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Structural Audit on RCC Residential Building

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Abstract - In India, we come across many old building demanding major repairs or go early in to a state of dilapidation condition to make them unfit for occupation. Regardless of improvements in construction materials and advance techniques, several concrete structures still fail prematurely, leading to costly and time-consuming repairs. Seismic evaluation of structures requires obtaining first-hand information regarding the current condition survey. The structural audit of an existing building subject to gravity. Analysis of existing building with real time inputs for seismic evaluation of a reinforced concrete building. Examine documentation, Visual examination, Field testing, Laboratory testing, Structural analysis. Determination of capacity of the same. The structural stability of the building and the service life of the building concludes by this report. The design and analysis of the building is carried out by using structural analysis and design software Staad Pro.

Key Words: structural audit, structural analysis and staad Pro.

1.INTRODUCTION

We come across many old buildings needing major repairs or go early in to a state of dilapidation condition to make them unfit for occupation. Regardless of improvements in construction materials and advanced techniques, several concrete structures still fail prematurely, leading to costly and time-consuming repairs. Seismic evaluation of structures requires obtaining information regarding the current condition of structure through a thorough condition survey. Such condition survey involves non-destructive and semi destructive tests to obtain the strength and other properties of concrete and condition of reinforcement. Material properties and state of degradation can be known through condition assessment. Structural audit should highlight and investigate all critical areas and recommend immediate remedial and preventive measures. We study the different parameter of structural audit including visual inspection, non-destructive testing. It also emphasizes on different repairs and retrofitting measures to be used for buildings after structural audit.

1.1 Object of Project

- Performing preliminary inspection of the building.
- Preparation of architectural, structural plan of the building.
- Visual inspection to highlight critical area.
- Performance of NDT tests.
- Finding actual strength of the building.
- Suggesting remedial measures

2 . Methodology

2.1 Introduction

In order to carry out structural audit old RCC building is selected of age around 35 years.

Steps involved in structural audit carried out is as follows:

Step 1: Conformance of structure to original design

Step 2: Inspection for presence of degradation

Step 3: Laboratory testing

Step 4: Degradation assessment

Step 5: Structural reanalysis for current conditions

Step 6: Nondestructive Tests

3 NON DESTRUCTIVE TESTIING

Non-destructive Testing method are the method of testing in which properties of material or condition of the material is determined without damaging or making changes in the object. This methods of testing allows to test the material or component without losing its usefulness .NDT method helps in testing integrity of concrete or structural members throughout its life span. Once the NDT tests is performed it is possible to re-test the structure or the object. NDT tests are applicable in testing the condition of the bridges, highways, building ect. NDT allows users to determine following properties of the object.

- Strength properties at site
- Durability
- Density
- Moisture content

- Elastic properties

Extent of visible cracks

3.1 TEST CARRIED OUT FOR STRUCTURAL AUDIT OF BUILDING

1. Rebound Hammer Test
2. Half-cell Potentiometer
3. Chemical Tests

3.2 Rebound Hammer

Application of rebound hammer test:

1. For determination of the compressive strength of the concrete
2. Determine uniformity of the concrete.
3. Determine quality of the concrete.

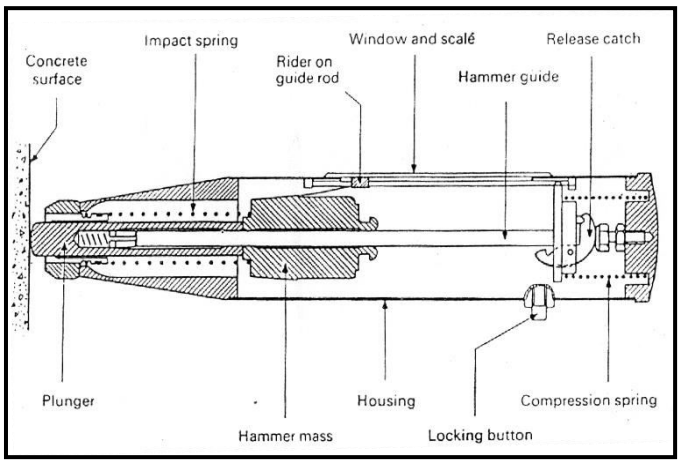

Fig 3.1: Components of Rebound hammer test

Method of testing:

1. Prepare the instrument for the test,remove the plunger from lock position by pushing the plunger on the surface and push it slowly against the surface.
2. Hold the plunger perpendicular to the testing surface.
3. As the body is pushed, the main spring connecting the hammer mass to the body is stretched. When the body is pushed to the limit, the latch is automatically released and the energy stored in the spring propels the hammer mass towards the plunger tip. The mass impacts the shoulder of the plunger rod and rebounds.
4. This rebound distance is measured on the graduated scale and is termed as rebound number.

