

# A Review on “Structural Audit of Residential Building

Gourav Sanjay Shinde<sup>1</sup>, Dr.S.J.Arwikar<sup>2</sup>

<sup>1</sup> PG Student, Civil department, Annasaheb Dange College Of Engineering and Technology, Ashta, Sangli, Maharashtra, India

<sup>2</sup> Prof. & Head of Department ,Civil department, Annasaheb Dange College Of Engineering and Technology, Ashta, Sangli, Maharashtra, India

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**Abstract** - This review paper covers the study of Structural Auditing of Residential Building .Now a days structural Auditing is necessary because of poor quality of construction , carelessness in supervision during construction ,use of poor quality of materials, carelessness by labours during work because of such reasons the quality of the building goes down and then automatically life of the building goes down.Now a days life of the building comes 60 years from 100 years because of such reasons we need to do Structural Auditing of the building after 15 years to check whether it is safe or not if not then remedial measures to be provided . Now while performing the audit of a residential building and we will conduct non destructive testing on this building like Rebound hammer and ultrasonic Pulse velocity meter test after getting test results we will decide the building is safe or not and if it is not safe then remedial measures will be provided to increase life of the building.

**Key Words:** Structural Audit, NDT Methods, Structural Engineering, Rehabilitation.

## 1. INTRODUCTION

In India there are many old buildings which have reduced strength in due course of time. If further use of such deteriorated structure is continued it may endanger the lives of the occupants and surrounding habitation. Appropriate actions should then be implemented to improve the performance of structures and restore the desired function of structures. Thus, it is utmost important to perform structural audit of existing buildings and to implement maintenance/ repair work timely which will lead to prolonged life of the building and safety of the occupant.

To act more responsible and preemptive towards the dilapidated buildings, the municipal corporation must issue notices to the buildings and co-operative societies which are more than 30 years old to carry out mandatory structural audit and submit the audit report. Structural audit should highlight and investigate all critical areas and recommend immediate remedial and preventive measures.

### 1.1 About Structural Audit

Structural Audit is nothing but health check up of the building to know building.After knowing the real condition

of the building we give remedial measures to increase service life of the building.

### 1.2 Need Of Structural Audit

1. Increase life of the building.
2. To save life of lives in the building.
3. To find damaged area of the building and to repair it immediately.
4. To know the real condition of the building whether it is safe for dwelling or not.

## 2. Instruments

### 2.1 Ultrasonic Pulse Velocity

Ultrasonic testing of concrete or ultrasonic pulse velocity test on concrete is a non-destructive test to assess the homogeneity and integrity of concrete. With this ultrasonic test on concrete, following can be assessed:

1. Qualitative assessment of strength of concrete, its gradation in different locations of structural members and plotting the same.
2. Any discontinuity in cross section like cracks, cover concrete delamination etc.
- 3 Depth of surface cracks.

The pulse velocity in concrete may be influenced by:

1. Path length
2. Lateral dimension of the specimen tested
3. Presence of reinforcement steel
4. Moisture content of the concrete

Concrete Quality based on Ultrasonic Pulse Velocity Test

PULSE VELOCITY	CONCRETE QUALITY
>4.0 km/s	Very good to excellent
3.5 – 4.0 km/s	Good to very good, slight porosity may exist
3.0 – 3.5 km/s	Satisfactory but loss of integrity is suspected
<3.0 km/s	Poor and los of integrity exist.

## 2.2 Rebound Hammer

Rebound Hammer test is a Non-destructive testing method of concrete which provide a convenient and rapid indication of the compressive strength of the concrete. The rebound hammer is also called as Schmidt hammer that consist of a spring controlled mass that slides on a plunger within a tubular housing.

### Objective of Rebound Hammer Test

As per the Indian code IS: 13311(2)-1992, the rebound hammer test have the following objectives:

- 1.To determine the compressive strength of the concrete by relating the rebound index and the compressive strength
- 2.To assess the uniformity of the concrete
- 3.To assess the quality of the concrete based on the standard specifications
- 4.To relate one concrete element with other in terms of quality

## 3. LITERATURE REVIEW

**Rajendra P. Srivastava et.al.(1) (1999)** -This article performs two types of analysis using Dempster-Shafer theory of belief functions for evidential reasoning. The first analysis deals with the impact of the structure of audit evidence on the overall belief at each variable in the network, variables being the account balance to be audited, the related transaction streams, and the associated audit objectives. The second analysis deals with the impact of the relationship (logical "and" and "algebraic relationship") among various variables in the network on the overall belief. For our first analysis, we change the evidential structure from a network to a tree and determine its impact.

**Constantinos A. Balaras et.al.(2) (2005)** – A total of 349 residential building audits were performed in seven European countries to collect data on the degradation of building elements (architectural and installations). The

buildings cover typical architectural typologies, sizes, constructions and installations, at different states of deterioration. The data was collected based on a standardized methodology for building audits. Follow up analysis revealed the most important influencing factors on the deterioration of existing residential buildings throughout Europe and estimated service lives of various building architectural elements and electromechanical installation.

