

Investigation of Interlayer Shear Effects in Asphalt Overlay on Existing Rigid Airfield Pavement Using Digital Image Correlation

Authors : Yuechao Lei, Lei Zhang

Abstract : The interface shear between asphalt overlay and existing rigid airport pavements occurs due to differences in the mechanical properties of materials subjected to aircraft loading. Interlayer contact influences the mechanical characteristics of the asphalt overlay directly. However, the effective interlayer relative displacement obtained accurately using existing displacement sensors of the loading apparatus remains challenging. This study aims to utilize digital image correlation technology to enhance the accuracy of interfacial contact parameters by obtaining effective interlayer relative displacements. Composite structure specimens were prepared, and fixtures for interlayer shear tests were designed and fabricated. Subsequently, a digital image recognition scheme for required markers was designed and optimized. Effective interlayer relative displacement values were obtained through image recognition and calculation of surface markers on specimens. Finite element simulations validated the mechanical response of composite specimens with interlayer shearing. Results indicated that an optimized marking approach using the wall mending agent for surface application and color coding enhanced the image recognition quality of marking points on the specimen surface. Further image extraction provided effective interlayer relative displacement values during interlayer shear, thereby improving the accuracy of interface contact parameters. For composite structure specimens utilizing Styrene-Butadiene-Styrene (SBS) modified asphalt as the tack coat, the corresponding maximum interlayer shear stress strength was 0.6 MPa, and fracture energy was 2917 J/m². This research provides valuable insights for investigating the impact of interlayer contact in composite pavement structures on the mechanical characteristics of asphalt overlay.

Keywords : interlayer contact, effective relative displacement, digital image correlation technology, composite pavement structure, asphalt overlay

Conference Title : ICEMA 2024 : International Conference on Engineering Materials and Applications

Conference Location : Tokyo, Japan

Conference Dates : April 22-23, 2024