Parametric Evolution of Structural Member using NDT

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Abstract— Non-dangerous testing (NDT) is the way toward reviewing, testing, or assessing materials, segments or gatherings for discontinuities, or contrasts in qualities without annihilating the serviceability of the part or framework. As it were, the point at which the examination or test is finished the part can at present be utilized. As opposed to NDT, different tests are ruinous in nature and are in this manner done on a predetermined number of tests ("part examining"), as opposed to on the materials, segments or congregations really being put into benefit. These ruinous tests are frequently used to decide the physical properties of materials, for example, affect protection, flexibility, yield and extreme rigidity, crack durability and exhaustion quality, yet discontinuities and contrasts in material attributes are all the more adequately found by NDT. In our venture we will utilize different NDT technique to survey the qualities of different individuals from the confined structure. For this we used the accompanying strategies for NDT: - Schmidt's Rebound Hammer test, Ultrasonic Pulse Velocity technique, Impact Echo Test. we are going to perform tests on one of the building which is too old and most of the part of the structure are damage and there are also so many cracks in that structure so we will study different types of damages and also we will study plastering effects on various NDT.

Key words: NDT, Nuclear Method, Penetration Technique, Radiographic Testing

I. INTRODUCTION

Non-Destructive Testing consists mainly of techniques which are utilized to assess certain physical or chemical characteristics of a material without disturbing or damaging the parent material. These Non Destructive Testing (NDT) methods have a great technical and useful importance for testing of concrete in the structure. Traditional testing of concrete involved crushing of concrete cube specimens which were casted simultaneously along with the member. These provided us with the ultimate strength of the cube specimen and not necessarily of the concrete that was present in the structural member. These variations may occur because of different factors like:-

- Difference in the method of casting
- Non-uniform curing of the actual structural member
- Chances of arising of doubt with regards to the material in the cube specimen

To get around these problems various techniques were developed which are now known as Non-Destructive Tests or NDT's. They are basically categorized into two groups,

1) Tests that assess the on-site strength of concrete.
2) Tests that determine some other related characteristics of the concrete such as-flaws, voids, cracks and deterioration which may be present inside the concrete member.

II. ADVANTAGES OF NON-DESTRUCTIVE TESTING

The NDT of concrete has a very much importance in technical and other field. The main advantage of NDT is that it avoids the concrete damage or doesn't hinder the performance of building and its components. This is very simple and quick method of testing. Results of test are made available on site which leads to better time efficiency as compared to traditional methods of testing concrete.

It is highly precious technique that can save both time & money in troubleshooting product, evaluation, and research. By testing concrete cubes in compression strength of hardened concrete is determined, but the quality of entire concrete structure can't be fully determined by only testing a some concrete cubes. In this case NDT comes as quite effective method for assessing the strength of concrete in the entire structure without any additional cost incurred.

III. VARIOUS NDT METHODS

There are various methods of NDT developed for concrete:-

A. Penetration Technique

Calculation of hardness by testing procedure was right off the bat detailed amid 1954. Amid 1964-1966 a procedure known as Windsor test was created for testing concrete in research center and in-situ. A hardness analyzer of the surface of the solid is Windsor test. Windsor Probe is infiltration protection estimation hardware, which comprises of an explosive impelled driver, solidified composite of test, stacked cartridges, a profundity measure and different embellishments. In this system a black powder incited driver is utilized to flame a solidified amalgam test into the solid. Amid testing, it is the uncovered length of test which is estimated by an alignment profundity measure. In any case, it is desirable over express the coefficient of variety as far as profundity of infiltration as the principal connection is between solid quality and entrance profundity.

Fig. 1: Showing Windsor Probe Apparatus[24]

B. Pullout Apparatus

A pull-out test measures, the force required to pull from the concrete a specially shaped steel rod whose enlarged end has been cast into the concrete to a depth of 3 in. (7.6 cm).The

Concrete will be said stronger if force required to pull out is more. The standard way to use pullout test in the field would be to link assemblies in the structure.

The concrete is at the same time in strain and in shear, yet the power required to haul the concrete out can be identified with its compressive quality.

The haul out procedure would thus be able to quantify quantitatively the in-situ quality of concrete when appropriate relationships have been made. It has been found, over an extensive variety of qualities, that haul out qualities have a coefficient of variety equivalent to that of compressive strength.(Fig No 2)

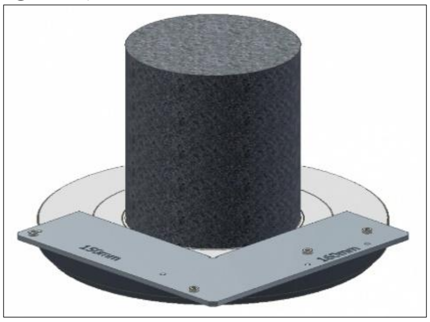

Fig. 2: Showing Pullout Apparatus[17]

