

Strengthening of Existing Structure-Case Study

Sneha T Ingole¹, Prof M.D.Mata²

¹Dept of Civil Engineering

²Professor, Dept of Civil Engineering

^{1,2}Shri Sant Gadge Baba College of Engineering and Technology, Bhusawal

Abstract- Structural elements of any structure are designed to mostly to carry the various types of loadings. Many civil structural elements are required to be upgraded. The main objective of strengthening is to upraise the strength capacity of an existing structural element. Strengthening of structures must be taking into consideration when the existing structure deteriorates adversely or any alteration to the structure has to be made out because of which the structure may fail to serve its desired purpose. In this project various strength method is discussed. The project is carried out by checking the strength of various components and concluded with the suggestions on the basis of strength. It is also becoming environmentally priority and economically preferable to repair the structure or strengthen the structures. Else replacing them totally, particularly if rapid, effective and simple strengthening methods are available. The strengthening of the structure should be designed with accounting to minimize the maintenance needs and repair needs.

I. INTRODUCTION

As Structural elements normally are designed to suit the various types of loadings. However many civil structural elements, reinforced concrete beams as an example are often required to be upgraded or strengthened due to increased load requirements. Strengthening is the process of upgrading structures to improve performance under existing loads or to increase the strength of structural members to carry additional loads.

Strengthening of reinforced concrete structures is an important task in the field of structural maintenance. The aim of strengthening is to increase the capacity of an existing structural element. Strengthening of structures must be considered when the existing structure deteriorates or any alteration to the structure has to be made due to which the structure may fail to serve its purpose.

NEED OF STRUCTURAL STRENGTHENING FOR STRUCTURES

Concrete structures need to be strengthened for any of the following reasons:

- Load increases due to higher live loads, increased wheel loads, installations of heavy machinery, or vibrations.
- Damage to structural parts due to aging of construction materials or fire damage, corrosion of steel reinforcement, and/or impact of vehicles.
- Improvements in suitability for use due to limitation of deflections, reduction of stress in steel reinforcement and/or reduction of crack widths.
- Modification of structural system due to elimination of walls/columns and/or openings cut through slabs.
- Errors in planning or construction due to insufficient design dimensions and/or insufficient reinforcing steel.

It might be necessary to redesign the structure with the probable former codes that were active when the structure was built. This can give enough knowledge about the structural mode of action, otherwise field investigations must be undertaken to provide an understanding of the structure.

The design of a strengthening however must fulfill requirements in the codes of today. It is not only the financial and structural aspects that should form the basis for decisions of strengthening method, but environmental and aesthetic aspects must also be considered.

A. Overview

It is important to study strengthening of structure and its normal now a days this project contains study on strength check, what are the reason behind deterioration and its effect on structure. Basically the strengthening includes every aspects that it will consider from the design stage of structure to know better about strengthening technique and its measure. So that we can compare the strength values of different elements and suggest the conclusion.

B. Aim

To study strengthening of existing structure-case study.

C. Objectives

- To study the concept of strengthening of existing structure in detail.
- To observe existing building through visual inspection and evaluate the above collected data.
- To do live case study of heck of strength on any existing structure through Non-Destructive Testing (NDT).
- Suggestions on the analysis obtained from data measured.

II. METHODOLOGY

A. General

1. To achieve first objective – strengthening of existing structure, study on the importance of strengthening of existing structure will be done in detail. In addition study of previous work done on it through various research papers (included in literature review) will be done.
2. The second objective comprises a visit to site to observe the building through visual inspection whether any crack, or bending of beams or displacement in columns is present through tapping as well as evaluation of collected data will be done.
3. To achieve third objective detailed study of strength of an existing building will be done through Non Destructive Test (NDT). In this detailed study of NDT and proper use of rebound hammer for various structural part of the building will take place.
4. To achieve final objective based on above work findings suggestion are given for the structure.

III. RESULTS AND OBSERVATIONS

structural audit results of various sections.

(*note in all results below strength representing 8 is least measurable by ndt it may be even below 8 n/mm²)

Table1 location: chemistry lab & A13A

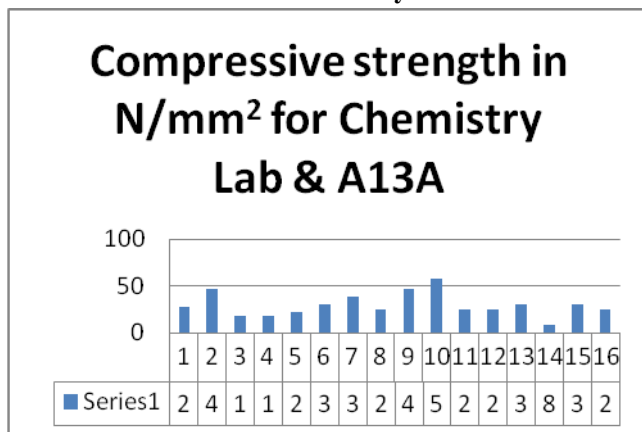
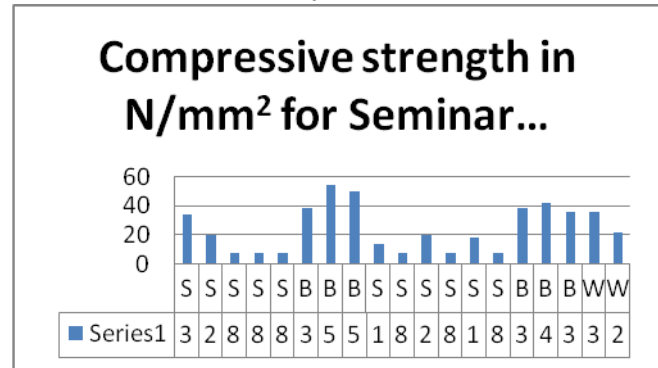
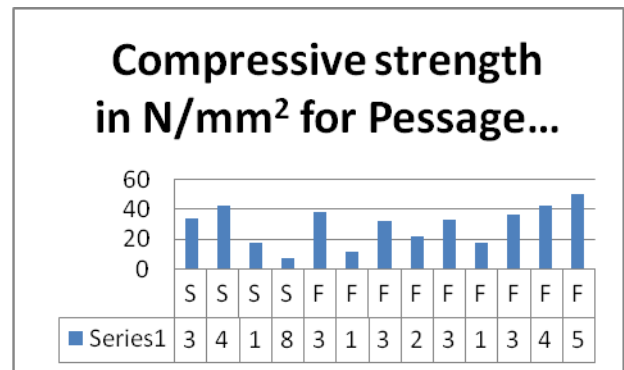


