



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 10, October 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118

 9940 572 462

 6381 907 438

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 www.ijirset.com



Structural Health Inspection of Institutional Building (SGBIT CAMPUS)

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ABSTRACT:In today's world, the most used building material is concrete. After the 1970s and 1980s, all major countries agreed on new preventive measures and appropriate practices for the durability of concrete (IS Code – 456:2000). In the current scenario of construction research, repair and rehabilitation plays a vital role as it is important in construction applications. The main defects reported are discussed and an appropriate and economical solution to a particular defect is identified. In general, the life of a structure depends on the geography of the site, building material, technology and workmanship. The geography of the site includes various aspects like strata type, water table, earthquake or wind or cyclone or flood or snow, pollutants, landslide and location of trees with respect to the building. Building materials include cement, lime, fine sand, coarse sand, quality water, bamboo or wood, brick. Technology includes various aspects such as architectural design, construction methods and quality procedures. Finally, one of the main execution factors includes various aspects such as construction work, finishing work, waterproofing work, building maintenance.

KEYWORDS:restoration, rehabilitation, building maintenance

I. INTRODUCTION

Currently, concrete is the main building material used for the construction of structures. Some old buildings are still in good working order, but some modern buildings begin to show signs of distress within a short time due to poor workmanship, poor maintenance, poor quality of materials and inappropriate design. Thus, most of the old buildings require more building maintenance and repairs also due to the increase in population and increase in their shelter requirements, they require more space for new building construction, but the required amount of space is not available for new ones or people may have to pay a higher amount to purchase of new land and the construction of a new building, so instead it is more economical to use the existing building and renovate that building.

Instead of demolition, it is advisable to rehabilitate the damaged building and build a new one. So, in the construction industry, repairing and rehabilitating an existing structure is very well-known because it is an economical and time-saving process rather than building a new structure.

II. RELATED WORK

Repair and rehabilitation is a neglected area of civil engineering and health assessment of structures is hardly done in India except for large structures nearing end of life. Repairs and rehabilitation require skills such as inspecting, assessing and quantifying damage and knowing how to use new repair materials. This would make it possible to economically achieve increased strength, increased workability and resistance to cracking. Renovation, modernization and renovation of an existing building present an opportunity to increase the energy performance of commercial buildings over their lifetime.

Following are the objectives of a project:

- To identify causes of distress and their sources.
- To priorities the distressed elements according to seriousness for repairs
- A suitable solution for the defects and deterioration of the structures.



III. METHODOLOGY

Following are the steps of the project work:

1. Visual inspection and Field inspection.
2. Collection of data of the building.
3. Click Photographs of distresses and defects.
4. Classification of defects and distresses.
5. Analysis of defects and their possible solutions.
6. Non-destructive testing and Chemical testing.
7. Suggestion of repair.

Visual inspection and Field inspection

Visual inspection of the structure is the most effective qualitative method of assessing structural integrity and identifying typical signs of distress along with associated problems. A record of visual inspection is a necessary requirement for the compilation of a real statement of dimensions of various repair items. During the inspection, various points should be checked such as settlement in the foundation, detection of moisture in the wall, cracks in columns, beams, slabs and walls, any signs of material damage, various additions and alterations, condition of balconies - sagging, deflection, cracks, leaks from the terrace etc.

Collection of data of the building

Name of Building: - S.G Balekundri Institute of Technology Belagavi.

Year of construction: - 2008

Address: - Shivabasava Nagar, Belagavi, Karnataka-590001

Following are the basic information collected with respect to building:

Table 01 - Basic Information of Building

No's.	DESCRIPTION	REMARK
1	Type of Building	commercial
2	Age of Building	14 years
3	Mode of use	Institutional, Residential
4	No of Stories	G+2
5	Details of Repair	Plumbing work, leakages, minor cracks



Fig.1 S.G.B.I.T CAMPUS

Vertical cracks: These cracks can indicate that structural components such as bricks or blocks have failed, and so can be a sign of significant stress in the building structure.



Fig.2 representation of vertical cracks



Fig.3 representation of horizontal cracks

Horizontal cracks: Occurs near the beam-column joint and column face where tensile stress is high. Columns with sufficient moment capacity, insufficient reinforcement, or the disposition of the installed reinforcement are prone to horizontal cracking; due to shear force and direct load and uniaxial bending

Diagonal Cracks:

The main cause of diagonal cracks in concrete columns is the insufficient bearing capacity of the columns; insufficient cross-section and insufficient reinforcing steel. It can appear anywhere in the height. And it runs diagonally across a section of uniform thickness



Fig.4 representation of diagonal cracks

HEALTH RATING INDEX FROM VISUAL INSPECTION

The evaluation values were used to determine the visual inspection factor (VIF). The result of the VIF is strongly dependent on subjective judgment and observation of elements of deterioration and distress.

the ratings are given as 2, 4, 6, 8 & 10, Add the scores and divide it by 8 to get Health Rating Index (HRI)

Following table represents the information of HRI for existing buildings of a SGBIT campus

Table 02 HRI of SGBIT Campus building

Sl. No.	Building Description	HRI	Remarks
1	Civil Department	7	Good
2	Auditorium Building	6	Fair
3	Girls Hostel Building	5.25	Fair



IV. EXPERIMENTAL RESULTS

1. Rebound Hammer Test

Table 03 Rebound hammer test results

➤ LOCATION - CIVIL DEPARTMENT BUILDING

COMPONENTS	REBOUND VALUE	AVERAGE STRENGTH (Mpa)	REMARK
COLUMN	36	33.6	GOOD LAYER
BEAM	33	28.2	GOOD LAYER
SLAB	28	25.9	FAIR
WALL	33	28.2	GOOD LAYER

