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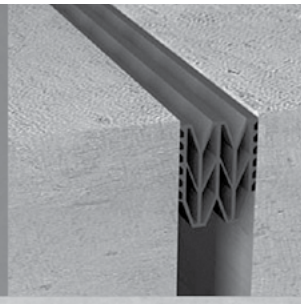

Guidelines for MAINTAINING SMALL MOVEMENT BRIDGE Expansion Joints

2021

1st Edition

Summary

Guidelines for replacing, repairing, and maintaining Small Movement bridge Expansion Joints (SMEJ) were developed (small movement is defined as 4 inches or less). A literature survey was conducted that showed a dearth of work on SMEJs. A stakeholder survey was conducted of bridge owners, contractors, consultants, and suppliers that provided a good picture of the current state of practice with regard to SMEJs. Using this as a foundation, a variety of tasks were conducted in support of developing detailed procedures for replacing, repairing, and maintaining SMEJs. These procedures became the basis for the proposed guidelines.

The guidelines cover the key types of SMEJs in use today: asphalt plug joint, compression and bonded joints, strip seal joints, pourable joints, and open joints. Typical schematics and photographs of these joints are presented, as are their typical modes of failure. A procedure for evaluating joints is proposed that is based on the condition states and defect definitions in the AASHTO *Manual for Bridge Element Inspection*, to determine when a joint should be maintained, repaired, or replaced. Details on how to calculate joint movement and size a seal are presented. This section also explains how to calculate maximum expected compression, tension, shear, and compression at install, based on the gap width and temperature when the seal is installed. Next, the guidelines discuss selecting a replacement joint. This is based on key performance metrics for a joint: joint opening, joint movement, skew, expected service life, installed cost, constructability, lead time, location, traffic, and durability. A table is presented that shows typical values for each of these metrics for the key types of SMEJs: some metrics are quantitative and others are qualitative. Factors to consider when switching from one joint type to another are presented. Detailed procedures are then presented for replacing and repairing the header. This is then followed by detailed procedures for replacing, repairing, and maintaining each of the five main categories of SMEJs. A separate section for each type of joint is presented that provides detailed step-by-step procedures for each of these activities. The sections end with a collection of photographs that show the steps involved in replacing the joint.

It is hoped that with the adoption of these proposed guidelines, owners can begin to see longer life joints and reduced costs associated with deteriorated joints.

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CHAPTER 1
Introduction

1.1. Scope and Objectives of the Guidelines

Small Movement Expansion Joints (SMEJs) serve a very important function in the life-cycle of a bridge. They provide a smooth transition from one span to another in a multi-span bridge or from the approach roadway to the deck, and they direct water and other chemicals off of the deck and away from the bridge. While the cost of a joint may be small relative to the total cost of the bridge, the consequences of a joint failure can be significant. Failure of a joint or selection of an improper system can lead to damage and deterioration of the superstructure, bearings, and substructure, in the form of corrosion of steel girders, spalling of concrete, and erosion of embankments. These are serious problems that are expensive to repair and impact the condition rating of the bridge. Thus, it is vitally important that joints are maintained and repaired in a timely manner, lest it lead to more serious problems. That said, there has been a growing awareness of the need to develop detailed procedures for maintaining, repairing, and replacing SMEJs.

The objective of this guideline is to provide bridge maintenance practitioners with detailed procedures for replacing, repairing, and maintaining SMEJs. "Small movement" is defined here as an expansion joint with a total movement of 4 in. or less; anything higher than that is

DISCLAIMER

The guidance and procedures outlined in this document are intended to be generic in nature. Manufacturer's recommendations and engineer specifications must be considered in any work to maintain, repair, or replace a small movement expansion joint.

beyond the scope of this document. The guidelines are applicable to the most common SMEJs in use and on the market today; they may not be applicable to joints that are not readily available today or those developed in the future.

Some attention has been paid recently to eliminating bridge joints, which clearly is one approach to solving the problems associated with joints. This, however, introduces many other factors for consideration and a detailed discussion of this approach is beyond the scope of these guidelines; however, a brief discussion of the topic can be found in Section 6.3. There are other references that address joint elimination; the interested reader should consult those documents for more information on this subject.

1.2. Definitions

Blockout—The sections at the end of bridge spans and abutment backwalls formed to anchor the joint system.

Header—The material placed in the blockout.

Joint gap—The nominal opening of the joint that must be spanned; is set at the time of construction or reconstruction of the joint.

Joint movement—The opening or closing displacement of the joint caused by the change in temperature of the bridge.

Joint rotation—The change in angle between the vertical faces of the joint caused by the movement of live loads over the bridge; may occur with or without joint movement.

Maintenance—Any activity that is done on a regularly scheduled, cyclic basis (e.g., every year, every two years) to maintain the proper operation of the joint.

Repair—Any activity that is done on an intermittent basis to bring a joint back to proper functioning; may involve work on a portion of the joint, or the entire joint, but does not constitute a complete reconstruction of the entire joint.

Replacement—A complete reconstruction of the entire joint.

Seal—Sometimes also referred to as a gland, gasket, or membrane; the flexible material that spans the joint opening.