



Assessment of Building by Non-Destructive Test

Prof. Sanket Kalamkar^{1*}, Siddhey Phatkar², Dhanshree Sawarkar³, Sejal Bhojar⁴

Abstract

Usefulness of the concrete structure is very important aspect in the life cycle of structure besides the strength of structure. To prevent the deterioration of the structure and maintain the structure in good condition for a long run, Non-Destructive Testing (NDT) have been evaluated for more than 3 decades. Now a day, NDT helps in monitoring and inspecting the civil structure. There are several methods of non-destructive testing (NDT) but this paper reviews the most common Non-destructive methods. They are Ultrasonic Pulse Velocity Test and Rebound Hammer test. These methods are being performed according to its potential and limitation at the site where the basement gets filled up with water numerous times. The aim of this work was to determine and conclude the condition of the structure.

Keywords: - NDT, Rebound Hammer, Ultra Sonic Pulse velocity

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I. INTRODUCTION

The requirement of testing and technology such that due to which no harm made to the existing structure. This gives birth to the invention of nondestructive test also known as NDT. This invention of test made possible the ease of testing the old structure without disturbing or damaging the existing condition of the structures. Due to nondestructive testing of structures lot maintenance cost is reduced. The solution of the testing gives the better solution to the problems of the old structures. This testing is not only done on structures but also done on materials as well as on the equipment's. Therefore, the development of such technology is very beneficial to our construction industry. It is just a matter of time that building reduces its strength as time passes. In India as a developing country there are many such buildings with less strength. As if we continue using such structures it may lead to serious life or property damage. So, considering such scenarios structural audit plays an important role in identifying such hazards before time.

The aim of this work to present Condition Assessment and Structural Audit of Gokulpeth Market NIT Building at Nagpur (Maharashtra)

structural audit plays an important role in identifying such hazards before time. with various NDT like Ultrasonic Pulse Velocity Test, Rebound Hammer Assessment of structural stability and safety for remaining life through testing, half-cell testing, pH testing including visual inspection, and problem diagnosis and root cause diagnosis with corrective action..



Figure 1: Old Market Building

II. Methodology

1. Architectural and structural drawing studies, design criteria for existing structures
2. Visual inspection

***Corresponding Author:** - Prof. Sanket Kalamkar

Address: ^{1*}Assistant Professor, Civil Engineering Department, (YCCE), Nagpur,

²B.E. UG Student, Civil Engineering Department, Yeshwantrao Chavan College of Engineering (YCCE), Nagpur

³B.E. UG Student, Civil Engineering Department, Yeshwantrao Chavan College of Engineering (YCCE), Nagpur

⁴B.E. UG Student, Civil Engineering Department, Yeshwantrao Chavan College of Engineering (YCCE), Nagpur

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3. Non-destructive tests such as impact velocity and hammer tests.

**• NON-DESTRUCTIVE TESTING
 ULTRASONIC PULSE VELOCITY**

This pulse velocity test examination technique has the resolution of the velocity of an ultrasonic pulse inside the body of solid material. The speed by which these pulses transfer through the structure of material was dependent on the property as well as elasticity of a material.

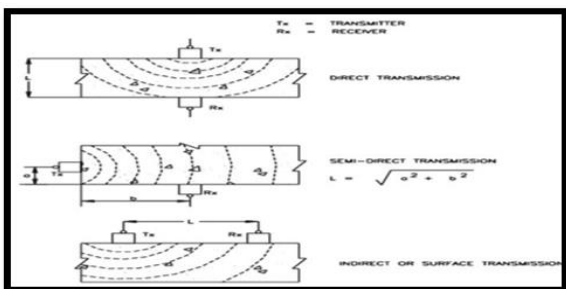


Figure 2: Types of Testing

The time required for the first part of the pulse to travel from the surface of the material and reach the receiver of the instrument. According to IS 13311:1992, ultrasonic pulse velocities above 4.5 km/s are considered good. A speed of 3.5 to 4.5 km/s is considered good. Between 3.0 and 3.5 km/s is considered average and below 3 km/s is considered questionable.

