



South Carolina
Department of Transportation



U.S. Department of Transportation
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Summary report

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South Carolina
Department of Transportation
955 park Street
P.O. Box 191
Columbia SC 29202

Simplifying Bridge Expansion Joint Design and Maintenance

Bridge expansion joints are designed to permit the longitudinal movement and small rotations presented on bridge decks due to changes in environmental condition, live loads, and physical changes on the structural materials such as creep and shrinkage. While early designs did not provide water sealing, current designs require sealing to prevent the damage of support components. In addition, the construction of longer spans requires the use of longer expansion joints that can become prone to damage due to the fatigue loads caused by traffic.

This report identifies the most durable expansion joints in South Carolina based on a degradation model that is updated based on joint inspections data. The proposed model is based on degradation models found in the literature for bridge structural members. The model is a function of time and has two random variables. The probability density function of these variables was obtained using Bayes inference and information from the SCDOT pontis database for each joint studied. One of the parameters was found to have little effect on the degradation model for all joints. Therefore, the degradation model was described with only one random variable that indicated the rate of degradation.

Open expansion joints and pourable joint seal were found to be the best performing joints based on the proposed degradation models. Assembly joints and compression joint seal have an intermediate performance and strip seal expansion joints have the lowest performance of the type of expansion joints studied. Assembly joints are found to be problematic because of the different moving parts composing the joint. A significant number of bridge joint failures are

caused because of incorrect installation, in particular, joints with complex anchor systems between the bridge deck and expansion joint.

The SCDOT standards were found to be up to date and comparable to other DOT standards in terms of the design and installation aspects of bridge joints. A recommendation is made to request a warranty for the joint installation when appropriate. Other general best practices during the installation of the expansion joint include: i) when possible, install joints when the ambient temperature is the average of the range of temperatures in the area. This allows the joint to be installed close to the “undeformed” position of the bridge; ii) the support of the joint should be installed in good quality, cured concrete; iii) avoid splicing of any pre-manufactured material. If splices cannot be avoided, place the splice outside the wheel path.