Table 2: Location :Seminal Lab, Computer Lab and Msc Analytical lab



Location :Seminal Lab, Computer Lab and Msc Analytical lab



OBSERVATION

1. Uneven strength in entire slab at certain weak zone it is below measurable.
2. Strength in wall is fair in most of the reading it is not found below measured.
3. In classroom A13-A plaster is spalling which may lead to even more weakening the structure.
4. Slab in seminar hall is found weak where at certain places its strength is found below measurable.
5. Base foundation is found with fair strength which shall be keep protected by leakage and moisture.
6. Exposed reinforcement in slab leads to strength reduction

IV. CONCLUSION

1. Strengthening is the process of upgrading structures to improve performance under existing loads or to increase the strength of structural members to carry additional loads. The aim of strengthening is to increase the capacity of an existing structural element.
2. Steel fiber reinforced high strength lightweight self-compacting concrete (SHLSCC) developed by the authors is applied for the strengthening of RC beams to improve their bending moment capacities.

3. Use of standard and innovative repair materials, appropriate technology, workmanship, and quality control during implementation are the key factors for successful repair, strengthening and restoration of damaged structures.
 4. The shear wall is one of the best lateral load resisting systems which is widely used in construction world but use of steel bracing will be the viable solution for enhancing earthquake resistance.
 5. Application of appropriate strengthening and stabilization method can prolong the life together with new utilization of existing building. Strengthening/repair of structures is more economical compared to its demolition and reconstruction. By observing case study on crack treatment it is important to keep maintaining structure time to time or else leads to injury and in addition cost will increase for future problems in structures that might be come.
 6. The strength in existing structure is highly variable due to age factor and uneven loading conditions.
- [5] Ondřej Holčápeka, Filip Vogela, Pavel Reiterman, “Using of Textile Reinforced Concrete Wrapping for Strengthening of Masonary Columns with Modified Cross-section Shape”, 18th International conference on Rehabilitation and Reconstruction of Buildings, 2016, p.p.62-66.
 - [6] Hakan Yalciner and Amir A. Hedayat, “Repairing and Stregthening of an Existing Reinforced concrete Building : A North Cyprus Perspective”, American J. of Engineering and Applied Sciences, 2010, p.p. 109-116.
 - [7] Shri. Pravin B. Waghmare, “Materials And Jacketing Technique For Retrofitting Of Structures”, International Journal of Advanced Engineering Research and Studies E-ISSN2249 – 8974, volume 1, October-December 2011, pp. 15-19.
 - [8] M.D. Kevadkar and P.B. Kodag, “Lateral Load Analysis of R.C.C. Building”, International Journal of Modern Engineering Research (IJMER) ISSN: 2249-6645, Volume-3, May-June 2013, pp.1428-1434.
 - [9] T. Zahra, Y. Zehra, S. Ahmad, “Condition assessment and strengthening of residential units”, Case Studies in Construction Materials Elsevier Ltd., 2014, pp. 144-153.
 - [10] P. S. Kumbhare¹, A. C. Saoji, “Effectiveness of Changing Reinforced Concrete Shear Wall Location on Multi-storeyed Building”, International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622, Volume 2, September- October 2012, pp.1072-1076.s

It is suggested that the existing slab shall be repaired and exposed surfaces shall be treated to maintain the strength.

V. ACKNOWLEDGEMENT

This research was supported by Principal Dr. R. P. Singh, H.O.D. Prof. P. P. Bhangale & Prof. M. D. Mata, S.S.G.B.College of Engineering and Technology, Bhusawal .

REFERENCES

- [1] T.Gorgulu, Y. Selim, Salih Yilmaz, H. Kalpan , “Strengthening of reinforced structures with external steel shear walls”, journal of Construction Steel Research Turkey, 2012, pp. 226-235.
- [2] El-Samny M. Kassem¹ and Abd El-Samee W. Nashaat, “Rehabilitation of Existing Foundation Building to Resist Lateral and Vertical Loads”, International Journal of Current Microbiology And Applied Sciences, Volume3, 2014, p.p. 950-961.
- [3] K. Holschemacher , S. Iqbal, A. Ali ,T. A. Bierb, “Stregthening of RC bems using lightweight self compacting cementitious composite”, Science Direct Elsevier Ltd., 2017, p.p. 369-376.
- [4] Ali Fadhil Naser , Wang Zonglin ,“ Damage Investigation, Strenghening, and Repair of Jilin Highway Double-Curve, Arch concreting Bridge in China”, The Twelfth East Asia-Pacific Conference on Structural Engineering and Construction Elsevier Ltd.,2011, p.p. 2294-2300.