optimal system for high rise buildings and skyscrapers. In this system the external columns are connected to main inner or outer core by means of outrigger beams at different floors to resist against story drift and rotating action of core due seismic and wind forces. In this study various papers allied to this topic are reviewed in which an enormous work is done in this field earlier. With the help of review of research paper we came to know about the conclusive outcome which forms the

research objectives of our further study (Neeraj Patel et. al.).

The infrastructure building is increasing day by day all over the world and the main material is used in building construction is concrete therefore to reduce the amount of cement in concrete supplementary material are used. These supplementary materials are cheaper than cement. Silica fume is most popular material used in the concrete to improve its compressive, strength. For this purpose silica fume is replaced by 0%, 5%, 7.5%, 12.5%, 15%, 20% & 25% by the weight of cement. Water binder ratio is taken 0.42 for M-25 grade of concrete. Various tests were conducted in the research which showed the results of the same percentage at the different of 0% 5%, 7.5%, 12.5%, 15%, 20% & 25% for the time period of 7, 14, and 28 days curing as a substitution of cement by micro silica on compressive behavior. (Prabhulal Chouhan et. al.)

The use of fly ash in concrete is increasing day by day as a partial replacement of cement. There are mainly three grades of (OPC) cement used in concrete namely 33, 43 and 53.it is commonly used grades of cement in construction industry. It is the comparative study of effects on concrete properties when cement is replaced by fly ash and concrete strength against compressibility, shrinkage and durability were also studied. The results of the test shows that fly ash improve the properties of concrete in all grade of ordinary Portland cement (C. Marthong et. al.).

To reduce the bad effect of lateral loads shear wall is used as structural member and also it provides stability to the structure. This system is made up of R.C.C, timber, masonry, reinforced masonry. This paper shows the study and analysis on shear wall system behavior against lateral loads. Shear wall resist the lateral load on high rise buildings therefore it supports and provide stability to high rise structures (Ms. Priyanka Soni et. al.).

In this present era of high rise buildings and skyscrapers it is obligatory to work on overall shape, plan and structure of building. The building performance under seismic loading is a constraint of various factors comprises of geometry, location and the way of earthquake forces transferred to the ground. The affected zones of higher chances of occurrence of seismic effects with respect to other part of the country may leads to collapse of building under seismic load if they are not provided with and structural strengthening arrangement. However, safety has to be the main criteria when seismic hazard has taken into account in multistoried buildings. In the current study the solution for aforementioned problem is suggested by providing shear wall in a specified ratio with respect to wall area in plan irregularity which helps in resisting lateral

load generated by seismic forces. This paper provides the review of research work previously presented by various researchers which shows the further research option (Prafoolla Thakre et. al.).

The waste materials which can be used as additional cementitious material like fly ash, steel slag, blast furnace, silica fume etc. Silica fume improves the strength of concrete. Now days the good strength and good performance concrete is extensively used in much civil engineering structure. To reduce the amount of cement in concrete supplementary material are used. Silica fume is most popular material used in the concrete to improve its flexural, split tensile strength. For this purpose silica fume is replaced by 0%, 5%, 7.5%, 12.5%, 15%, 20% & 25% by the weight of cement. Water binder ratio is taken 0.42 for M-25 grade of concrete. Various tests were conducted in the research which showed the results of the same percentage at the different of 0% 5%, 7.5%, 12.5%, 15%, 20% & 25% for the time period of 7, 14, and 28 days curing as a substitution of cement by micro silica on Split Tensile Strength and Flexural Strength (Prabhulal Chouhan et. al.).

The concrete is the most used material in infrastructure development around the world. There are many varieties and grades of concrete is researched and developed in laboratories according to the need of specific fields. In this paper an experimental investigation has been done in the area of strength and durability of concrete by replacing fine aggregates by fire bricks and glass powder. And it recommends that fire brick and glass powder can be used in the place of fine aggregate (Tiwari Darshita et. al.).

It is observed that stability of the structure depends upon its structural members because they transfer and carry loads and they also connected to each other. In the case of high rise buildings structure height is more therefore they are less stable against lateral loads. Therefore belt supported system and shear core outrigger system is used in G+10 buildings located under seismic zone IV. The Taranath method is used in this paper and total seven numbers of cases has used and compared with each other (Archit Dangi et. al.).

To reduce the overall cost of the project, it is highly recommend reducing the cost in different manner. To make economic structure, the cost cutting should be done in every construction stages. The dual systems in building structure consist of structural walls and moment resisting frames. The walls are made up of RCC, which is a costly material used. The purpose of current study is to explore the reduction in shear wall area in multistorey building to reduce cost. Total 5 buildings framed in Staad pro software

abbreviated as SA, SB, SC, SD, SE supposed to be situated at Seismic Zone III. Post parametric analysis results shows that, the reduction in shear wall area should be adapted to a certain limit up to 20 % for cost cutting (Prafoolla Thakre et. al.).

IV. CONCLUSIONS AND OUTLINE OF THE PROPOSED WORK

To conclude the above literature review, it is found out that it is necessary to introduce stiffness increasing members in tall structures to increase the lateral load handling capacity. Various researches already done till now in terms of stability improvement. Since one side of the current theme is to increase overall stiffness to resist lateral load but the other side is; that it increases overall construction cost. To maintain these two things, wall belt supported system plays a major role. Hence wall belt supported system should be implemented in tall structures.

The upcoming proposed work shows various wall belt stability cases with different grades of concrete with different thickness. The optimum case of stability by comparing all the decided cases of different thickness will be implemented and shown in upcoming papers.

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