An Economical Composite Girder Bridge Using Rolled Steel H-Section

Mohammad Hamid Elmy and Shunichi Nakamura

Tokai University, Hiratsuka, Japan

Contact: snakamu@tsc.u-tokai.ac.jp

Abstract

The bridge using rolled steel H-section seems very economical compared with the welded plate girder bridges due to lower material and fabrication cost. On the other hand, as the maximum web height is 900 mm, the applicable span length of the girder bridge with rolled H-section is up to 20m or 25m. A new composite girder bridge was proposed using rolled steel H-section. The superstructure is a continuous girder with rolled steel H-section and the RC slab, and the substructure is RC pier. The girder and the pier are rigidly connected by concrete and reinforcements. This new SRC bridge is basically the multi-span rigid frame structure: the steel/concrete composite girder resists at the span-center, and the steel girder covered by RC section resists at the rigid joints. The proposed SRC bridge increases the span length up to 50m, and its construction cost is much lower than the conventional plate girder bridge.

Keywords: Rolled steel H-beam; compact section; limit states design; experimental investigation; non-linear analysis.

1 Introduction

The bridge using rolled steel H-section is expected to be economical compared with the welded plate girder bridges due to lower material and fabrication cost for short span bridges. Besides, the rolled steel H-section is a compact section and has favorable bending characteristics and no need for stiffeners. However, as the maximum available web height of the rolled H-sections is 900mm, the applicable span length for simple span is up to 20m and for continuous spans up to 25m.

A new composite girder bridge was proposed using rolled steel H-section (Figure 1.) [1]. The super-structure is a continuous girder with rolled steel H-section and the RC slab, and the substructure is RC piers. The girder and the pier are rigidly connected by concrete and reinforcements. The proposed SRC girder with the rolled H-section could extend the applicable span length up to 50m. When the bridge has a continuous form, the area around the intermediate supports is always more critical than that of span center. Hence the rolled H-beams are strengthened around the intermediate supports by covering the joint with reinforced concrete, which forms SRC and increase the bending capacity.

A rolled H-girder has high ultimate strength with good ductile property, attains full plastic moment and is regarded as the compact section. The deflection of the SRC Bridge due to the design live load is expected to be small and satisfy the serviceability limit state. The super-structure is rigidly connected to the pier and seems to have better performance against earthquakes. A trial design and experiments were conducted in this study, showing that the proposed SRC bridge using rolled H-section is feasible and economical.

https://doi.org/10.2749/stockholm.2016.1972