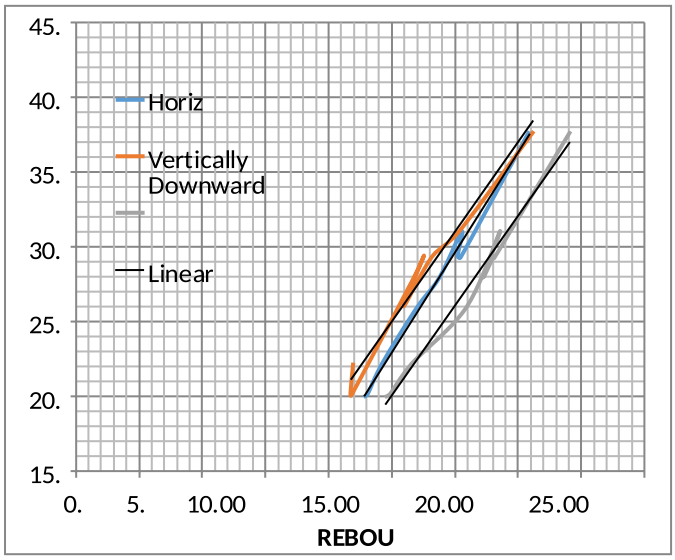

Fig. 3.2: Calibration curve for Rebound hammer

Tabel 3.1: Relative compressive strength of structural element

Sr No.	Structural Element	Relative Compressive Strength (MPa)	
1	Beams on 1st floor	20.54	21.28 MPa
2	Beams on Ground floor	22.02	
3	Columns on 1ST Floor	17.48	17.45 MPa
4	Columns on Ground Floor	17.42	

3.3 Half-cell Potentiometer

Fundamental principle: The method of half-cell potential measurements normally involves measuring the potential of an embedded reinforcing bar relative to a reference half-cell placed on the concrete surface. The half-cell is usually a copper or copper sulphate or silver or silver chloride cell but other combinations are used. The concrete functions as an electrolyte and the risk of corrosion of the reinforcement in the immediate region of the test location may be related empirically to the measured potential difference.

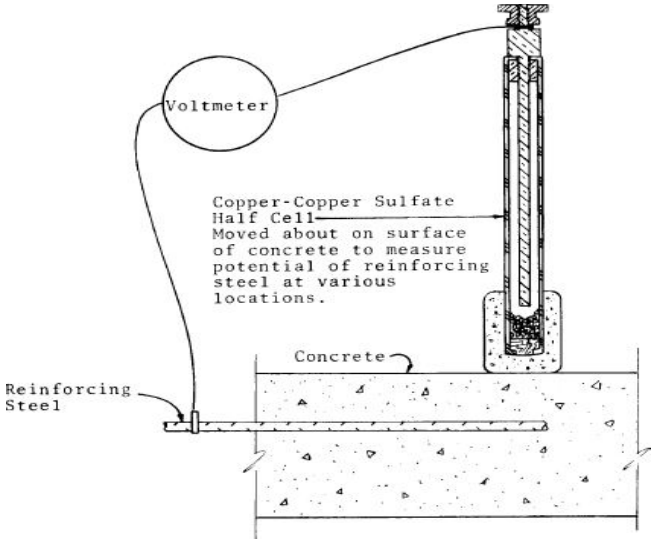

Fig. 3.3: Procedure for Half-cell Potential Test

Tabel 3.2: Risk of corrosion against the potential; difference readings

Potential difference levels (mV)	Chance of re-bar being corroded
less than -500	visible evidence of corrosion
-350 to -500	95%
-200 to -350	50%
More than -200	50%

Table 3.3: Overall summary of half-cell potential test

Sr NO	Elements	Avg. Half-cell potential	Conclusion
1	Beams of 1st floor	-93.75mV	Probability of reinforcement corrosion is < 5 %
2	Beams of G.F	-65.68mV	
3	Columns of G.f	-127.26mV	

4 CONCLUSION

1 The condition of a Building is quite normal only the following problem seen, Growth of plant on exposed reinforcement, Minor cracking found in some external walls, Dampness found near pipes.

2 The rebound hammer test given the relative compressive strength of a concrete is 21.28 Mpa for beam that is 14.88 % and 17.45 Mpa for column that is 30.2 % reduced with respect to M25 grade of concrete.

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