

Measurement of the Dynamic Modulus of Elasticity of Cylindrical Concrete Specimens Used for the Cyclic Indirect Tensile Test

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Abstract : Concrete, as a result of its use as a construction material, is not only subject to static loads but is also exposed to variables, time-variant, and oscillating stresses. In order to ensure the suitability of construction materials for resisting these cyclic stresses, different test methods are used for the systematic fatiguing of specimens, like the cyclic indirect tensile test. A procedure is presented that allows the estimation of the degradation of cylindrical concrete specimens during the cyclic indirect tensile test by measuring the dynamic modulus of elasticity in different states of the specimens' fatigue process. Two methods are used in addition to the cyclic indirect tensile test in order to examine the dynamic modulus of elasticity of cylindrical concrete specimens. One of the methods is based on the analysis of eigenfrequencies, whilst the other one uses ultrasonic pulse measurements to estimate the material properties. A comparison between the dynamic moduli obtained using the three methods that operate in different frequency ranges shows good agreement. The concrete specimens' fatigue process can therefore be monitored effectively and reliably.

Keywords : concrete, cyclic indirect tensile test, degradation, dynamic modulus of elasticity, eigenfrequency, fatigue, natural frequency, ultrasonic, ultrasound, Young's modulus

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