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Examination on Increasing Stability of Multistoried Building: A Theoretical Review

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Abstract *— The behavior of building depends upon its structural components and add on applied to it for high strength stability. Grade of concrete is the key components and plays a vital role in this regard. The current study summarizes the performance of different grades of concrete as on the stability factor in high rise buildings. The tall tower or high rise building is subjected to lateral loads like wind and seismic loads. Various researchers analyzed their work and evaluated something new in their work done but none of them describes the importance of the concrete grade and its importance on the increasing stability of entire building by adding stability components, using different materials and by replacing raw concrete components. The current review summarizes the same.*

Keywords *— **Beam, Column, Concrete grade, Stability, Tall structures.***

I. INTRODUCTION

High rise mega structures or skyscrapers are changing the pictures of skyline which accommodates the major population under one roof. They are proving highly suitable for increasing population where land availability is major issue, hence contributing in maintaining the environment. But higher they go more chances of failure in stability occurs as they are subjected to lateral forces namely wind force and seismic force. For any tall structure stability is the most major factor to be kept in mind while designing and analyzing.

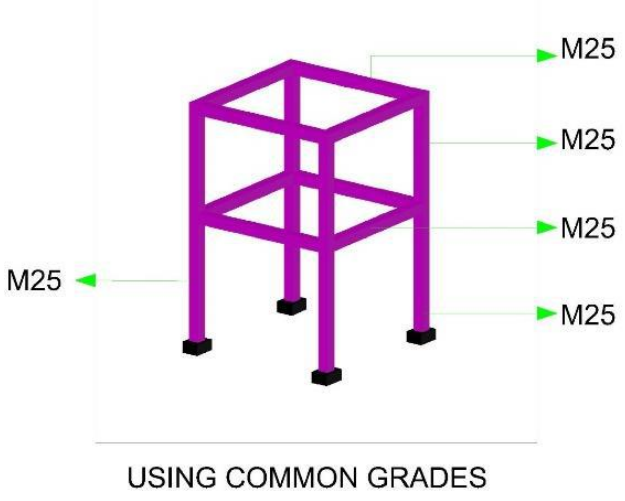

Fig. 1: Bare frame having same grade of concrete

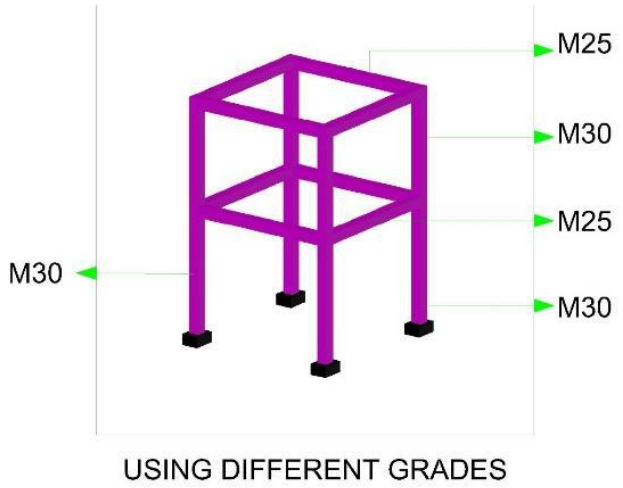

Fig. 2: Bare frame having different grades of concrete

II. LITERATURE REVIEW

The work deals with casting of geo-polymer concrete, geo-polymer being obtained from industrial waste such as fly ash. It used different grades of concrete namely M30, M40, M-50 and M60 and experimented on varying quantity of alkaline solution on mechanical property of geo-polymer concrete. An alkaline solution is mixture of Na2SiO3and NaOH solution in two different ratios as 2, 2.50 and 3, 3.50. The samplings of 150x150x150 mm cubes and 100x200 mm cylinders heat-treated at 60°C in an oven. Outcomes of experiment showed workability in the range of 85-145. Which depend on the ratio by mass

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of Na2SiO3 and NaOH. The workability increases with rise in ratio of alkaline solution while its strength is enhanced by reducing water to binding ratio. The results of compressive and split tensile strength lie between 20.64 – 60 N/mm2 and 3 – 4.9 N/mm respectively, (Shankar H. Sanni, R. B. Khadiranaikar).

The effort summarizes test performed on different multi tower high rise buildings on shaking table. Instead of assuming rigid floor for analysis, flexible transfer floor method is used. The dynamic behavior is equated with theoretical method. The dynamic behavior of structure is also taken into account, (Wensheng LU, Xilin LU).

This paper made use of fly ash to improve the durability of concrete. For this experimental studies three grades 33, 43, 53 of ordinary Portland cement are used. A comparative study is conducted with different grades of OPC, partially replaced by fly ash by per cent 10, 20, 30 and 40. The study parameters are shrinkage of concrete compressive strength and durability. The results showed improvement in properties of concrete up to certain per cent replacement of fly ash in all three grades of OPC, (T. P. Agrawal C. Marthong).

The work of the authors highlights the overuse of fine aggregates obtained from rivers which is a reason of overexploitation and ecological imbalance. To reduce the pressure on environment, an alternative to fine aggregates are discussed in this paper. Fine aggregates are being partially replaced by compatible materials like glass powder, crushed rock dust, and sintered fly ash but "spent fire brick"(SFB)obtained as a waste material from chimney lining and "glass powder" are chosen as best alternative to partially replace fine aggregates, (Tiwari Darshita, Patel Anoop).

