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Stability Increment Techniques by Altering Beam Members: A Review

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Abstract: ***To decrease the problem of less living land and the introduction of high rise structures let any country comes under their goal to achieve the sustainability. The Multistoried structures are built and consume a lesser land area that ultimately takes the city into metropolitan one.***
If any city comes under the huge construction, the investments are also generated that make it as a major city across the country. The buildings taller in height are the only possibility presented since it delivers more correctness in lesser space consumption. In this study, various papers allied to this topic are intensively reviewed in which an enormous work is done in this field earlier. To make these buildings inexpensive, harmless and suitable it is really important to add new ideas and expertise. Among them, stability increment techniques are now demands more in the field of structural engineering.
By the help of this study, various papers are reviewed intensively in which a huge work has been done accompanying to this subject.
With the help of this literature survey, we came to know the conclusive outcome which forms the research objectives of our technical aspects of the supplementary study.
Keywords: Beam, Concrete Grade, Dual system, Dimension change, Grade change levels, Shear wall, Dual System

I. INTRODUCTION

The main and the basic necessity of the recent living world is introduction of the tall and high rise structures to use the lesser land area. Since from seismic disasters, the main concentration is to use a dual structural configuration that stabilizes the tall structures from lateral effects.
The development in construction industry now follows all the financial customs to make cost operative constructions. It only comes with the financial and commercial point of view to the stability of the structures which is again a tough task and it loses the above economic trend, since it entails heavy structural components.
The main criteria in this are that, it needs extra cost to make the structure earthquake free and also needs some supplementary stiffening members for the same.
The heavy R.C.C. additional components that increase the complete weight of the structure on the other hand, it also rises with its base shear. Hence it is necessary to make the structure lighter as much as possible.

A. Criteria of Stability Increment Techniques

The theory, by which stability enhances in overall structure, could be done by changing the structural configurations by some aspects that it's overall behaviour changes. Various researches done in this field shows and proved if stability would increase with and without adding the additional component. If anything that derives in response reduction criteria, reduces the self-weight of the structure too.

The stability increment techniques can be done by:-

1) By changing the size of the structural components.
2) By changing the grade of concrete.
3) By implementing some stability improvement structural components that resist the lateral and vertical loads.
4) By eliminating the structural components.
5) By reducing the weight of the structure.

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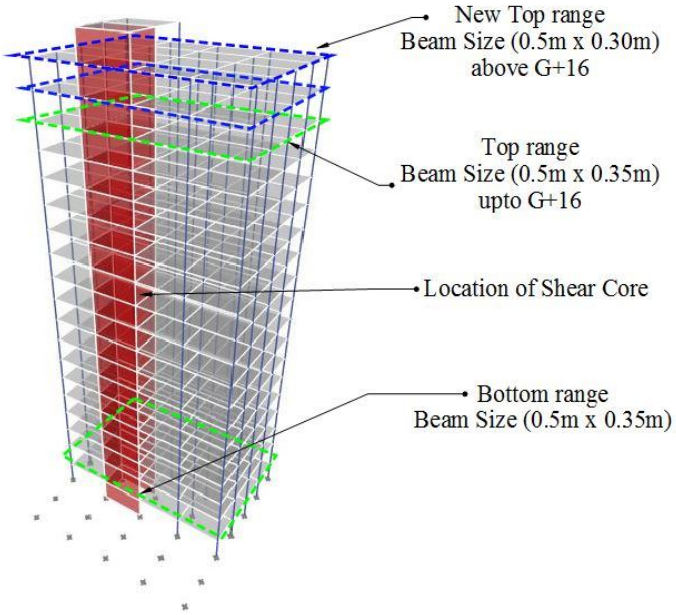


Fig. 1: Structure with Dual Structure Configuration and Stability Increment Techniques

