

Performance Evaluation of Concrete Bridge Deck Reinforced with GFRP Rebars

Young-Jun You^{1,2}, Ji-Sun Park², Young-Hwan Park², Hyeong-Yeol Kim²

Summary

Reinforced concrete is the most commonly utilized material in the construction of structures and facilities, of which steel reinforcing bar has a long history owing to its effectiveness and cost efficiency as concrete reinforcement. However, when the structure is exposed to aggressive environmental conditions like de-icing salts, industrial chemicals, and combinations of moisture, corrosion occurs, which accelerates the deterioration of the structure and the loss of its performances and serviceability, and finally, leads to tremendous maintenance costs. In Korea, the exploitation of FRP composite materials in the construction field started in the mid of the 1990s typically through the use of glass or carbon fiber sheets for the strengthening of deteriorated concrete structures. Since 2003, KICT (Korea Institute of Construction Technology) has developed a FRP reinforcing bar for concrete structures. It consists of glass fiber and vinyl-ester resin. It is fabricated by modified pultrusion method and has deformations of spiral type. The developed GFRP rebar shows tensile strength of more than 1,000 MPa. This paper describes a study to replace the steel reinforcement with GFRP reinforcing bars as an alternative solution. The study investigated the behaviour of full-scale bridge decks with the depth of 240 mm, the width of 3,000 mm, and the length of 4,000 mm. Below is the tested deck and a deck reinforced with conventional steel reinforcements was tested for the comparison with the fully GFRP reinforced one. Tests were performed using a concentrated load to simulate the truck wheel load. From the test results for maximum load capacity, deflection, and maximum crack width, it was concluded that GFRP reinforcements could be used as an alternative for steel rebars in bridge deck.

keywords: GFRP bars; Rebar; Concrete deck; Punching

¹Corresponding author, Tel.: +82-31-910-0052; Fax: +82-31-910-0121; E-mail address: yjyou@kict.re.kr

²Korea Institute of Construction Technology, 2311 Daewha-Dong Ilsan-Gu Goyang, Gyeonggi-Do 411-712, Republic of Korea

