Multiple Linear Regression Models for Predicting Surface Damage Due to Repeated Dynamic Loading on Submerged Asphalt Pavement

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A B S T R A C T

Asphalt surface damage due to water pumping from moving traffic is underexplored. A laboratory test has been developed to simulate the impact of moving traffic on submerged surfaces. In total 36 tests were conducted on Hot Rolled Asphalt (HRA), open-graded Stone Mastic Asphalt (SMA) and Porous Asphalt (PA). The specimens were submerged in shallow water while 5 kN repeated loading was applied at 5 and 10 Hz frequencies until failure. It was observed that irrespective of surface type, cracking, and rutting occurs simultaneously, although their magnitudes were different on different types of surfaces. The experimental data were then used to develop multi-input deterioration prediction models using regression analysis. The experimental parameters such as asphalt surface type, aggregate size, weather conditions, void contents, load magnitude and load frequencies were used as model inputs. The measured cracking and rutting were used to compare with the predicted cracking and rutting. The models yield 84 and 71.6% correlation with measured rutting and cracking respectively. Furthermore, combined distress (cracking and rutting) model for all HRA and SMA variations was developed and found 52 and 39% correlation respectively. The low correlation was believed to be due to the measurement difficulty of narrow cracks during testing. Despite this, the models showed promising results for overall distress prediction and with further development, it could be used as a screening tool to evaluate the performance of asphalt surfaces when subject to both prolong rain and traffic loading.