

Retrospective Determination of Water-to-Cement Ratio (W/C) of Concrete Through Ultrasonic Pulse Velocity Measurements

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The objective of this research is to find a method to determine the water-cement ratio that has been used in a concrete during construction, retrospectively. Water-Cement ratio affects the properties of concrete including its strength. Ultrasonic Pulse Velocity (UPV) of concrete can be related to its strength. These inter-relations can be used as the tool to achieve our objective.

Different grades of concrete with varying water-cement ratios were used in this study. 28-day strength was measured using the standard concrete cubes and UPV measurements also were done for the same samples. 28-day strength of concrete can be considered as its long-term strength, as it does not change much after 28 days.

UPV and 28-day strength of concrete, both found to decrease with the increase of water-cement ratio. These reductions were due to increased volume of capillary voids and micro-cracks within concrete transition zone and porous structure within the interconnected hydrates. The relationships established can be used to predict the water-cement ratios used in concrete structures retrospectively.

Keywords: Water-cement ratio, UPV, Strength