

# A Study to Evaluate Performance Characteristic of Thin Layer Pavements for Long-Span Orthotropic Steel Bridge

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## Summary

A major purpose of this study is to evaluate performance characteristic of various thin layer pavement materials such as poly-urethane polymer concrete (PUPC), mastic & polymer modified stone mastic asphalt (PSMA), and ductile fiber reinforced cementitious composite (DFRCC) for long-span orthotropic steel bridge. In this study, various laboratory tests including flexural strength test, bonding strength test, tensile strength test were performed. Accelerated pavement test was performed under various environmental conditions using small-scale accelerated pavement tester (SSAPT) developed to evaluate performance characteristic of pavement materials on various conditions of temperature, humidity, and ultra-violet. Structural analysis for pavement and steel deck bridge structure according to variation of pavement thickness was performed using a commercial finite element code, MIDAS Civil 2009.

**Keywords:** thin layer pavement; poly urethane polymer concrete (PUPC); ductile fiber reinforced cementitious composite (DFRCC); mastic & polymer modified stone mastic asphalt (PSMA); small-scale accelerated pavement tester (SSAPT); long-span orthotropic steel bridge; structural analysis.

## 1. Introduction

The construction of super long-span bridges (cable-stayed bridge: over 1,000m, suspension bridge: over 2,000m) has been globally increased because long-span bridges which have been recently planned must be a landmark and a kind of the criterion to evaluate technical level. The conventional pavement system for long-span orthotropic steel bridge is 80mm thickness asphalt pavement system which occurs heavy dead loads on bridge structure. The most important technology for construction of super long-span bridge is to reduce dead loads of bridge. Thus, there are various attempts for reducing dead loads of bridge deck pavement in many of advanced countries.

Various thin layer pavement materials such as 50mm thickness epoxy asphalt mixture in China (2003, Wei HUANG), various thin layer polymer concrete in Europe and United States (1999, Brian A.), and 50 ~ 70mm engineered cementitious composite in Japan (2006, K. Rokugo) have been applied on long-span orthotropic steel bridge. However, some distresses on thin layer pavement and fatigue damage of the steel deck plate have ever been observed. It is difficult that thin layer pavement retains enough performance on long-span orthotropic steel bridge.

In this study, various laboratory tests, accelerated pavement test, and structural analysis were performed on three kinds of thin layer pavement materials to apply long-span orthotropic steel bridge.