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## ABSTRACT

The increasing rate of deterioration of concrete structures due to poor construction techniques and quality control has resulted in an increasing demand for non-destructive testing to ascertain the compressive strength and quality of concrete. This is because destructive testing approaches such as core drilling are mainly representative of the areas in the concrete where they have been extracted, while NDT testing can be conducted in many areas on the concrete in order to obtain a true characterisation of the properties of concrete. Therefore, the accuracy of non-destructive test results for estimating the compressive strength and quality of concrete is imperative and has also been a subject of significant scrutiny.

Previous research revealed that numerous factors in the concrete can largely affect the accuracy of NDT results. Hence, a more accurate approach exists in combining NDT methods to improve their reliability to estimate the compressive strength, quality and uniformity of concrete.

The aim of this study was to evaluate reliable combinations of NDT methods for the accurate estimation of the compressive strength and uniformity of concrete. This was achieved through non-destructive testing of two reinforced concrete beams using the Rebound hammer method, Ultrasonic Pulse Velocity and Impact Echo methods before coring and 28 days after coring and repair. Destructive testing was also conducted through drilling of cores from the RC beams and testing for compressive strength, for a comparative analysis between results obtained through non-destructive testing and those obtained through destructive testing, as well as for calibration purposes.

It was found that both the combinations of the Rebound hammer and Ultrasonic Pulse Velocity and the Rebound Hammer and Impact Echo methods are both reliable for estimating the strength of concrete, both results had a closer correlation to the known compressive strength compared to individual methods, before and after calibration.

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