Improving the Reliability of On-site Concrete Strength Estimation with Non-destructive Techniques

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Abstract

The non-destructive assessment of concrete strength in existing structures is a complex issue. While many standards exist addressing the way non-destructive measurements must be carried out, few exist for the strength assessment itself. Many questions remain unanswered, like for instance the reliability of the strength estimation, the possibility of estimating the concrete variability, or the advantages of combining several non-destructive techniques. These problems have been tackled by a recent RILEM committee (TC ISC 249) whose Guidelines and Recommendations are to be released soon. This paper details their main innovations and how they are expected to improve the engineering practice and the reliability of strength estimation in existing structures.

Keywords: concrete structures, non-destructive techniques, on-site measurements, strength assessment

1 Introduction

The reliable evaluation of concrete strength is a key input for the safe assessment of existing structures. Non-destructive techniques (NDT) have been promoted as being capable of providing this evaluation. However, whereas many research programs have been carried out in order to develop tools and models for assessing concrete strength, one still lacks any validated methodology that guarantees the quality and efficiency of this process. Several NDTs have been promoted (rebound hammer [1], ultrasonic wave velocity measurement [2], pull-out [3-4], etc.) and a large variety of conversion models (i.e. empirical relationships providing a strength estimate once the NDT result is obtained) have been proposed. However, no agreement exists on what can be done in real situations in order: (a) to estimate concrete strength, (b) to know the quality of this assessment. Many case studies have developed an investigation methodology for existing structures and established specific conversion models using a variety of NDTs (e.g. see [5-8]) but they usually fail to draw more general conclusions that could be applied as general rules of good practice.

Some interesting methodological innovations have been proposed but have not been widely disseminated until now. This is the case, for instance, of the analysis of various scales of

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