



## Dynamic performance of timber truss pedestrian bridge used steel ball joint

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Hideyuki Honda, born 1950, received his doctor engineering degree from the Kyoto University, Japan. 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 pedestrian bridge of panelled chord truss objected in this study is under consider, and cost curtailment of the steel ball-joint is expected. The purpose of this study is to evaluate analytically dynamic performance and vibration serviceability of the timber truss pedestrian bridge with steel ball joint. The eigenvalue analysis was conducted by FEM based on three-dimensional analysis model, and then dynamic performance of this bridge was investigated. The three dimensional dynamic response analysis by walking of pedestrian was performed, and the vibration serviceability was investigated. After the vibration serviceability of this bridge had been grasped, the methods for vibration reduction such as boundary conditions at supported point and set of TMD were performed analytically, and the improvement of vibration serviceability of this bridge was investigated.

Keywords: Timber truss pedestrian bridge; dynamic performance; vibration reduction; vibration serviceability.

### 1. Introduction

The steel ball joint typed bridge shows a bridge of structural form using steel ball joint at panel points of truss. The laboursaving of construction can be more possible for the bridge with this structural form than the usual truss bridge. Moreover, the replacement of only member which carry out decay is possible, and maintenance also becomes readily. However, those bridges which are constructed in Japan and Germany have many curved chord truss, and the steel ball joint becomes an expensive. The bridge of panelled chord truss objected in this study is under consider, and cost curtailment of the steel ball joint is expected. The steel ball joints of 148 are used. The analytical study on dynamic performance for timber pedestrian bridges is not almost carried out worldwide. The purpose of this study is to evaluate analytically dynamic performance and vibration serviceability of the timber truss pedestrian bridge with steel ball joint.

In Japan, there is the rule of frequency limit that it may not go into the range whose fundamental frequency of pedestrian bridge is 1.5 Hz - 2.3 Hz. As the results of eigenvalue analysis, this bridge has high odds of going into this range, and can consider odds of giving uneasy to pedestrian's walking. Then, the three dimensional dynamic response analysis by walking of pedestrian was performed, and the vibration serviceability was investigated. After the vibration serviceability of this bridge had been grasped, the methods for vibration reduction such as boundary conditions at supported point and set of TMD were performed analytically, and the improvement of vibration serviceability of this bridge was investigated.

### 2. Objected bridge