7th National Conference on
"Role of Engineers in Nation Building" organized by VIVA Institute of Technology, Mumbai
(1st and 2nd March 2019)
International Journal of Engineering Research & Science (IJOER)
ISBN: [978-93-5321-411-1] ISSN: [2395-6992] [Vol-5, Issue-3, March- 2019]

# Study of Structural Audit for Health Performance

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***Abstract -*** *Structural audit is the technical survey of the building in order to check its strength and stability. Structural audit is the first step in repairing procedure of the building. Structural audit is generally recommended for older buildings. Structural audit was first introduced by Indian society of structural engineers. Structural audit helps in improving the safety, efficiency and gives idea about the strength of the structure by detailed technical inspection. In present study attempt have been made to carry out structural audit of the old RCC building by carrying out site inspection, performing NDT on the structure. Building is modeled and analyzed using ETABS and Demand to capacity ratio is determined. After checking strength and stability of the structural members suitable recommendations are given in order to retrofit unsafe structural component. Finally structural audit report is prepared for the building.*

***Keywords - Structural audit, NON-Destructive testing, Structural plan, Demand to capacity ratio, Repair and retrofit.***

## I. INTRODUCTION

Structural audit is the overall health and performance checkup of the building like doctor check the patient. It will helps to understand the status of the old building. The Audit helps to highlight and investigate all the risk areas, critical areas and whether the building needs immediate attention. It cover the structural analysis of the existing frame and highlight the weak structural areas for static, wind and earthquake loads.

Non-destructive testing (NDT) methods are techniques used to obtain information about the properties or internal condition of an object without damaging the object. Non-destructive testing is a descriptive term used for the examination of materials and components in such way that it allows materials to be examined without changing or destroying their usefulness. NDT is a quality assurance management tool which can give impressive results when used correctly. It requires an understanding of the various method available, their capabilities and limitations, knowledge of the relevant standards and specifications for performing the tests. NDT techniques can be used to monitor the integrity of the item or structural throughout its design life.

### 1.1 Need For Structural Audit -

Structural audit is carried out in order to

- To increase life of property
- To know the health of building and its expected life'
- To check actual realiability of the structure.
- In order to recommend rehabilitation techniques.
- For structural audit certificate required by municipality and other authorities.

### 1.2 Objective of Project -

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

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## II. METHODOLOGY

The various Non-destructive / Partial destructive tests areas below.

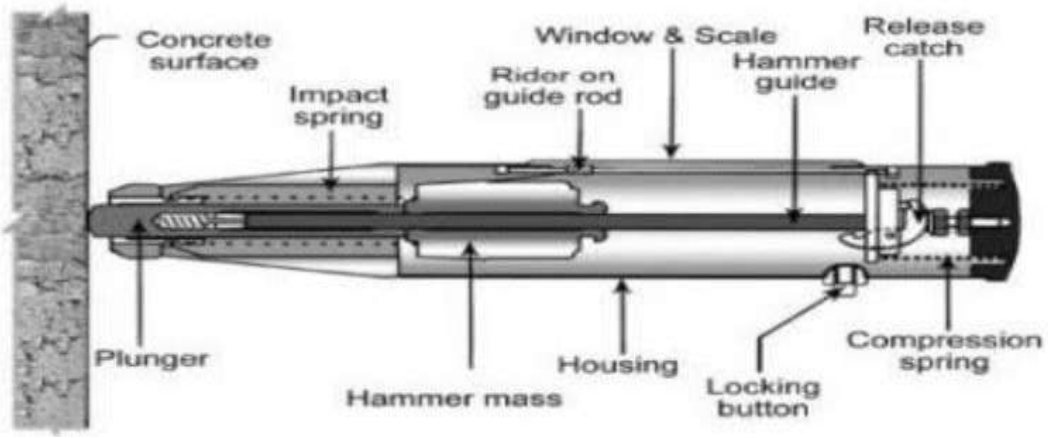
- Rebound Hammer Test
- Ultrasonic Pulse Velocity
- Magnetic Particle Inspection
- Dye Penetrate Test
- Ultrasonic Flaw Detention
- Eddy Current
- Radioactive Method

### 2.1 Rebound hammer test

- For determination of the compressive strength of the concrete.
- Determine uniformity of the concrete.
- Determine quality of the concrete.

Method of Testing

- 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.
- Hold the plunger perpendicular to the testing surface.
- 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.
- This rebound distance is measured on the graduated scale and is termed as rebound number.




### 2.2 Ultra Sonic Pulse Velocity

This is one of the most commonly used method in which the ultrasonic pulses are generated by electro-acoustical transducer are transmitted through the concrete. In solids, the particles can oscillate along the direction of sound propagation as longitudinal wave s or the oscillations can be perpendicular to the direction of sound waves as transverse wave.