**B.H Chafekar et. al.(3) (2013-14)** - Before going in detail about the structural audit is necessary to know about the structure. A structure is a system of inter connected elements to carry loads safely to underground earth. The health examination of concrete building called as structural audit. The author shows different methods in paper:

**A.B. Mahadik et.al.(4) (2014)** -This paper deals to create awareness amongst the civil engineers, residents and owners of building towards the health examination of existing concrete buildings called as Structural Audit. The need of structural audit is for maintenance and repairs of existing structures whose life has exceeded the age of 30 years to avoid any mishaps and save valuable human life. The concrete is widely used as construction material being inexpensive, easy for construction, applications and because of it high strength-cost ratio. More than ever, the construction industry is concerned with improving the social, economic and environmental parameters of sustainability. In India, from 1980 onwards the infrastructure industry witnessed stepping up of public investment and growth in infrastructure industry which results in construction of new multistories concrete apartments which are now in the age of thirty plus years. There are many buildings during this period and earlier have reduced strength in due course of time because of structural deficiency, material deterioration, unexpected over loadings or physical damage. If, further use of such deteriorated structure is continued it may endanger the lives of occupants and surrounding habitation. There is demand of appropriate actions and measures for all such building structures to improve its performance and restore the desired functions of structures which may leads to increase its functional life

**Francesca Ceronia(5) (2015)** - A synergic approach for the investigations of the historical building performances - with reference to both the structural behavior and the energy performances for the space heating and cooling - is presented. The historical masonry building “Palazzo Bosco Lucarelli”, located in Benevento, has been chosen as case study. The structural and energy analyses are carried out in parallel, especially during the identification of the building characteristics through tests and surveys in-situ. For the structural analysis - beyond examinations on materials – some dynamic tests have been used for better assessing a numerical Finite Element model necessary for the verification of the structure safety. Moreover, being

necessary a structural refurbishment, also an energy retrofit could be realized. A rigorous evaluation procedure - aimed to guarantee the necessary reliability of numerical predictions - is performed in order to verify the technical and economical convenience of various energy retrofit solutions.

**Mohammad Ismail(6) (2016)** - The paper presents research findings on the deteriorating conditions of abandoned residential projects due to environmental factors of degradations. Sampling was made from two hundred and sixty-one abandoned housing projects. Structural degradations associated with the uncompleted buildings were studied. In a similar manner, a small-scale reinforced concrete structure was erected in an open and critically monitored for defects caused by environmental factors of degradations. The selected uncompleted buildings were assessed for surface salt deposits, crack formations and reinforcement corrosion. However, the small-scale structure was evaluated for performance degradations through destructive and non-destructive strength tests, steel tensile strength test and corrosion test. Results show that there is an alarming decrease in structural integrity and durability functions in abandoned reinforced concrete buildings with time. Eventually, performance-depreciation versus age graph was developed for assessing life-span limit beyond which unacceptable mechanical properties are eminent. Based on the surrounding exposure conditions, an abandoned reinforced concrete building could fail to perform acceptable designed strength functions within a period of twelve (12) years.

**J. Bhattacharjee(7) (2016)** -The construction material mainly reinforced concrete is being used extensively for various types of construction projects. However, the deterioration of Reinforced Concrete structures is recognized as a major problem worldwide. Apart from requiring regular maintenance, many structures require extensive Repair, Rehabilitation &Retrofitting. Over a period of time, as these structures become older, we find in them certain degradation or deterioration with resultant distress manifested in the form of cracking, splitting, delaminating, corrosion etc. Such deteriorated structures can be rehabilitated and retrofitted by using various types of admixtures & modern repair materials. The paper brings out the present state of concrete structures & the major areas where improvement is needed during its service life stage for sustainable development & also the method of carrying out Repair, Rehabilitation &Retrofitting. This has been brought in details in the paper along with Case studies, where the Author of the paper was directly involved in planning and execution of the jobs.

**Swapnil U Biraris(8) (2017)** - Structural audit is an overall health and performance check-up of buildings .It is important to the building to check their safety and they have no risk. It is process of analyses of building And this process

suggest a appropriate repairs and retrofitting measures required for the buildings to perform better in its service life structural audit is an important tool for knowing the real health status of the old buildings.

#### 4. OBJECTIVES

- To study the types of structural defects.
- To identify any signs of material deterioration.
- To identify any signs of structural distress and deformation.
- To identify any alteration and addition in the structure.
- Remedies for the restoration of the structure.

#### 4. METHODOLOGY

An old building of age in the range of 30 to 40 years will be selected. The research methodology will be consist as follow

1. Performing preliminary inspection of the residential building.
2. Preparation of architectural, structural plan of the residential building.
3. Visual inspection to highlight critical area.
4. Performance of NDT tests.
5. Finding actual strength of the building.
6. Suggesting remedial measures.

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