

New York – a metropolis of challenging bridge expansion joint applications

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1 Abstract

The New York metropolitan area is a treasure trove of spectacular bridges – structures of great cultural significance and remarkable engineering value. Many of these bridges are very long, with long main spans, and thus require expansion joints that can accommodate correspondingly large movements at each end. The challenges associated with meeting the expansion joint needs of such structures are illustrated with reference to iconic bridges including the Verrazano Narrows Bridge, the Bayonne Bridge and the new Tappan Zee Bridge. The paper thus illustrates the importance of suitably engineered solutions for key component requirements in creating and maintaining the extraordinary structural heritage of a city like New York.

Keywords: Bridge; expansion joint; New York; heritage; modular; sliding finger; renovation; replacement.

2 Introduction

New York is a true metropolis by any metric, but one area in which it particularly stands out from other metropolitan areas is as relates to its built environment. A key aspect of that is its rich stock of spectacular bridges, a number of which are known all around the world. And New York City has been at the forefront of the worldwide bridge construction industry for well over a century, helping to push the boundaries of what could be achieved, often setting world records. In terms of lengths of suspension bridges alone, world records were set by the Brooklyn Bridge in 1883, the Williamsburg Bridge in 1903, the George Washington Bridge in 1931 and the Verrazzano-Narrows Bridge in 1964.

But constructing iconic bridges such as these is only the start of a story that will go on for many years. Indeed, every bridge has its own unique story – dealing with its aging process, coping with exceptional challenges/events, adapting to

changing demands and even growing – in terms of capacity – when required. These processes require work to be carried out on bridges frequently throughout their lives, often presenting daunting challenges for the responsible engineers. Work must be carried out in a way that minimizes impacts on traffic and the local population, in a sustainable manner that protects the existing structure and its heritage value, and in a way that ensures good value for money – especially considering the taxpayer dollars that generally finance such work.

The extent of these challenges is especially evident when the work relates to a bridge's expansion joints – which, as dynamically loaded mechanical structures, typically require to be replaced several times during the long service life of a major bridge. Since these key components form part of the bridge's driving surface, some level of disruption to traffic is virtually unavoidable on a heavily-trafficked structure when an expansion joint needs

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