➤ LOCATION - AUDITORIUM

COMPONENTS	REBOUND VALUE	AVERAGE STRENGTH (Mpa)	REMARK
COLUMN	36	33.6	GOOD LAYER
BEAM	33	28.2	GOOD LAYER
SLAB	26	22.8	FAIR
WALL	34	30	GOOD LAYER

➤ LOCATION - GIRLS HOSTEL

COMPONENTS	REBOUND VALUE	AVERAGE STRENGTH (Mpa)	REMARK
COLUMN	36	33.6	GOOD LAYER
BEAM	33	28.2	GOOD LAYER
SLAB	26	22.8	FAIR
WALL	33	28.2	GOOD LAYER

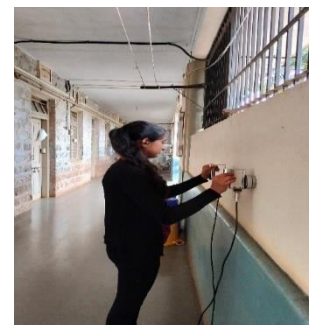


Fig. 5 Rebound Hammer test

Fig 6. UPV test

2. Ultrasonic Pulse Velocity Test

Table 04 UPV test results

Building Type	Distance	Avg. Time	Avg. Velocity	UPV Method	Quality of Concrete
Civil Department (Wall)	400m	103.55	3.87	Indirect	Good
Civil Department (Column)	230m	47.17	4.89	Direct	Excellent
Auditorium (Column)	300m	67.84	4.43	Direct	Excellent
Auditorium (Wall)	300m	63.45	3.99	Indirect	Good
Girls Hostel (Column)	300m	74.54	4.09	Direct	Excellent
Girls Hostel (Wall)	262.33m	63.94	4.13	Indirect	Good

3. Carbonation Test

Carbonation testing provides a means by which we can determine the presence of carbon dioxide infiltration into concrete. The carbonation test is performed by drilling a hole on the surface of the concrete up to the concrete cover. Remove the dust with a brush and blow air to clean the hole. Spray a 0.2% solution of phenolphthalein with a syringe over the cracked/holed concrete and observe the color change. Measure the depth of the uncolored layer (carbon layer) in millimeters from the outer surface at 6 to 8 positions. Take the average of the measurements.

Table 05 Carbonation test results

Building	Carbonation present
Civil department building	No
Auditorium	No
Girls hostel	No



Fig. 6 Carbonation Test

IV. CONCLUSION

Through the above investigation, we came to the conclusion that the health condition of the structure is decent. By studying the NDT test, we concluded that the structural element or component suffers from Class 3 damage. According to the Central Department of Public Works, Class 3 damage means observations such as spalling of the concrete cover, structural cracks, etc., which require major repairs.

Major repairs should be started as soon as possible to prevent further damage to the structure. Remedial work should include column strengthening, plastering of damaged areas and waterproofing, etc., as well as remediation of leaks at various locations on the top floors. The quality of the RCC found was poor according to the results of the reflection test and the UPV test performed at different locations. Delays in repairs will result in an increase in the amount of work due to the permanent deterioration of the buildings.

Recommendations depending on visual inspection and test result:

- From the health assessment index conducted by visual inspection, we conclude that the building suffers from Class 3 damage. (Class 3 damage means observations such as structural cracks, seepage, moisture, reinforcement corrosion, etc., these damages or deterioration should be repaired and combed honey. A damaged hole-like surface requires immediate repair.
- In order to restore the service life and operability of the structure, the damaged parts of the structures should be repaired as a priority, but the structures affected by reinforcement corrosion need special treatment for corrosion care in addition to restoring strength.
- Small cracks can be repaired with epoxy or grout.
- It is necessary to carry out regular maintenance of the structure

REFERENCES

[1] Structural Audit of RCC Building”, Sanket Sanjay Suryawanshi, Vaibhav Vishnu Vishe, Deepak Premchand Sah, Reetika Sharan
 [2] 1). Kajol Merwala, 2). Liza Hirpara, 3). Kavita Choksi, 4). Darshan Mehta “Repair and Rehabilitation of RCC structure” [online] <http://www.grdjournal.com/uploads/conference/GRDCF/001/045/GRDCF001045.pdf>



- [3] Shital Pardeshi and U. L. Deshpande “Repair, Restoration and Strengthening of Building” (VOLUME 4, ISSUE 3, Mar-2017)
- [4] S.S. Chandar “Rehabilitation of buildings” ISSN: 2278-3652 VOL.5 ISSUE 4 (2014)
- [5] J.M. Sadamate , G.A. Hinge. “Structural Auditing with a Case Study”, (Volume 7, Issue NO. 7)
- [6] Sachin RambhauShelke, Prof. Darshana Ainchwar. “Structural Health Monitoring, Audit and Rehabilitation of Building in Construction Building”, (Vol, 7, Issue 3, March 2018)
- [7] Varinder K. Singh “Structural repair and rehabilitation of (G+8) multi-storied residential building, at ONGC colony at Chandkheda, Ahmedabad, Gujarat” Volume 51, 2013
- [8] Nurul Nadia Omar Bakri and MdAzreeOthumanMydin “General Building Defects Causes, Symptoms and Remedial Work” [DOI: 10.1387/ISSN.2310-0133]:
- [9] B.H Chafekar, O.S. Kadam, K.B. Kale, S. R. Mohite, P.A. Shinde, V.P. Koyle,” Structural Audit”, International Journal of Civil and Structural Engineering Research (IJCSER) Vol.1, Issue 1, pp (42-46), Month: October 2013- March 2014.
- [10] “Structural Audit of RCC Building”, Sanket Sanjay Suryawanshi, Vaibhav Vishnu Vishe, Deepak Premchand Sah, Reetika Sharan



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Impact Factor: 8.118



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