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Integral safe expansion joint: a new long-service-life joint for bridges

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1 Abstract

The integral expansion joint is a novel bridge expansion joint for bridges and viaducts with three breakthrough characteristics: (1) allows continuous driving, therefore (i) reducing the risk of accidents and increases safety for the road user and their vehicles; (ii) mitigating noise (the bump effect from conventional joints); (2) avoids the filtering of water, detritus and de-icing salts reducing conservation costs (opex and capex) of bridge substructures; (3) has a long-service life vis-à-vis conventional joints, therefore: (i) reducing the maintenance expenditure in bridge joints (life-cycle cost analysis); (ii) reducing traffic cuts and diversions, relevant for toll road operators where there is payment for - or penalties due to lack of – availability and (iii) reducing potential management liability due to improper maintenance. At an affordable supply and installation cost - aligned to conventional joints -, the integral expansion joint aims to solve a well-documented and historical problem in Structural Engineering, strengthening the most vulnerable part of any bridge and road surface. It can be prefabricated or manufactured in situ, implemented in all kind of bridges (new or rehabilitation), in any geography (thermal range), regardless of length of the deck or skewness, and in any material (concrete or metal).

Keywords: bridge expansion joint, safety, integral joint, maintenance, road bridges, life cycle cost analysis.

2 Introduction

Expansion joints are one of the most vulnerable parts of a bridge: unsafe point for road users, a frequent and costly maintenance item for rehabilitation, and a source of noise. At present, there are dozens of different technical solutions.

After a thorough study in a Ph. D. thesis of the existing expansion joints´ common and specific pathologies, a generic way to develop a new typology for the expansion joint is being proposed: the integral or safe expansion joint.

This paper presents a short description of the, in short, ´integral joint´, so that the research and testing developed after said thesis presentation can be further divulged.

Actual expansion joints act under the same principle: a single joint (1) is developed to absorb the maximum movement of X mm according to the calculations due to hygrothermal actions, located in a single gap transversal to the road.
The integral joint changes the existing philosophy: several joints (X) are cast in place as close as possible to absorb a maximum movement of approximately 1 mm each.

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