



Effects of the concrete mixture for the strength prediction by ultrasonic pulse velocity

A. Benouis^{1,*}, N. Khaldi² and Y. Cherait¹

1 Ph. D., Civil Engineering and Hydraulic Laboratory, University of Guelma (24000), Algeria.

2 Ph. D. candidate, University of Guelma, Algeria.

** Corresponding author : Fax : 00 213 37 21 58 48 ; E-mail : benouis_h@yahoo.fr
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Abstract

The velocity measurement of ultrasonic wave propagation through concrete is currently used to diagnose the possible severe zones of concrete degradation or to detect singularities in the concrete. In addition, on the theoretical level ultrasonic velocity is used to determine the dynamic modulus of elasticity and the density of the concrete. For the relationship with compressive strength, several parameters can intervene so that we have not only one and simple relation between ultrasonic velocity and the strength of concrete. Differences can exist, if various compositions and ages of the concretes are used in the relationship ultrasonic velocity/compressive strength. This experimental work is interested in the study of uncertainties between ultrasonic velocity (vpu) and the strength (fc) introduced by the difference of admixture of concrete. Seven compositions of concrete are tested while various water/cement ratios (W/C) and fine aggregates fins/aggregates ratios (S/S+G). The tests related to measurements of ultrasonic velocity through cylindrical samples (16/32). These same samples were crushed in order to determine their compressive strengths at various ages (7, 14 and 28 days).

Key words: Concrete, Mixture, Ultrasonic velocity, Compressive strength, Correlation

1. Introduction

The non destructive methods for simple concrete or reinforced concrete structures are particularly interesting because of the high proportion of these constructions and the importance of quality control directly on the construction. The advantages of these tests compared to others can be summarized in the non-destructive character (Price and Gudra, 2000). We can obtain information in

fields inaccessible to the traditional methods, economise materials, time and tools for test, by the possibility of carrying out the tests on material in the structures or on only one sample performing a practically infinite number of tests. The principal disadvantage of the non-destructive testing methods lies in the fact that at the present time, they cannot provide sufficient precise data to replace the destructive methods completely in the principal applicability. Some non-destructive methods are based on the fact that some physical properties of the concrete