

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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processes research advancements and diverse applications across technological and biomedical domains Welding has traditionally been considered more of a skill based proficiency than a technological industrial method The reliance on highly trained human operators along with the high cost and low reproducibility of many welding processes has contributed to this perception Extensive research has now been conducted on the fundamentals of welding processes and while it remains a complex multidisciplinary subject the basic concepts are well understood Advanced Welding Technologies is a comprehensive collection of the processes and applications of advanced welding technologies giving a basic understanding of each process research advancements and their applications in various technological and biomedical domains for improving machining accuracy and quality This volume will extend the possibilities of research in various areas of advanced welding technologies with basic and hybrid approaches making it an easy reference for students and researchers working in this critical field Readers will find the book Covers technologies for successful improvement in advanced processes and the application of advanced welding technologies Serves as a valuable reference to students and researchers involved in working with advanced welding technologies Discusses successful fabrication of multipurpose advanced welding technologies sustainability of advanced welding technologies materials and processes applications of machine learning in advanced welding technologies and future scopes and challenges of advanced welding technologies Audience Engineers welders researchers academics and students involved in advanced welding technologies manufacturing and materials science

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