3D MAPPING OF STIFFNESS AND WAVE VELOCITY EVOLUTION OF HARDENING CONCRETE USING ELASTIC WAVE TOMOGRAPHY

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Phenomena occurring during the delicate phase of concrete curing can have a strong influence on the final mechanical properties. This paper aims to assess the wave velocity and stiffness development of hardening concrete during various curing stages using the Elastic Wave Tomography (EWT) method. This technique allows for internal distributions to be obtained using elastic wave parameters. The monitoring of the curing process starts as soon as five hours after casting and lasts up to eighty hours after casting the material. A three-dimensional (3D) velocity and stiffness map is created, and normal concrete is compared to concrete containing SuperAbsorbent Polymers (SAPs), a novel admixture used for shrinkage mitigation by providing internal curing in cementitious materials. SAPs have been proven to reduce compressive strength when added to concrete due to the increased porosity they create. These voids result in reflections and refractions of the elastic waves and theoretically reduce the velocity. However, the internal curing provided by the SAPs can promote the formation of new hydration products in the matrix and thus compensate for the strength loss making the uniformity of the internal curing another important point of concern. EWT can provide important information on the influence of the SAPs in the cementitious matrix while the determination of the early-age stiffness evolution can be connected to the final mechanical properties of the material.