Determining the Effects of Cross-Anisotropy on Pavement Response and Performance

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Abstract:
When layers of a pavement are compacted vertically using vibratory or roller compactors, the compaction forces are not the same in horizontal and vertical direction due to the lack of confinement in the horizontal direction. Later, service traffic adds on to this by applying vertical load and forward impacts. Therefore, materials stiffness may vary along the vertical and horizontal directions. As stiffness is not the same in three directions, the asphalt concrete (AC) layer can be considered to be anisotropic. Unfortunately, to this day, stresses and strains predicted by the recently developed pavement design software as well all other available layered elastic analysis software assume AC as an isotropic material. Isotropic means AC layer material has identical stiffness along 3-dimensions. Therefore, ignoring AC cross-anisotropy may cause significant error in predicting critical stress and strains, which are used to predict fatigue damage or permanent deformation of a pavement by pavement ME design. To this end, it is proposed to study the effects of AC layer cross-anisotropy on pavement responses and predicted fatigue and rutting performances.