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Evaluation of Modulus of Elasticity by Non-Destructive Method of Hybrid Fiber Reinforced Concrete

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Abstract : Plain, unreinforced concrete is a brittle material, with a low tensile strength, limited ductility and little resistance to cracking. In order to improve the inherent tensile strength of concrete there is a need of multi directional and closely spaced reinforcement, which can be provided in the form of randomly distributed fibers. Fiber reinforced concrete (FRC) is a composite material consisting of cement, sand, coarse aggregate, water and fibers. In this composite material, short discrete fibers are randomly distributed throughout the concrete mass. The behavioral efficiency of this composite material is far superior to that of plain concrete and many other construction materials of equal cost. The present experimental study considers the effect of steel fibers and polypropylene fiber on the modulus of elasticity of concrete. Hook end steel fibers of length 5 cm and 3 cm at volume fraction of 0.25%, 0.5% and 1.% were used. Also polypropylene fiber of length 12, 6, 3 mm at volume fraction 0.1, 0.25, and 0.4 % were used. Fifteen mixtures has been prepared to evaluate the effect of fiber on modulus of elasticity of concrete. Ultrasonic pulse velocity (UPV) and resonant frequency methods which are two non-destructive testing techniques have been used to measure the elastic properties of fiber reinforced concrete. This study found that ultrasonic wave propagation is the most reliable, easy and cost effective testing technique to use in the determination of the elastic properties of the FRC mix used in this study.

Keywords : fiber reinforced concrete(FRC), polypropylene fiber, resonance, ultrasonic pulse velocity, steel fiber
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