IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 4, June 2026
Impact Factor: 8.2

The Repair, Rehabilitation and Retrofitting of Rcc Structure (A Case Study)

Dr. Y. R. Suryawanshi[1] Kiran Jadhav[2] Dhanraj Tonpe[3] Aditya Sutar[4] Pavan Kudale[5] Om Chakor[6]
Professor, Department of civil Engineering, JSPM's Imperial College of Engineering and Research, Pune, India [1]
Students, Department of civil Engineering, JSPM's Imperial College of Engineering and Research, Pune, India[2,3,4,5,6]

Abstract: *The construction of high-rise buildings involves complex co-ordination of labour and resources, making efficient management a critical factor in project success. This study focuses on the construction labour management and resource management practices adopted in high-rise building projects. The objective is to analyse the u liza on of manpower, materials, and equipment, and to identify key factors that affect productivity, cost, and me efficiency. Data is collected through site visits, interviews with project managers, and observation of on-site activities. The study examines labour scheduling, resource allocation, safety practices, and the impact of workforce performance on project millines. Challenges such as labour shortages, skill varia on, material wastage, and ineffective communication are analysed. Based on the findings, strategies for improving labour efficiency and resource optimization are proposed. These include effective planning, skill development programs, use of modern construction technologies, and be er coordination between management and site teams. The study concludes that proper labour and resource management in high-rise building projects significantly enhances overall productivity, reduces delays, and ensures cost-effective and quality construction*

Keywords: high rise building, retrofitting, NDT Test, Rehabilitation

I. INTRODUCTION

Reinforced Cement Concrete (RCC) structures play a vital role in modern infrastructure due to their strength, durability, and versatility. However, over time, these structures are subjected to deterioration caused by environmental exposure, aging, poor construction practices, corrosion of reinforcement, excessive loading, and inadequate maintenance. Such deterioration can reduce the service life and structural performance of buildings, leading to safety concerns and increased maintenance costs.

With rapid urbanization and increasing demand for sustainable infrastructure, the repair, rehabilitation, and retrofitting of existing RCC structures have become essential. Repair refers to restoring damaged portions of a structure, rehabilitation aims at improving the overall condition and functionality of the structure, while retrofitting enhances its load-carrying capacity and resistance against future deterioration. These techniques provide an economical and environmentally sustainable alternative to demolition and reconstruction.

Assessment of existing structures is a crucial step before undertaking any rehabilitation work. Non-Destructive Testing (NDT) methods such as Rebound Hammer Test is widely used to evaluate the condition and strength of concrete without causing significant damage to the structure. These techniques help identify defects, determine the extent of deterioration, and select appropriate repair measures.

The present study focuses on the condition assessment and rehabilitation of a G+4 RCC hostel building located in wagholi, Pune. During the field investigation, various defects such as cracks in walls, dampness, water leakage, flaking of plaster, paint deterioration, and water accumulation were observed. NDT tests were conducted to evaluate the quality and strength of the concrete. Based on the findings, suitable repair, rehabilitation, and retrofitting techniques were recommended to improve the durability, serviceability, and overall lifespan of the structure.

DOI: 10.48175/568

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 4, June 2026
Impact Factor: 8.2

II. PROBLEM STATEMENT

Many existing Reinforced Cement Concrete (RCC) structures are experiencing deterioration due to aging, environmental exposure, moisture penetration, corrosion of reinforcement, inadequate maintenance, and construction defects. These issues lead to the development of cracks, dampness, water leakage, spalling of concrete, flaking of paint, and reduction in the overall durability and serviceability of the structure. If left untreated, such defects can adversely affect the structural integrity and safety of the building.

The selected G+4 RCC hostel building at Wagholi, Pune, exhibited several signs of deterioration, including cracks at the junction of concrete and masonry walls, dampness, leakage, flaking of plaster and paint, accumulation of water on the terrace, and localized deterioration of structural elements. Although the building was found to be structurally stable, the observed defects indicate the need for timely assessment and rehabilitation to prevent further degradation and extend its service life.

Therefore, a systematic condition assessment using Non-Destructive Testing (NDT) techniques is required to evaluate the quality and strength of the concrete and identify the extent of deterioration. Based on the assessment results, suitable repair, rehabilitation, and retrofitting measures must be proposed to restore the structural performance, improve durability, and ensure the long-term safety and serviceability of the building.

III. OBJECTIVE & ANALYSIS

The objectives of this research are to conduct a detailed visual inspection of the selected RCC building and identify signs of deterioration such as cracks, dampness, leakage, and surface defects. To evaluate the quality, strength, and durability of structural elements using Non-Destructive Testing (NDT) methods such as Rebound Hammer Test. To determine the in-situ compressive strength of concrete through Concrete Core Testing and assess the structural condition of the building. To identify the causes of deterioration, including moisture ingress, corrosion of reinforcement, environmental exposure, and inadequate maintenance. To recommend suitable repair, rehabilitation, and retrofitting techniques for restoring the structural performance and durability of the building. To enhance the service life, safety, and functionality of the existing RCC structure through appropriate maintenance and strengthening measures.

