MOISTURE AND TEMPERATURE INTERACTION EFFECT ON THE ULTRASONIC PULSE VELOCITY IN CONCRETE

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It is known that ultrasonic pulse velocity (UPV) in concrete is affected by raw material properties, curing and exploitation conditions, various physical factors etc. So far, all of them are usually analyzed separately. Each specific factor and the results of the researches of its impact, unfortunately, does not find the assurance that the measurement data are obtained in sufficiently correct manner, without considering this specific and other factors influence on the UPV in the form of interaction. This paper summarizes the information obtained from a number of researches by analyzing the mutual subordination of main physical factors, if it is tested the same concrete composition.

Carrying out the tests with ultrasonic devices it is found that the most significant influence on measuring results gives concrete moisture. Changes of its content largely determine the influence degree of the rest of the physical, mechanical etc. factors on the UPV in concrete. Aim of this research is to develop a methodology for obtaining the correct UPV data, if the testing of the concrete specimens is carrying out at different ages and at different moisture and temperature conditions.

In the curing process, as well as about 3 years of age concrete specimens were exposed to moisture changes, as well as to the impact of different temperatures (from -20 °C to +30 °C). Direct and indirect transmission methods were applied in this research to determine the ultrasonic longitudinal and surface waves pulse velocity. It has been shown that the moisture and temperature interaction effect on the UPV in concrete mainly depends on the hardening (curing) conditions and the phase of hydration process of the hydrated cement paste. In certain cases the direct and indirect transmission methods have shown the different results. The elaborated UPV measurement methodology includes a function that contains four arguments — the phase of hydration process of the hydrated cement paste (or concrete age), hardening (curing) condition, concrete moisture and ambient temperature.