



Development of ductile cast-iron bridge slabs for onsite replacement

Shinsuke Akamatsu

Chief Researcher, Hanshin Expressway Research Institute for Advanced Technology, Osaka, Japan

Hironobu Tobinaga

Section Manager, R&D Center, Hinode, Ltd., Saga, Japan

Kunihiro Oshima

Manager, Taisei Corporation, Tokyo, Japan

Norihiro Nohara

Engineering & Development Office Manager, SATO TEKKO CO., LTD., Toyama, Japan

Contact: shinsuke-akamatsu@hit.or.jp

Abstract

Most of the road bridges in Japan were constructed in the 1960s and 1970s, and many of them have been in service for more than 50 years. The reinforced concrete slabs of such bridges have been damaged and deteriorated by heavy traffic. Although these slabs have already been reinforced with steel plates, they have deteriorated further and need to be replaced.

The renewal of reinforced concrete slabs leads to increase of dead load, the fatigue damage at welds has not been completely solved in the case of steel slabs, and the social loss due to long-term road closures at the renewal construction of the slabs on urban highways. Therefore, there is an urgent need to develop an alternative slab that is lighter in dead weight, has good fatigue resistance, and can be installed rapidly.

The proposed slabs in this paper are made of ductile cast-iron instead of mild steel. Ductile cast-iron bridge deck can be light-weighted like mild steel, can show high fatigue resistance with improved residual stress and detail by integrally forming into complex shapes, and can be rapidly installed to the existing bridges by bolts.

The Hanshin Expressway has been conducting research and development for the practical application of ductile cast-iron slabs. This paper will introduce a ductile cast-iron deck, and will show the study results of the details of the slab panels, the slab-to-slab connection method, and the slab-to-girder connection method.

Keywords: ductile cast-iron bridge deck; slab renewal; connection method; construction method