The building has located in Wagholi, visually inspected on Tuesday 10/4/2026

Observations:

Dampness or leakage in wall or slab: we observed the at left side external portion of the building the theirs is too much dampness and some places the water leakages.

Fig.1 show the dampness present in the building structure.

Flaking of plaster or paint: At the site we find the problem of flaking of plaster or paint at 3-4 places. Details show in fig 4.5.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 4, June 2026
Impact Factor: 8.2

Fig.2 Flaking of Paint & Plaster

Repair and Rehabilitation and retrofitting Methodology: The quality of concrete in most of the columns and beams are found to be satisfactory to good as the UPV values are reasonable. How-ever the number of chlorides is quite considerable. Many of the columns and beams which have undergone damage due to corrosion are to be strengthened to regain their original load carrying capacity. Before taking up the strengthening procedure, proper supporting scheme has to be provided to prevent damage of the building by affecting the transfer of load from column to the temporary supports. This is essential to ensure safety aspects during the rehabilitation. It may be noted that before rehabilitation the RC beams, RC column in which the beams are spanning have to be suitably strengthened from the point of view of ensuring safety.

Epoxy Injections: It is an economical method of repairing non-moving cracks in concrete walls, slab, column and piers as it is capable of restoring the concrete to its pre-cracked strength. It does where the cracks detect at the concrete surface.

Routing and Sealing: This method the cracks is made wider at the surface with a saw or grinder, and then the groove is filled with a flexible sealant. Crack Repair and Protective Coating Acid wash and water wash the entire repaired surface as well as the existing good members. Apply acrylic asphaltic based protective coating to the members to prevent the damage in future. Plasticized expanding grout admixture with acrylic polymer modified mortar will used for sealing of all masonry and RCC cracks. The external masonry cracks will fill with polymer modified grout.

Waterproofing: Waterproofing is necessary at terrace or where water leakage is detected. Waterproofing is necessary because it is the formation of an impervious barrier over surfaces of foundations, roofs, walls, and other structural members. The function of the impermeable barrier is to prevent water

Painting: Using a scraper or 100-grit sandpaper, remove any loose, cracked, or peeling paint from the damaged area. Remove any dust or debris from the area with a water-dampened rag. Using a putty knife, apply a thin layer of patching material to the damaged area. Allow it to dry. When it gets properly dry paint the portion by using the good quality of paint.

Reinforcement Cleaning and Anti Corrosive Coating: All the concrete sticking to the rebar was removed by hammering and manual chipping. Rust remover coating was applied on the reinforcement steel bars and care was taken that the backside of the bars also gets coated. It was allowed to act for 24 hrs. wire brush were used to remove the rust from the steel bars followed by washing with water jet for the complete removal of rust. Anti-corrosive zinc primer coating was applied completely surrounding the periphery of the reinforcing steel and allowed it to dry for 4 hrs. second coat of primer was applied after 4 hours and care was taken to cover all the steel area without leaving a small portion of the steel uncovered .The reinforcing steel which were highly corroded were replaced with additional reinforcement by welding with existing bars or drilling holes into concrete and inserting additional steel bars with epoxy mortar. Anti-corrosive Coating.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 4, June 2026
Impact Factor: 8.2

NDT Test: Rebound Hammer Test

The method of using the hammer is explained. With the hammer pushed hard against the concrete, the body is allowed to move away from the concrete until the latch connects the hammer mass to the plunger. The plunger is then held perpendicular to the concrete surface and the body pushed towards the concrete. The hammer can be used in the horizontal, vertically overhead or vertically downward positions as well as at any intermediate angle, provided the hammer to the surface under test. The position of the mass relative to the vertical, however, affects the rebound number due to the action of gravity on the mass in the hammer. This movement extends the spring holding the mass to the body. When the maximum extension of the spring is reached, the latch releases and the mass is pulled towards the surface by the spring. The mass hits the shoulder of the plunger rod and rebounds because the rod is pushed hard against the concrete. During rebound the slide indicator travels with the hammer mass and stops at the maximum distance the mass reaches after re bounding. A button on the side of the body is pushed to lock the plunger into the retracted position and the rebound number is read from a scale on the body.

