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BITUMINOUS CONCRETE MIX DESIGN USING NANOSILICA AS MODIFIER

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Abstract

Nano-modified bituminous concrete was prepared using a nano additive called as Nano silica which was extracted from rice hush ash is a relatively new inorganic material that is used to enhance its potential beneficial properties like huge surface area, strong adsorption, good dispersal ability, high chemical purity and excellent stability. Materials include coarse and fine aggregates, plain bitumen and nano additive. Scanning Electron Microscope (SEM) analysis coupled with Energy Dispersive X-ray (SEM/EDX) Spectroscopy is executed for component analysis. Marshall Specimens were prepared for the aggregate gradation of Bituminous Concrete Grade II with unmodified and Nanosilica modified bitumen. Marshall Mix properties were studied for both binders. The performance characteristics of Bituminous Concrete mixes were studied by conducting Marshall Stability, Indirect Tensile Strength and Repeated Load Tests in the laboratory. Results show Nano silica to bituminous concrete mix significantly improves the performance of the mix. Similarly tensile strength and fatigue characteristics were improved for the bituminous concrete mix with Nanosilica. Because of improved mechanical properties, nanosilica offers an excellent potential for bituminous concrete mix modification. . The Stability value was found to have increased with the addition of nanosilica when compared to conventional mixes with a reduction in flow values. An attempt has been made to develop fatigue models, to find out the variation of fatigue life and to develop relationship between resilient modulus (M_r) and Fatigue life (N_f) of different contents of nano-silica using SPSS. This can be further extended by conducting studies for different modified binders with less quantity of Nanosilica as well as with different varying temperatures and also for different types of aggregate mixes.

Key words: modified bitumen binder, rice husk ash, nano-silica, fatigue models, SPSS