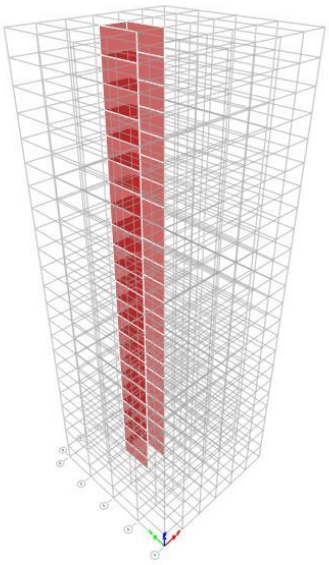


Fig. 2: Structure with shear Wall at Core

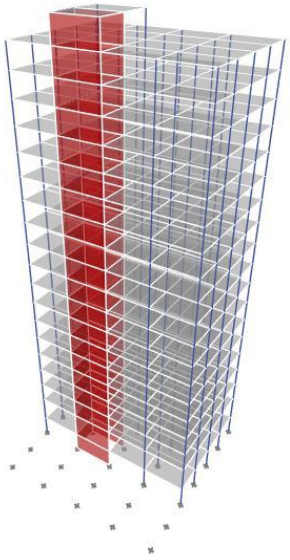


Fig. 3: 3D Sectional View of Structure with basic Base Shear Reduction Techniques

II. REVIEW OF LITERATURE

The usage of the complete preparation of the placing of the telecommunication towers which is supposed to be over a multistoried building, the researchers take care of it as per the provisions. The main theme in their work was that that they have not known if there will be telecommunication tower should be placed in future over roof. The telecommunication tower comes with the complete arrangement with its fixtures. The load calculated to design a multistoried building is enough to resist itself under the effect of the earthquake. The main idea of their research was if additional load applied in the future will going to be a catastrophe to a multistoried building. In introduction, they tell and explain the same. They adopt the aims includes diverse output parameters such as the assessment of bending moments and shear in beam members, torsional moments and dynamic parameters for the same topic. The various output parameters assessed for both X and Z direction on horizontal plane. Structure was assumed to be placed at seismic zone IV. The roof was supposed to have different tower positions, hence total 5 cases have selected as per positions. From

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Case A o Case E, position P1 to P5 have decided respectively. An efficient column head was added in various comparable output tables for describing efficient column position. By the help of different graphs, the data was described and in conclusion they proved each of the efficient case for each result (Suyash Malviya et. al.).

The opening effect of core type shear wall had been become a main criteria in structural engineering, emphasize given on it by the researchers. They made a theory to prove the opening area effect of shear wall for both single core shear wall and core type shear wall. They have taken total eleven cases to prove shear wall usage area. From Core 1 to Core 5, single core usages have selected and from Dual core 1 to Dual core 6, dual core usages have selected as per shear wall usage area. All these eleven cases are supposed to have rested over medium soil under earthquake zone III. By the help of software approach, they made all these buildings by providing the input parameters and under each head, results have drawn. In conclusions, single core case 5 obtained as the best case for singe core usage. On the other hand, dual core case 6 obtained as the best case for dual core usage (Gagan Yadav et. al.).

Researchers came to grips with the usage of the glass powder and fly ash to over whelm with the issue of increasing the flexural properties and compressive strength parameters of the concrete. An experimental approach using the fly ash substitution of glass powder and fly ash with cement in a particular percentage to make the improved properties of concrete have made by them. They described clearly in introduction that there was a need of change of construction industries with the importance of waste materials used as a partial swap to expensive raw materials. They have taken OPC cement, natural coarse aggregate, natural fine aggregate for their experimental method with the leftover materials such as fly ash and glass powder for creation of the mixes. Total seven mixes with different swap combinations have made by them and they have drawn comparative result outcomes after testing after 7 days, 14 days and 28 days of curing for both compressive and flexural test. The conclusion have shown that 0% glass powder in combination of 25 % fly ash in replacement of cement demonstrated to the effective combination. The abbreviation of the same effective case was Mix second i.e. (M-2) respectively (Sachin Sironiya et. al)

