COMPARISON OF PERFORMANCE OF AC SPECIMENS IN BRIQUETTE AND SLAB SETUPS UNDER MMLS3 TRAFFICKING

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Traditionally, pavement performance has been evaluated by actual monitoring of pavement distresses over time. While field monitoring provides unquestionable evaluation of performance, it is not the most efficient, since it incurs a certain amount of time. Hence, considerable effort has been put into development of accelerated pavement testing solutions, which may be either full- or small-scale devices.

The latest of small scale accelerated trafficking devices is the Model Mobile Load Simulator at 1/3rd scale (MMLS3). Evaluations have shown that application of trafficking using MMLS3 will create the same stresses and strains on the pavement model as on the field if certain rules are met, such as scaling down the model geometry and traffic velocity to 1/3rd and load to 1/9th that on the field. This enables the MMLS3 to be a much smaller and more portable device than those before it. To take full advantage of this, it has been proposed that, in the laboratory, trafficking be done on smaller specimens, called briquettes, fixed in a special holding mold and effort in preparing slabs may be dispensed with.

However, this may create some new issues that need to be resolved. First, it must be noted that the mold is made of steel and therefore confinement may be qualitatively different from that in slabs or pavements, where the longitudinal and transverse expanse of the pavement provides the confinement. Thus, the effect of horizontal confinement of the specimens must be evaluated. Second, the mold itself in bolted to the laboratory floor, which is usually made of concrete. This is also different from the slab or pavement, where the structure incorporates many layers beneath the AC layer with progressively decreasing moduli.

In recent investigations, the focus of mechanistic evaluation of pavements has shifted from classical methods to more fundamental stress analysis using the finite element method (FEM). This study aims at improving an understanding of the issues mentioned above by preparing analytical models of slabs and briquettes and evaluating them using finite element (FE) techniques. 3-D FE models of briquettes as well as slabs are prepared in ABAQUS using brick elements. Viscoelastic properties of AC as obtained in the laboratory are applied and dynamic loading similar to actual MMLS3 trafficking is simulated. Mechanical responses observable as stresses and strains in briquettes and slabs are compared and objective conclusions are drawn regarding the use of the briquette setup vis-à-vis fabrication of slabs as pavement models.

References

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