

ABSTRACT

Bituminous pavements are prone to distresses such as rutting, cracking, and moisture and oil damage. Limited past studies showed that cement grouted bituminous (CGB) mix is an alternative pavement composition for better rutting, oil and moisture damage resistance. CGB mix is prepared by grouting a porous bituminous mix. In this study, different CGB mixes prepared using different aggregate gradations and binder contents were evaluated and threshold values of mix parameters such as minimum air void content in dry aggregates, minimum void ratio in dry aggregate, minimum voids in bituminous mix, minimum voids in mineral aggregate of compacted bituminous mix, minimum permeability of bituminous mix and maximum Marsh flow time of grout were identified as 44%, 0.61, 35%, 40%, 8.8 mm/s and 6 s respectively for selection of mixes suitable for preparation of CGB mixes.

Indirect tensile strength (ITS) and flexural strength measured at 25°C, rutting performance observed at 60 °C, fatigue performance measured at 25°C and moisture resistance in terms of the tensile strength ratio (TSR) were evaluated. A few combinations of CGB mixes identified based on laboratory performance were used for construction of test sections for accelerated testing. The ITS and Resilient modulus values of the selected mixes were measured at test temperatures of 15°C, 25°C, 35°C and 45°C.

The mechanical properties of CGB mixes were influenced by the binder content used. CGB mixes showed better rutting performance compared to conventional bituminous mix. The rut depth correlated well with the ITS of the mix. The CGB mixes also had very high resistance to damage due to moisture and petroleum products. The laboratory fatigue life of CGB mix increased with increase in binder content and decreased with strain level. While the laboratory test results indicate that the fatigue lives will increase with increase in binder content, analysis of typical pavement sections with CGB mixes suggests that mixes with smaller binder contents, due to their higher stiffness and the resulting smaller tensile strains, will have longer fatigue lives compared to mixes with larger binder contents. CGB mixes performed well in the accelerated test track in terms of rutting, cracking and surface erosion.

Key words: Porous Bituminous mix, Cementitious Grout, Cement Grouted Bituminous mix, Permeability, Dry aggregate air voids, rutting, Indirect Tensile Strength, Modulus of Rupture, fatigue cracking, Beam Fatigue test, moisture resistance, resilient modulus, resistance to petroleum products, Accelerated Pavement performance testing