Author carried out a study on self-compacting concrete on higher temperatures. To study the behavior of SCC on structures exposed to high temperatures, beams of dissimilar grades of SCC were tested under flexural loading. Temperature of SCC beams was maintained at 900 degree Celsius followed by cooling either by air or water. The result showed the loss in strength of SCC beams of higher grades as compared to lower ones. Due to type of heating and cooling conditions, there was also decline in compressive, flexural and tensile strength of specimens, (N. Anand, G. Prince).

The author explains the various methods to enhance the function of shear wall against lateral loading. The maximum portion of lateral load of lower segment of building is taken by shear wall while the upper segment is supported by frames suited for soft storey. Shear wall is a part of structural unit which is mainly design to take lateral loads and can be made of reinforced concrete, timber and unreinforced masonry, (Purushottam Lal Tamrakar, Vikky Kumhar, Priyanka Soni).

This paper recaps about the stability of high rise buildings subjected to seismic and wind load acting at the base or up to certain height.it also talks about the structural stiffness discontinuity which causes failure of member at junction and ultimate collapse in structure. Lateral supports are provided using bracing system or shear system to analyze stability of shear walls, cores and columns and coupled components. Many structures failed in stability due to wind load which gets solved using P-Delta analysis. All the stability analysis is done using ETAB/SAP 2000 software including P-Delta, (Mohd. Zeeshan, Mohd Sadiq, Masoom Mazhar, Ahsan Khan).

III. CONCLUSION

After reviewing and analyzing previous research papers it is concluded that:

1) Stiffness and Stability is analyzed by raw components used.
2) Different materials should be used for improving the analysis results.
3) No software analyses are done before on different grades. Different software should be used to determine the analytical results.
4) Design of the structure depends on the size, its materials and method used. Hence it should keep in mind while designing the structure.
5) Cost effectiveness of the structure depends on the sizes and material of the components used; therefore the approach should be effective.

As per the above conclusion by reviewing the researches of different studies, the technical approach should be there in the field of Civil Engineering, by software approach on multistorey building and the first analytical work will be provided and will soon be seen in the analytical research papers. A conclusion section must be included and should indicate clearly the advantages, limitations, and possible applications of the paper. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

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REFERENCES

[1] C. Marthong, T. P. Agrawal, "Effect of Fly Ash Additive on Concrete Properties" International Journal of Engineering Research and Applications July-August 2012.

[2] Markanday Giri, Sagar Jamle and Kundan Meshram (2020), "Response Spectrum Analysis", LAP LAMBERT Academic Publishing, Mauritius.

[3] Ms. Priyanka Soni1, Mr. Purushottam Lal Tamrakar, Vikky Kumhar, (2016), "Structural Analysis of Multistory Building of Different shear Walls Location and Heights" International Journal of Engineering Trends and Technology (IJETT) – Vol. 32, No. 1.

[4] N. Anand, G. Prince Arulraj, "Effect of Grade of Concrete on the Performance of Self-Compacting Concrete Beams Subjected to Elevated Temperatures" Fire Technology, 50, 1269–1284, 2014 Springer Science + Business Media New York. DOI: 10.1007/10694-013-0345 – 6.

[5] Prabhulal Chouhan, Sagar Jamle, M.P. Verma, (2017), "Experimental Investigation On Silica Fume As Partial Replacement Of Cement For M-25 Grade Concrete", IJSART - Volume 3 Issue 5, ISSN- 2395-1052.

[6] Prakash Mandiwal, Sagar Jamle, (2018), "Use of Polyethylene Glycol as Self Curing Agent in Self Curing Concrete - An Experimental Approach", International Research Journal of Engineering and Technology, (ISSN: 2395-0072(P), 2395-0056(O)), vol. 5, no. 11, pp. 916-918.

[7] Sachin Sironiya, Sagar Jamle, M. P. Verma, (2017), "Experimental Investigation On Fly Ash & Glass Powder As Partial Replacement Of Cement For M-25 Grade Concrete", IJSART - Volume 3 Issue 5, ISSN- 2395-1052, pp. 322-324.

[8] Sagar Jamle, Dr. M.P. Verma, Vinay Dhakad, (2017), "Flat Slab Shear Wall Interaction for Multistoried Building under Seismic Forces", International Journal of Software & Hardware Research in Engineering (IJSHRE) ISSN: 2347-4890 Vol.-05, Issue-3, pp. 14-31.

[9] Sameer Khan, Sagar Jamle, M.P. Verma, (2017), "Experimental Investigation with Marble Dust Powder as a Partial Swap of Cement for M20 Grade Concrete", IJSART - Volume 3 Issue 6, ISSN- 2395-1052, pp. 256-259.

[10] Shankar H. Sanni, R. B. Khadiranaikar, (2013), "Performance of Alkaline Solutions on Grades of Geo-polymer Concrete", IJRET: International Journal of Research in Engineering and Technology.

[11] Tiwari Darshita, Patel Anoop, (2014), "Study of Strength and Workability of Different Grades of Concrete by Partial Replacement of Fine Aggregate by Crushed Brick and Recycled Glass Powder", International Journal of Science and Research (IJSR).

[12] Wensheng LU, Xilin LU, (1998), "Seismic Model Test and Analysis of Multi - Tower High-Rise Buildings" Research Institute of Engineering Structures, Tongji University, Shanghai, P. R. China.