Abstract

Transverse joints are placed in Portland cement concrete pavements to control the development of random cracking due to stresses induced by moisture and thermal gradients and restrained slab movement. These joints are strengthened through the use of load transfer devices, typically dowel bars, designed to transfer load across the joint from one pavement slab to the next. Epoxy coated steel bars are the materials of choice at the present time, but have experienced some difficulties with resistance to corrosion from deicing salts.

The research project investigated the use of alternative materials, dowel size and spacing to determine the benefits and limitations of each material. In this project two types of fiber composite materials, stainless steel solid dowels and epoxy coated dowels were tested for five years in side by side installation in a portion of U.S. 65 near Des Moines Iowa between 1997 and 2002. The work was directed at analyzing the load transfer characteristics of 8 inch vs. 12 inch spacing of the dowels and the alternative dowel materials, fiber composite (1.5 and 1.88 inch diameter) and stainless steel (1.5 inch diameter), compared to typical 1.5 inch diameter epoxy-coated steel dowels placed on 12 inch spacing. Data was collected biannually within each series of joints and variables in terms of load transfer in each lane (outer wheel path), visual distress, joint openings, and faulting in each wheel path.

After five years of performance the following observations were made from the data collected. Each of the dowel materials are performing equally in terms of load transfer, joint movement and faulting. Stainless steel dowels are providing load transfer performance equal to or greater than epoxy-coated steel dowels at the end of five years. FRP dowels of the sizes and materials tested should be spaced no greater than 8 inches apart to achieve comparable performance to epoxy coated dowels. No evidence of deterioration due to road salts was identified on any of the products tested. The relatively high cost of stainless steel solid and FRP dowels was a limitation at the time of this study conclusion. Work is continuing with the subject materials in lab studies to determine the proper shape, spacing, chemical composition and testing specification to make the FRP and stainless (clad or solid) dowels a viable alternative joint load transfer material for long lasting Portland cement concrete pavements.