

GFRP Composite Decks with Snap-fit Connections for Pedestrian Bridges in Korea

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Summary

Glass fiber-reinforced composite decks are a promising alternative to conventional decks for pedestrian bridges, due to their many advantages such as light weight, high strength, high durability, low maintenance costs and fast installation. In most cases, composite decks are connected using tongue and groove type, which results in time consumption and costly connection work. To enhance constructability of deck connection, composite deck having snap-fit connections has recently been developed. The snap-fit connection enables easy assembly and disassembly of the composite deck, which provides a significant advantage compared to those of the conventional connection methods.

After laminate design and extensive structural analysis for the pedestrian load, the snap-fit composite deck is fabricated by pultrusion. Various structural performance tests are also carried out for the pultruded deck to verify structural safety. This paper introduces some of the successful applications to pedestrian bridges in Korea. Due to significant advantages of the developed composite deck, increasing numbers of applications are currently underway in Korea.

Keywords: GFRP; fiber reinforced; composite deck; snap-fit connection; pultrusion; pedestrian bridge; walkway expansion.

1. Introduction

To cope with the problems of deterioration and corrosion in conventional steel and concrete materials, highly durable and lightweight fiber-reinforced polymer (FRP) composites are considered to be one of the most promising alternative materials for civil infrastructures. Among the FRP composite applications, glass-fiber-reinforced polymer (GFRP) composite decks for bridges are particularly notable.

The GFRP composite decks for pedestrian bridges have significant advantages compared to conventional concrete, steel and wood decks, as they are highly durable and corrosion free. Due to this reason they will provide much longer service life and lower maintenance costs, which will in most cases, result in much lower life-cycle costs (LCC). The light weight of GFRP composite decks reduces dead load compared to conventional deck materials. With the reduced dead load, substructures can be slimmer for bridges. It can be economically used for the walkway expansion of existing bridges due to its lightweight characteristics, enabling expansion of the walkway without strengthening existing structures underneath. Furthermore, since it can be installed easily and quickly, there is a significant reduction in the duration of construction.¹

Korea has become one of the leading countries in the construction of composite deck bridges. Up to 2011, more than 13 traffic bridges and 23 pedestrian bridges with GFRP composite decks have been built.² In this paper, some of the most notable cases for pedestrian bridges are introduced.

The most renowned case of the application is the walkway expansion of the Hangang Grand Bridge in Seoul. In 2008, the 1.7 km-long walkway of the bridge was successfully expanded from a width of 2.5m to 5.0m by replacing the existing concrete decks with the developed composite decks with