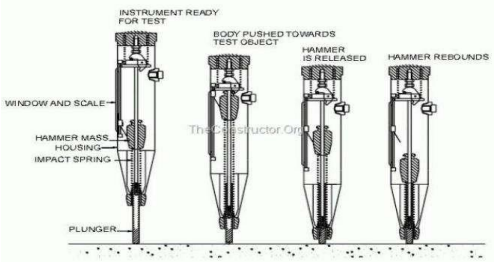

Fig.3 Mechanism of Rebound Hammer

Fig.4 Rebound Hammer Test on Site

Rebound Hammer Test Results

NDT Test	Actual Result	Expected Results (According to Thumb Rule)	Remark
I. Rebound Hammer Test	Avg. Rebound Number 35 Nos.	20 to 30 Nos	Good layer concrete quality

IV. CONCLUSION

The present study focused on the assessment, repair, rehabilitation, and retrofitting of an existing RCC hostel building located at Wagholi, Pune. A detailed visual inspection and Non-Destructive Testing (NDT) methods, including Rebound Hammer Test, were carried out to evaluate the condition and quality of the structural elements.

The investigation revealed defects such as cracks in walls, dampness, water leakage, flaking of plaster and paint, accumulation of water on the terrace, and localized deterioration of concrete. However, the NDT results indicated that the majority of the structural members were in satisfactory condition and possessed adequate strength. The observed deterioration was primarily associated with environmental exposure, moisture ingress, and inadequate maintenance rather than severe structural distress.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 4, June 2026 Impact Factor: 8.2

Based on the findings, suitable repair and rehabilitation measures such as epoxy injection, waterproofing treatment, anti-corrosive coating of reinforcement, polymer-modified mortar application, crack sealing, and column strengthening techniques were recommended. These measures can effectively restore the durability, serviceability, and aesthetic condition of the structure while preventing further deterioration.

The study concludes that timely condition assessment, regular maintenance, and the implementation of appropriate rehabilitation and retrofitting techniques can significantly extend the service life of RCC structures. The adoption of NDT methods provides a reliable and economical approach for evaluating structural health and selecting suitable repair strategies, thereby ensuring the safety, durability, and long-term performance of existing buildings.

V. ACKNOWLEDGEMENT

It is great pleasure in submitting this report. Making this report to reality takes many dedicated people and it is our great pleasure to acknowledge the contributors of the college. We take this opportunity to express our profound gratitude and indebtedness for the personal involvement and constructive criticism provided beyond technical guidance during the report making to our guide Dr. Y. R. Suryawanshi We will be ever grateful to him for encouragement and suggestions given by him from time to time. We are indebted to Dr. Y. R. Suryawanshi (Head of Civil Engineering Department) for his inspiration and creative approach. We would like to thank Dr. R. S. Deshpande (Principal, ICOER) for providing necessary facilities during the period of working of this project. We would also like to thank all the faculty members and entire non-teaching staff from Civil Department for their timely help and kind suggestions.

REFERENCES

[1](1997): 'Utilisation of Super plasticizers & other Chemical admixtures in Rehabilitation of Marine Structures along with a Case Study", in Proceedings of International Conference organised by CANMET/ACI at Rome, Italy on 7-10 Oct.1997. PP 23-26.

[2]Aguilar J, Juarez H, Ortega R, Iglesias J. The Mexico earth-quake of September 19, 1985. Statistics of damage and retrofitting techniques in reinforced concrete buildings affected by the 1985 earthquake. Earthquake Spectra. 1989 February; 5(1):145-51. Crossruff

[3] Alcocer, S.M. and Jirsa, J.O. (1993), "Strength of Reinforced Concrete Frame Connections Rehabilitated by Jacketing", ACI Structural Journal, American Concrete Institute, May-June Vol. 90, No. 3, pp. 249-261.

Avinash D. Kulkarni (structural Designer\Chartered Engineer) [2021]

[4] B. Rajoria, Ashok Basa, (2010) The Institute of Engineers(I), "Rehabilitation and Retrofitting of Structures" published by Macmillan Publishers India Pvt.Ltd.

[5] Bhattacharjee J (2015): "Need for repair/retrofitting of Concrete Structures using latest materials & Techniques", in International Conference of NCB, in New Delhi on 01 04 Dec15, (PP 710-713)

[6] Bhattacharjee J (2015): "Need for repair/retrofitting of Concrete Structures using latest materials & Techniques", in International Conference of NCB, in New Delhi on 01 04 Dec15, (PP 710-713)

[7] Bhattacharjee J. Repair, rehabilitation and retrofitting of RSS for sustainable development with case studies. Civil Engineering and Urban Planning: An International Journal (CiVEJ).2016 Jun3; 3(2):33-47. Crossref Bhattacharya Shubhamoy, Nayak Sanket, Datta Sekhar Chandra, (IJDRR, V 7, March). Bureau of Indian Standards.

[8] C. Misra, K. Pathak (2009) Book on "Maintenance Engineering and Management" published by PHI Learning Pvt. Ltd. Civil Engineering and Urban Planning: An International Journal (CiVEJ) Vol.3, No.2, June 2016 Hand Book on "Repairs and Rehabilitation of RCC Buildings" (2011) (published by CPWD, Govt. of India, New Delhi).