



EXPERIMENTAL INVESTIGATION ON THE INFLUENCE OF NANO-SILICA AND GLASS FIBERS FOR RIGID PAVEMENTS

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ABSTRACT

The paper experimentally explores the effect of nano-silica (NS) and glass fibers (GF) on properties of concrete for sustainable rigid pavement applications. A total of 11 concrete mixtures were made: a control, 5 NS series (1–5% by binder weight), and 5 GF series (0.2–1.0% by volume). Fresh properties (slump, air content and dry density) and mechanical properties (compressive, flexural and split tensile strengths) were tested at 7 and 28 days. The results indicated that in the development of compressive strength, The highest compressive strength (45.11 MPa) was obtained for NS02 (2.0% NS) which is 14.8% higher than of the control at 28 days. The flexural strength (7.14 MPa) of GF01 (0.2% GF) was the highest with 39.5% improvement, whereas GF02 (0.4% GF) had the best split tensile strength (3.60 MPa) with 15.0% improvement. Optimum dosages were 2.0% NS and 0.2–0.4% GF. Both additives had a negative effect on workability but a positive effect on mechanical properties. The study finds that both NS and GF are synergistic for rigid pavement, where NS (particularly NS02) is beneficial for compressive strength, while GF (particularly GF01 and GF02) is more effective for flexural and split tensile strengths, as well as crack resistance.

KEYWORDS: Nano-silica, Glass Fibers, Rigid Pavement, Mechanical Properties, Sustainable Concrete