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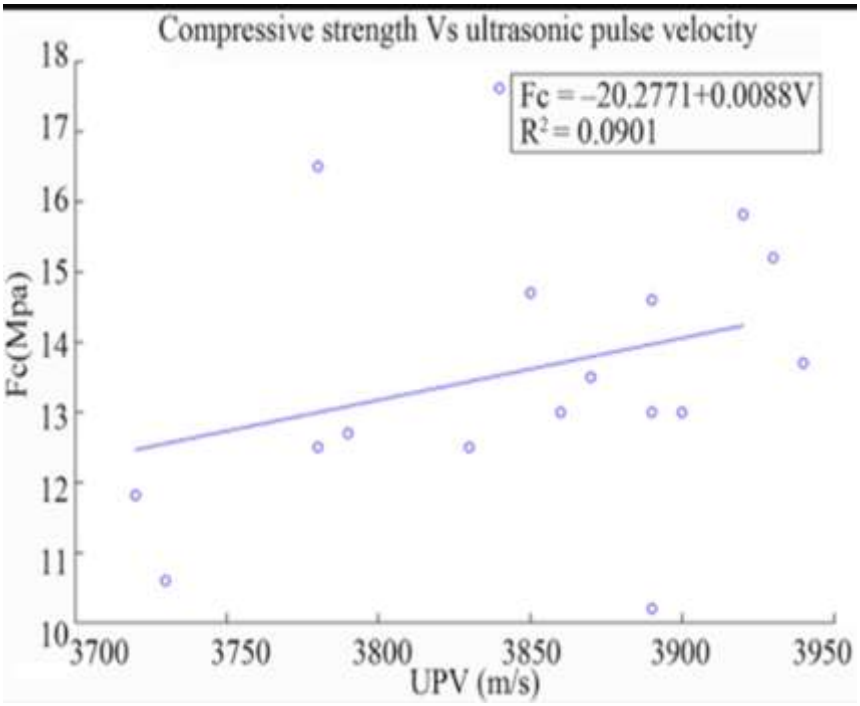


### 2.3 Dye Penetrate test

Penetrant solution is applied to the surface of a precleaned component. The liquid is pulled into surface-breaking defects by capillary action. Excess penetrant material is carefully cleaned from the surface. A developer is applied to pull the trapped penetrant back to the surface where it is spread out and forms an indication. The indication is much easier to see than the actual defect.

Used to locate cracks, porosity, and other defects that break the surface of a material and have enough volume to trap and hold the penetrant material. Liquid penetrant testing is used to inspect large areas very efficiently and will work on most nonporous materials.

Large surface areas or large volumes of parts/materials can be inspected rapid land at low cost.Parts with complex geometry are routinely inspected Indications are produced directly on surface of the part providing a visual image of the discontinuity .Equipment investment is minimal.

### 2.4 Magnetic particle testing

A magnetic field is established in a component made from ferromagnetic material. The magnetic lines of force travel through the material, and exit and reenter the material at the poles. Defects such as crack or voids cannot support as much flux, and force some of the flux outside of the part. Magnetic particles distributed over the component will be attracted to areas of flux leakage and produce a visible indication.

Used to inspect ferromagnetic materials (those that can be magnetized) for defects that result in a transition in the magnetic permeability of a material. Magnetic particle inspection can detect surface and near surface defects.

Large surface areas of complex parts can be inspected rapidly. Can detect surface and subsurface flaws. Surface preparation is less critical than it is in penetrant inspection. Magnetic particle indications are produced directly on the surface of the platform an image of the discontinuity. Equipment costs are relatively low.

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### 2.5 Ultrasonic Flaw Testing

High frequency sound waves are sent into a material by use of a transducer. The sound waves travel through the material and are received by the same transducer or a second transducer. The amount of energy transmitted or received and the time the energy is received are analyzed to determine the presence of flaws. Changes in material thickness, and changes in material properties can also be measured.

Used to locate surface and subsurface defects in many materials including metals, plastics, and wood. Ultrasonic inspection is also used to measure the thickness of materials and otherwise characterize properties of material based on sound velocity and attenuation measurements.

Depth of penetration for flaw detection or measurement is superior to other methods.Only single sided access is required.Provides distance information.Minimum part preparation is required.Method can be used for much more than just flaw detection'

### 2.6 Eddy Current Test

Alternating electrical current is passed through a coil producing a magnetic field. When the coil is placed near a conductive material, the changing magnetic field induces current flow in the material. These currents travel in closed loops and are called eddy currents. Eddy currents produce their own magnetic field that can be measured and used to find flaws and characterize conductivity, permeability, and dimension, Used to detect surface and near-surface flaws in conductive materials, such as the metals. Eddy current inspection is also used to sort materials based on electrical conductivity and magnetic permeability, and measures the thickness of thin sheets of metal and nonconductive coatings such as paintsional features.

Used to detect surface and near-surface flaws in conductive materials, such as the metals. Eddy current inspection is also used to sort materials based on electrical conductivity and magnetic permeability, and measures the thickness of thin sheets of metal and nonconductive coatings such as paint.

Detects surface and near surface defects. Test probe does not need to contact the part. Method can be used for more than flaw detection.Minimum part preparation is required.

### 2.7 Radioacive Test

X-rays are used to produce images of objects using film or other detector that is sensitive to radiation. The test object is placed between the radiation source and detector. The thickness and the density of the material that X-rays must penetrate affects the amount of radiation reaching the detector. This variation in radiation produces an image on the detector that often shows internal features of the test object.

Used to inspect almost any material for surface and subsurface defects. X-rays can also be used to locates and measures internal features, confirm the location of hidden parts in an assembly, and to measure thickness of materials.Can be used to inspect virtually all materials.

Detects surface and subsurface defects.Ability to inspect complex shapes and multi-layered structures without disassembly .Minimum part preparation is required.

## III. CONCLUSION

The paper has presented a combined approach of study of repair and maintainace of building by using a different NDT test without damaging the any part of the building structure.Non-destructive testing (NDT) methods are techniques used to obtain information about the properties or internal condition of an object without damaging the object. Non-destructive testing is a descriptive term used for the examination of materials and components in such way that it allows materials to be examined without changing or destroying their usefulness. NDT is a quality assurance management tool which can give impressive results when used correctly. It requires an understanding of the various method available, their capabilities and limitations, knowledge of

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the relevant standards and specifications for performing the tests. NDT techniques can be used to monitor the integrity of the item or structural throughout its design life.

We have recently contacted DharmeshGawade consultancy who has a good experience In repair and maintenance of building.We are going to visit the sites under his guidance and get the reports and results Of various NDT test.

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