



Weldability and post-welding fatigue strength of older railway bridges

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Abstract

Steel railway bridges in Japan were built in large numbers following the standard design established in 1885, and many older steel bridges are still in service today. One standard structure is that of an I-beam bridge with an I-beam main girder. One typical damage of these bridges is the fatigue crack, occurring near the radius of the bottom edge of the girder plate just above the fulcrum, propagating parallel to the bottom flange in an axial direction. The authors considered welding as a countermeasure for such cracks, but the guidelines for repair and strengthening of steel railway bridges in Japan do not provide details for welding steel members of steel bridges manufactured before 1940. In this study, we examined six bridges constructed in different years between 1889 and 1932, and after confirming their weldability, fatigue tests were conducted on butt welded joints made from their steel material to confirm fatigue strength.

Keywords: older steel railway bridges; repair; welding.

1 Introduction

Steel railway bridges in Japan date back to the later part of the 19th century, when a large number were built starting with a standard structure designed by British engineer Charles Pownall in 1885, and many of these older steel bridges are still in service today.

One standard structure is the I-beam bridge with an I-beam main girder, as shown in Figure 1. I-beam bridge construction is shown in blueprints and six bulletins published by railway agencies from 1897 to 1931 [1], and in the 1966 National Railway Standard Design [2]. These bridges reflect the establishment and revision of the Specifications for