C. Nuclear Method

Use of nuclear methods for non-destructive measurement of few properties of concrete is of fresh nativity. Two principle techniques have been reported, namely neutron activation analysis for the determination of cement content and neutron scattering method for determining moisture content of concrete these methods are not appropriate for detecting the strength of concrete. [24]

D. Magnetic Methods

This method includes battery operated magnetic devices that can measure the depth of reinforcement cover in concrete and locate the position of reinforcement bars are now available. In this case only ferromagnetic materials can be inspected. It requires large current for analysing larger parts of structures. After the analysis has been done it is necessary to demagnetize and provide post cleaning treatments. [24] (Fig No:3)

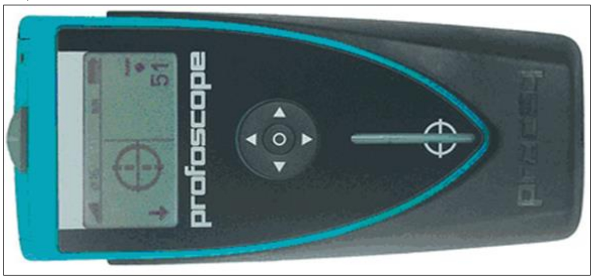

Fig. 3: Showing Profometer Apparatus[24]

E. Radiographic Testing

Radioactive methods of testing concrete can be used to detect the location of reinforcement, measure density and perhaps establish whether honeycombing has occurred in structural concrete units. The equipment is quite simple and running costs are small, although the initial price can be high. Concrete up to 18 in. (45 cm) thick can be examined without difficulty.

It's any two opposite sides of member must be accessible. It also proves to be hazardous to personnel using it due to potential radiation hazard. [24] (Fig No:4)

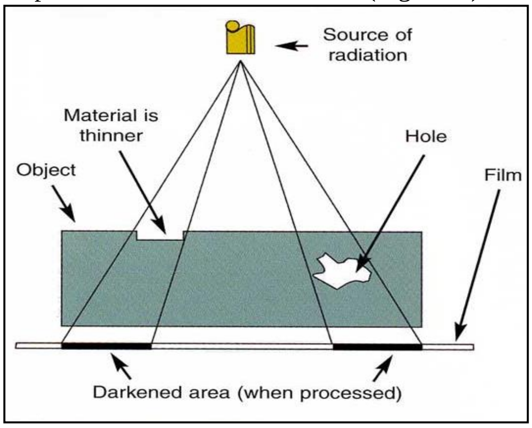

Fig. 4: Showing Radiographic Testing[17]

IV. PROBLEM STATEMENT

To determine the strength cracks widths, voids etc of various structural members of a framed structure using various methods of NDT and finding the life span of structure.

V. OBJECTIVES

1) To study the different type of damages in concrete structure.
2) To detect weak locations, voids, cracks, fractures & honeycomb
3) To minimize the local damage which affect the life span of structures.
4) Assess overall stability of the structure.
5) To assessing the actual condition of reinforcement.
6) To find out the regions in the structure which are of poor quality.
7) To study the effect of plastering on NDT.

VI. STAGES INVOLVED

1) Selection of site
2) Selection of NDT method
3) Actual performance on site

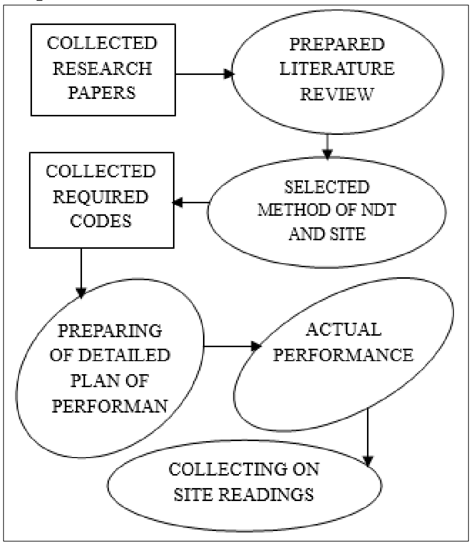

Fig. 5: Showing Flowchart of Processes Involved

VII. Conclusion

We discuss about the various NDT methods their advantages, limitations and the National codes to be used for their result interpretation. So, we decided to integrate different NDT methods which will be a better way to assess the structures providing the assessor with much more accurate and reliable results.

It ought to be noticed that all the NDT techniques in a roundabout way estimate the solid quality and in a large portion of the cases, it is similar. And still, at the end of the day, no single strategy can be said to be completely protected and along these lines, in excess of one technique ought to be performed and results ought to be corresponded.

VIII. Future Scope

To Keep High-level of Structural durability, safety & performance of the infrastructure in each country & regular structure valuation is urgently required.

It can be used in the later stages to determine the strength of the structure in future structural audit.

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