➤ REBOUND HAMMER TEST

1. This test is a non-destructive concrete test that provides a simple and fast indication of the compressive strength of concrete. A rebound hammer consists of a controlled mass spring that slides on a piston inside a tubular body.
2. Check the compressive strength of concrete by relating the restitution index to the compressive strength.
3. Check whether the concrete is evenly distributed. Based on the standard specification to examine the properties of concrete.
4. To co-related concrete elements with one another in consideration of quality

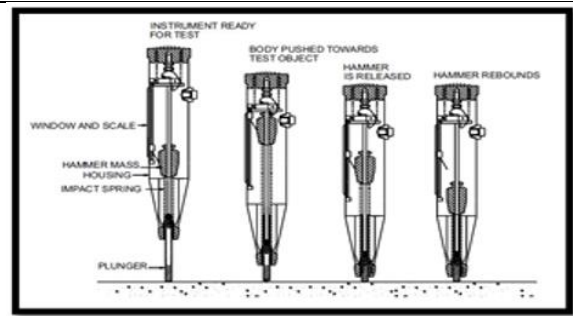


Figure 3: As per IS 13311 Part II

Table 1: Rebound Number with probable compressive strength

MEAN REBOUND	CONDITION OF CONCRETE
>40	Excellent
30-40	GOOD
20-30	FAIR
<20	POOR/OR DELAMINATED

**CONDITION ASSESSMENT IS DONE
 ACCORDING TO FOLLOWING CODES**

References of I.S. code and A.C.I. codes

Table 2: IS and ACI codes for the nondestructive tests

Sr. No.	Title	Codes
1	Concrete nondestructive testing is a type of nondestructive testing	IS 13311-1992-part 1 & IS 13311
2	hammer Schmidt	Part II
3	Rules of conduct for reinforced concrete	IS 456-2000
4	Concrete-strengthening-testing-methods	IS 516-1959
5	ACI committee 437 has completed a report on the strength of existing concrete structures.	ACI-437R-91
6	ACI committee 364 has published a guide for evaluating concrete structures prior to restoration.	ACI-364 1R-94
7	pH level	B.S. 5741-1991
8	Part I of a ACI committee's report on metal corrosion in concrete	ACI-222R-89

IV. VISUAL OBSERVATION OF GOKULPETH MARKET

After visual observation in the building. Critical levels are determined based on the following table. This technique helps to correctly classify buildings according to structural damage.

Table 3: Level of criticality

Sr.no	Level of criticality	No of locations
1	HIGH	159
2	MEDIUM	11
3	LOW	2

All visual observations were made and photographs were taken during structural testing of the building. is taken





Figure 5: Reinforcement exposed and concrete damage

Location: -Grid 27 to 29 CD back passage in front of stair slab
 Observation: -Reinforcement exposed, concrete damage, crack observed.
 Level of criticality: - High
 Remedial Measures: - Dilapidated Condition



Figure 6: Seepage in wall

Location: -Grid 8-9 BC wall between B7 to B9
 Observation: -Seepage
 Level of criticality: - High
 Remedial Measures: - Dilapidated Condition



Figure 7: Vegetation Growth on structure

Location: -Wall between 18AB
 Observation: -Vegetation Growth
 Level of criticality high
 Remedial Measures: - Dilapidated Condition

REBOUND HAMMMER

A rebound hammer test is used to find out one of the most important parameters of a

structure. This test is used to determine the estimated compressive strength (mpa) of a structure. Test results are displayed in table 4 below.

Table 4: Rebound Hammer test findings

Sr. No	Location	Average	Probable compressive strength (mpa)
1.	C19	22.2	14
2.	C23	23.66	16
3	C25	25.11	18

ULTRASONIC PULSE VELOCITY TEST

Ultrasonic pulse velocity testing is used to examine structural integrity. This test is used to determine the quality of construction materials. The test results are shown in Table 5 below..

Table 5: Pulse velocity test findings

Sr. no.	Description	Particulars	Transit time	Path length	Velocity	Factored value of UPV
1.	C7	Indirect	123.8	200	1.62	2.62
		Indirect	110.5	200	1.81	2.81
		Indirect	98.2	200	2.04	3.04
		Indirect	133	200	1.50	2.50

CONCLUSION

After visual inspection, we concluded that an NDT test was required. We performed an impulse speed test and a hammer test, but the results of these tests are not satisfactory. Therefore, more of his NDT tests such as pH test, half cell test and coverage meter should be performed. This test provides information on the structural condition of the building.

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