The possibilities of the usage of wall belt supported system in this work used in multistoried building the authors cope with it sincerely. As per review done, the various possibilities of the demand and supply of stability improvement system, the work compared the same. The main criteria in this work were to show the lateral load handling capacity. With total 14 cases with the usage of RSA will be used under Zone V with zone factor 0.36 respectively, they secretly exposed in their upcoming work. The main idea of their research was the Shear wall at corners with belt connecting over its periphery column members. They conclude that their main focus will be shear strip which was the modified part of the concrete wall system, after reviewing the various researchers and then outline of the proposed work were pointed out. If the height at which the shear strip behaves effective and out if the width and thickness were kept fixed will be their optimum case, they pointed out (Neeraj Patel et. al.).

The potentials of different grades of concrete comprises of dual structural system in wall belt system, was addressed by the researchers. To demonstrate their work, authors have done the parametric approach. They simply described the importance of wall belt supported system in introduction part. The dual structural system combined with wall belt supported system; ultimately, overall building stability will increase. With various cases comprises of with and without shear wall belt, since, they have taken the G+18 storey building. They have proved their research work, the need to fulfill some optimum parametric criteria's as mentioned in the objectives of their study. They found the efficient one by considered base shear, shear forces, displacement, bending moment, axial forces and torsional values by comparing all these heads. Total 10 cases were there and have abbreviated as Case B0 to Case B9 respectively. For that, M25, M30 and M35 Grade of concrete have selected with 140 mm, 160 mm and 180 mm thickness of the wall belt. All the structures were supposed to be rested over medium soil at seismic zone III. After comparing the results under various parametric heads, with importance factor maintained at 1.2 the conclusions have drawn. Building Case B7 appears to be optimum after comparison among 10 various cases and recommend whenever this type of construction have done (Durgesh Kumar Upadhyay et. al.).

The care taken in respect to outrigger and belt truss supported system in their research work by attention given to the stability enhancement system. The paper shown is a technical paper contains tabular and figurative values with effective approach to the stability system applied over a multistoried building by software approach. Total 7 cases abbreviated from Case S1 to Case S7 respectively. Tax and Taz for both the seismic direction for the building were taken as 1.2978 seconds with importance factor equals to 1. These building cases were supposed to be situated over hard soil with response spectrum method performed over it. Worst case shown in their work subjected to maximum values of the parametric case was really good. As per their conclusions, they have proved case S4 among all the cases shows the least value and would be recommended (Archit Dangi et. al.).

As per architectural view, where the large area needed in multistoried building, floating column criteria can be necessary as per researchers point of view. The main focus is to remove the column from a part without losing overall stiffness of the structure. Without losing its stiffness, the location criteria of the elimination of the floating column would be very important as per the authors.

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Various review papers have reviewed under the same theme of the work. They have given the conclusion work after literature survey and have drawn the outline of the proposed work in the view of the technical approach. They have concluded the work in the field of optimization in respect to the location of the elimination in conclusion and they have recommended there should be optimum height criteria as per different studies (Gaurav Pandey et. al.).

III. CONCLUSIONS AND OUTLINE OF PROPOSED WORK

After the analysis of above literature reviews and after the analysis of the complete theme of the current work, we personally initiated that no researcher would have discussed this new way to lessening worst effect on the structure, no one has ever done this new thing, no one have ever gave the importance of stability improvement criteria under various heads and specially by alteration of beam members only. As per seismic effects, it is necessary to also an attention to the stability improving components too. Since we have also gone through IS codes, mentioning various fixed criteria's related to this field and the current head of the work.

The conclusive outcomes drawn from the study are enlisted below:

1) Check of seismic zone before any proposed work to get the final dual structural configurations.
2) Various analysis of earthquake parameters should be checked and validate as per Indian Standards along within the limits.
3) It is always necessary to check the lateral effects in the form of displacements.
4) For lateral effect calculation, conduction of the study for both the directions would be necessary for many aspects.
5) As per Indian Standardization IS 1893-2016, Soil type should also be checked.

