

Advantage of 4th Generation Modular Joint from life cycle cost point of view – a case study

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Abstract

While the design life of a bridge is generally estimated to be around 100 years, an important component of the bridge, viz. expansion joints have a much shorter service life – typically between 10 to 20 years. Therefore, expansion joints need to be replaced quite a few times during the service life of the bridge. The total cost of ownership (TCO) of a product is defined by the sum of all the costs incurred by the owner at different stages, i.e., initial procurement and installation cost, regular inspection & maintenance cost and possible replacement cost involving engineering, project management, cost of new expansion joints and auxiliary civil works. Replacement of expansion joints not only forms the biggest component of TCO, but it also involves hardships to the bridge users during the replacement work which might need one or multiple lane closures, if not closure of the entire bridge, causing intangible cost of ownership. As such the bridge owners need to exercise discretion during selection of the product to ensure minimum number of replacements during the service life of the bridge and minimise the closure during the replacement work to keep a check on TCO and possibly on reduced collection of toll revenue.

4th Generation Modular Expansion Joints addresses the aforesaid issues with longer time interval between replacement work (> 15 years), minimum interruption to traffic during replacement and thus minimal loss of revenue due to possibility of a quick replacement work. Recently the Modular Expansion Joints on the major bridge over river Sone in the Indian state of Bihar was refurbished within a very short time, minimising traffic interruption, thanks to the detailing of the modular expansion joint.

Keywords: Expansion joint; durability; life cycle cost; TCO; installation; replacement; refurbishment.

1 Introduction

Expansion joints are bridge parts with very high demands in terms of performance and durability. Along with bearings, expansion joints are the only ‘moving parts’ of the otherwise rigid bridge structure. They must continuously allow movements and rotations of connecting parts, while sustaining frequent dynamic impacts. and eventually suffer from wear and tear as well as

from fatigue. On top of that, there are environmental elements to which the expansion joints are continuously exposed throughout its life. The combined effect of these impacts results in a steady and unavoidable deterioration of the expansion joints.

Due to their ability to facilitate very large movements, modular expansion joints, are the default choice for long span bridges over last