



Retrofit Engineering for Steel Bridge Structures in Japan

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Summary

The cases of fatigue damage, repair and retrofit applied are presented. The causes of fatigue damage are categorized as follows. (a) welding defects were remained during fabrication, (b) inappropriate structural details of low fatigue strength were adopted, (c) stresses and deformations unforeseen in design occurred at joints of members (d) structures behavior in a manner not expected, such as vibration due to wind. Case studies include girder bridges, orthotropic steel bridge decks, steel bridge pier structures and others.

Keywords: fatigue, retrofit, repair, improvement

1. Introduction

A number of steel bridges have been suffering fatigue cracking which sometimes resulted in brittle fracture since sixties of the last century. The occurrences of these accidents have been increasing more and more. How to manage fatigue related problems have been important and urgent assignment to bridge engineers.

Since elements of the social infrastructure are constructed in order of demand, major roads and rail lines were provided first. In other words, the greater the importance of the line under bridges are built, the earlier the technology used to built it, moreover, the bridges are likely to be subject to greater loads. These are vital data from the view point of bridge maintenance, particularly, fatigue and fracture control of steel bridges, and bridge engineers involved in the maintenance of bridges must be aware of them.

This paper introduces the cases of fatigue damage, the repair and retrofit methods applied. Because the causes of failures and repair measures for the cases are often referred from the repair cases reported in the past, it is very useful to obtain knowledge from the past case studies and it is expected that such accumulated information will be of use in the maintenance technology.

The causes of these are widely varied, relating with design construction and maintenance. The causes of fatigue of steel bridges may be categorized as follows:

- (a) Welding defects were included at the time of fabrication.
- (b) An inappropriate structural detail of low fatigue strength had been adopted.