

Structural Integrity Assessment by Destructive Testing and Non-Destructive Testing

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Abstract

Integrity assessment of various components of concrete structures is becoming increasingly important for both economic and safety reasons in Bangladesh context. Non-engineered constructions of buildings are very common in Bangladesh. There are many reinforced concrete (RC) frame buildings which have been constructed without any consideration to resist earthquake forces or without following current code of Earthquake Resistance Design. For such type of seismically deficient buildings, a quick Non-Destructive Testing (NDT) and Destructive Testing (DT) assessment could be a good approach for safety measurement of buildings within considerable cost. Destructive and Non-Destructive tests are widely applied to study the mechanical properties and integrity of concrete structures. In this study, a six (6) storied reinforced cement concrete (RCC) garments factory building was selected and assessed its structural integrity through DT and NDT testing. To evaluate the condition of existing structures against different loading patterns, several destructive and non-destructive tests have been conducted. As non-destructive testing, Ferro-scanner, Rebar detector, Ultrasonic device, rebound hammer have been introduced to assess building vulnerability. As destructive testing, cylindrical specimens (cores) from different structural elements have been collected to determine the compressive strength of the in-situ concrete. The present work deals with DT and NDT on existing structural elements and major findings obtained from the analysis of the surveyed data.

Keywords: RCC; DT; NDT; Ultrasonic Device; Rebound Hammer Test; Structural Integrity; Ferro-Scanner.

INTRODUCTION

Destructive testing (DT) & Non-destructive testing (NDT) of concrete are found to be gaining increasing acceptance as a means of evaluating the strength, uniformity, durability and other properties of existing concrete structures. DT and NDT are widely practiced due to their simple operating system. These tests give more information, less disruptive to occupants and are easier to interpret. NDT is the process of inspecting, testing or evaluating materials and structural components without destroying the serviceability of the part or system. The physical properties of materials such as impact resistance, ductility, yield and ultimate tensile strength, fracture

toughness and fatigue strength are determined by destructive tests, while NDT measures the discontinuities and differences in material characteristics. Modern NDT techniques have a much more reliability to condition assessment of buildings before taking up repair and upgrading work. Non-destructive tests are widely applied to assess the integrity of concrete structures. The tests available for testing concrete range from the completely non-destructive (where there is no damage to the concrete) to partially destructive tests (core tests and pullout and pull off tests) (Jones, 1969). Non-destructive tests and partially destructive tests are widely used to evaluate the strength, surface hardness, surface absorption, and

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Table of Contents Advances In Non Destructive Examination For Structural Integrity

1. Understanding the eBook Advances In Non Destructive Examination For Structural Integrity
 - The Rise of Digital Reading Advances In Non Destructive Examination For Structural Integrity
 - Advantages of eBooks Over Traditional Books
2. Identifying Advances In Non Destructive Examination For Structural Integrity
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Advances In Non Destructive Examination For Structural Integrity
 - User-Friendly Interface
4. Exploring eBook Recommendations from Advances In Non Destructive Examination For Structural Integrity
 - Personalized Recommendations
 - Advances In Non Destructive Examination For Structural Integrity User Reviews and Ratings
 - Advances In Non Destructive Examination For Structural Integrity and Bestseller Lists
5. Accessing Advances In Non Destructive Examination For Structural Integrity Free and Paid eBooks

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- Advances In Non Destructive Examination For Structural Integrity Public Domain eBooks
 - Advances In Non Destructive Examination For Structural Integrity eBook Subscription Services
 - Advances In Non Destructive Examination For Structural Integrity Budget-Friendly Options
6. Navigating Advances In Non Destructive Examination For Structural Integrity eBook Formats
 - ePub, PDF, MOBI, and More
 - Advances In Non Destructive Examination For Structural Integrity Compatibility with Devices
 - Advances In Non Destructive Examination For Structural Integrity Enhanced eBook Features
 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Advances In Non Destructive Examination For Structural Integrity
 - Highlighting and Note-Taking Advances In Non Destructive Examination For Structural Integrity
 - Interactive Elements Advances In Non Destructive Examination For Structural Integrity
 8. Staying Engaged with Advances In Non Destructive Examination For Structural Integrity
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Advances In Non Destructive Examination For Structural Integrity
 9. Balancing eBooks and Physical Books Advances In Non Destructive Examination For Structural Integrity
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Advances In Non Destructive Examination For Structural Integrity
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Advances In Non Destructive Examination For Structural Integrity
 - Setting Reading Goals Advances In Non Destructive Examination For Structural Integrity
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Advances In Non Destructive Examination For Structural Integrity
 - Fact-Checking eBook Content of Advances In Non Destructive Examination For Structural Integrity
 - Distinguishing Credible Sources
 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks
- 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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