

Structural Performance of Large Timber King Post Truss Highway Bridge

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Hideyuki Honda, born 1950, received his civil engineering degree from the University of Kyoto, Japan. He was a chairman of the timber bridges committee of JSCE from 1998 - 2005. His main area of research is related to structural performance and design method of modern timber bridges by field test and three dimensional static and dynamic structural analyses.

Summary

The bridge (Karikoboze Bridge) objected in this study is glulam timber king post truss highway bridge constructed in 2003, and is largest scale in the world. The main design geometry is as, span length: 48.2 m, truss height: 24.1 m, clear width: 7.0 m, and stress glulam slab: 0.33 m. The bridge length is 140 m (truss: 25m + truss: 50m + truss: 50m + girder: 15m). For the purpose such as (1) inspection of design factors and safety, (2) evaluation of structural rigidity, (3) investigation of environmental vibration problems under traffic loading and (4) store of initial data for maintenance, the static and dynamic field tests of the bridge with two dump trucks were done in July of 2003. The structural characteristics and performances on static and dynamic behaviours were investigated in the terms such as deflection, response vibration, dynamic characteristics, dynamic increment factor and vibration serviceability. Furthermore, three dimensional static and eigenvalue analyses of the bridge were also done by FEM of MSC/NASTRAN. This study investigates the structural characteristics and performances based on the field tests and the analyses.

Keywords: timber king post truss bridge; highway bridge; static field test; dynamic field test; static behaviour; dynamic behaviour; 3 dimensional analysis; structural rigidity; structural performance.

1. Introduction

The investigation on static and dynamic characteristics of modern timber bridges using glulam is necessary for the design, serviceability and maintenance problems. However, the basic data by field test and structural analysis for such problems of the bridges is not sufficient worldwide. Therefore, I have done investigated structural performance measured by field test and structural analysis of about 23 modern timber bridges from 1993, for example as deck arch highway bridge [1], half through highway bridge [2] and three spans continuous girder pedestrian bridge [3].

Karikoboze Bridge objected in this study is shown in Fig. 1 to Fig. 4. The span length of large truss bridge is 48.2 m. The Truss height is 24.1 m. The clear width is 7.0 m. The cross section of upper

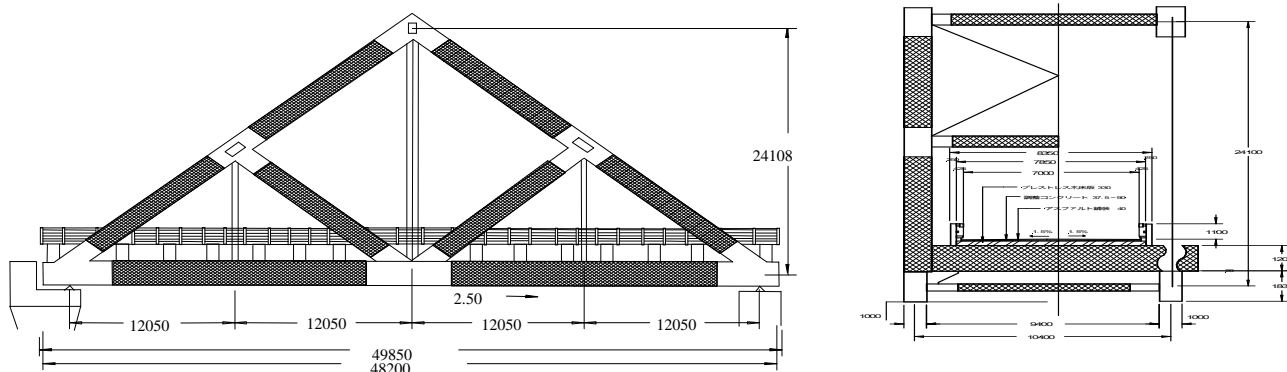


Fig. 1: General drawing of Karikoboze Bridge