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FRACTURE TOUGHNESS OF LATEX-MODIFIED CONCRETE OVERLAYS INTEGRATED WITH MACRO SYNTHETIC FIBERS

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ABSTRACT

Latex-modified concrete (LMC) bridge deck overlay established its reputation as a superior overlay system as a result of its strength and durability performance. Integration of macro synthetic fibers (polymer extruded polypropylene or polyethylene) within the LMC mixture provides residual tensile strength and toughness characteristics. Synthetic fibers are typically added in small quantities without the need to modify the mix design proportions. Due to their low specific gravity and very small diameters, a substantial number of single fibers are added for such small weights resulting in a homogeneous fiber distribution. Furthermore, synthetic fibers have high strength properties and alkali-resistant. Majority of existing studies in this regard focused on the impact of fibres on improving the mechanical properties and/or durability of concrete. Relatively, limited number of experimental studies compared the fracture behavior of fibrous concrete in terms of fracture energy (G_f) and stress intensity factor (K). Accordingly, this paper presents the fracture behavior of fibrous concrete overlay integrated with constructable dosages of macro synthetic fibers having monofilament configuration (40 mm long with aspect ratio of 90). Flexural performance tests were conducted for fibrous LMC mixtures according to ASTM C1609 at a typical compressive strength between 28-35 MPa. The flexural performance test results were related to theoretical fracture toughness results considering the same specimens size, concrete strength, and loading configuration.

KEYWORDS: Fracture Toughness; Fracture Energy; FEA; Synthetic Fibers; Cracks.

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