The final work in this field after the conduction of literature review is that there should be an approach to increase the stability by changing grade of concrete at different floor levels in beam component and that has going to be a major study for upcoming proposed work.

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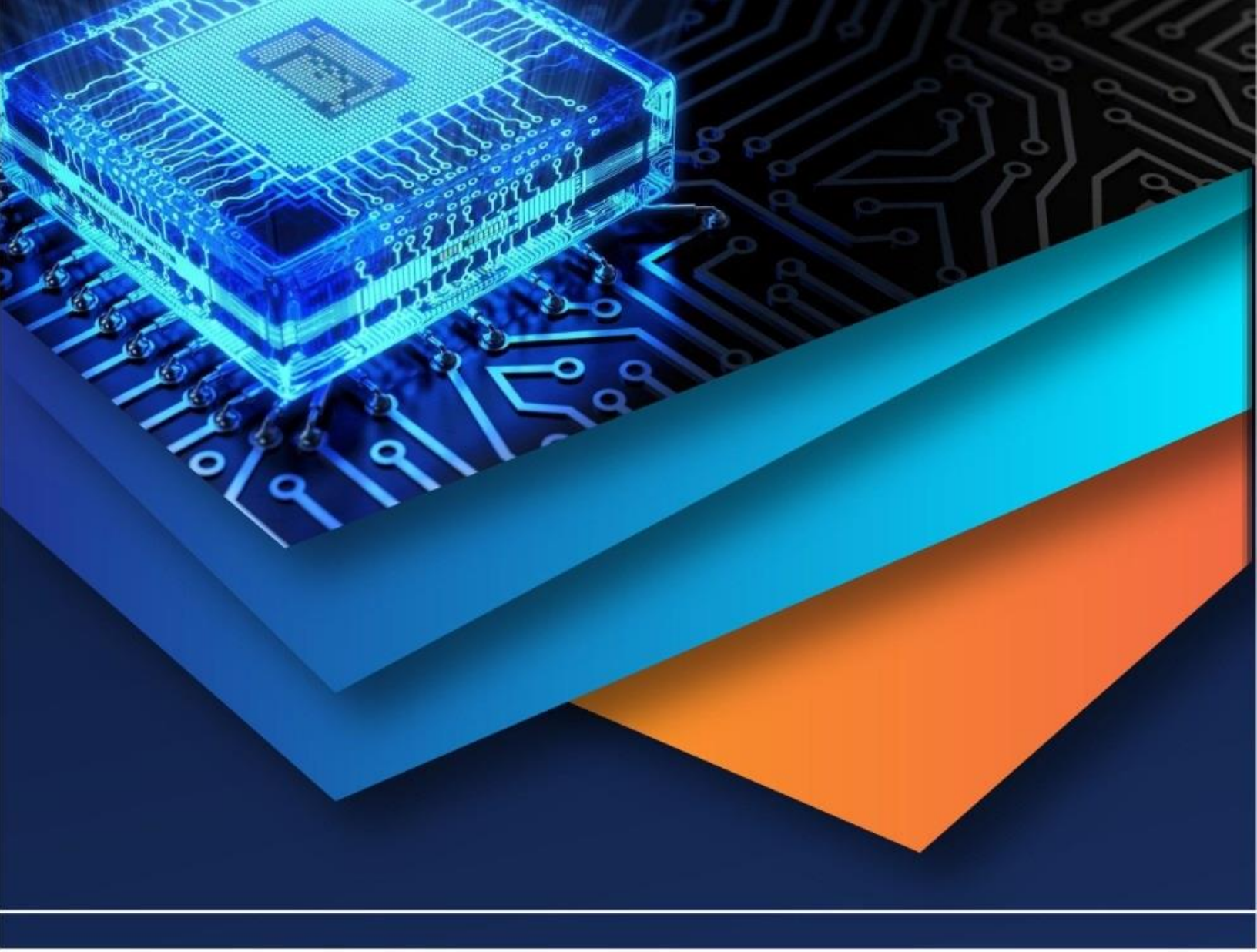
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