

Single-Sided Ultrasonic Technique to Characterize Thick FRP Composites

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ABSTRACT

This paper reports on the development of a single-sided, laser ultrasonic technique that is capable of measuring all of the engineering constants of a pultruded FRP composite structural member. The complex nature of these members (which are used in civil infrastructure applications) precludes the determination of all of the engineering constants using mechanical tests, while immersion ultrasonic techniques have certain drawbacks. The proposed technique, which uses a combination of contact piezoelectric and optical methodologies, does not call for cutting the specimen or placing it in an immersion tank. Optical generation and detection of ultrasound enable the direct measurement of the longitudinal and surface acoustic wave speeds in the pultrusion direction, without requiring access to the ends of the specimen, or relying on reflected quasi-longitudinal waves. The measured engineering constants are compared to immersion technique results and the advantages of the proposed technique are clearly demonstrated.