

The Fatigue Research on Long Span Steel Bridge for High Speed Railway in China

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Abstract

The paper firstly describes the application of a new type of structures to long span steel bridges for high speed railway in China, and then mainly introduces the technique research of fatigue design for long span steel bridges. The research includes two parts. One is fatigue load research on the new type of long span railway steel bridges, the other is fatigue strength on the new type of structure details. Through systematic investigation of fatigue load and fatigue strength with long span railway steel bridges, the fatigue load regulation factors are obtained. Based on the fatigue test results with more than 40 new kinds of structure details, the S-N diagrams are also obtained. The research results play an important part in the technology upgrade for the design of long span railway steel bridges in China.

Keywords: fatigue; long span; steel bridge; high speed.

1 Introduction

With the rapid economic development for China, there is also construction development of high speed railway in recent years. At the same time, numerous long span steel bridges have been built. For example, the Nanjing Dashengguan Bridge, a steel arch bridge with main span of 336 m, is on Beijing-Shanghai high speed railway line. There are four railway lines and two metro lines on the bridge. The bridge span is much longer and there are multi-lines on the bridge. Thus, new structure type and structure details are demanded. Since fatigue failure will cause huge disaster, fatigue is always the important topic of research in the field of steel bridges, especially for the new type of great steel bridges. To solve the new design problems, a series of researches must be made for the key technique of fatigue design.

For the fatigue load research on new type of long span railway steel bridges, based on the investigations of transport capacity and calculation by some analyses model, the fatigue factors of railway steel bridge with four or more lines were studied by the probability statistics and calculation method. For the fatigue strength on new type of structure details, three kinds of structure have been studied, and more than 40 new kinds of structure details have been experimentally studied. The research results have been used in the design of long span steel bridges for high speed railway, and some research results are also accepted by fatigue design code.

2 Fatigue load research

The Fatigue load of the long span bridge is more complex than ever before, with the rapid change of railway industry in China. There are usually several lines on a long span bridge, and various