

STATISTICAL DETERMINATION OF CEMENTITIOUS MATERIAL CONTENT IN HARDENED CONCRETE

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ABSTRACT

Determination of cementitious material content in hardened concrete is one of the most important objectives in concrete troubleshooting. Yet it has also been one of the most difficult challenges for concrete technologists for decades. Currently available methods are either too demanding on instrumentation and skills (such as ASTM C1084), or require mix design information that is often not available (such as some methods based on point-count).

An empirical equation has been developed to meet this challenge. It is well known that the paste content of the concrete is related to the cementitious material content and the amount of water added to the concrete. Therefore, the cementitious material content can be determined if the water to cementitious material ratio (w/cm) and paste content are known. The equation was developed based on a statistical investigation of 20 concrete samples with known mix designs covering a cementitious material content from 223 to 505 kg/m³ (376 to 852 lbs per cubic yard) and w/cm ratio from 0.30 to 0.70. The equation has a coefficient of determination (R²) of 0.98 and a standard deviation of 11.7 kg/m³ (19.7 lbs/yd³). Total cementitious material content can be readily calculated from the equation using the paste content determined by modified point count method and the w/cm ratio determined by traditional petrographic methods. Advantages and limitations of the method were discussed.

KEY WORDS: cementitious material content, regression, point count, w/cm