



Design and Experimental Study of Steel Box-Concrete Filled Steel Tube Composite Cable Tower

Wang Rengui, Wei Leyong, Yan Zhifa

CCCC HIGHWAY CONSULTANTS CO.LTD., Xicheng City, BeiJing, China

Fan Jiansheng, Zhang Chong

Department of Civil Engineering, Tsinghua University, Beijing 100084, China

Li Hongtao, Ruan Jing, Lin Haifeng, Dai Junping, Zhao Feng

Jiangsu Provincial Transportation Engineering Construction Bureau, Jiangsu, China

Contact: fgcfqh@163.com

Abstract

Steel box-concrete filled steel tube (BCFST) composite tower is a new type of tower structure proposed to be used in super-span suspension bridges. BCFST comprises of four concrete-filled steel tube (CFST) columns inside and a steel box outside. CFSTs and the steel box are connected with each other by steel webs and diaphragm plates. In this study, the combined compressive and bending loading experiments of the BCFST were conducted, and the ability of the composite tower section to deform together was studied. The experiment showed that the bottom section of the composite tower deviated from the plane section after deformation, and the other sections approximately maintained the plane section after deformation. The calculation method of the compression-bending capacity of the composite cable tower was proposed, which can provide a reference for the application of the composite tower in practical engineering.

Keywords: composite tower; concrete filled steel tube; lattice column; plane section assumption; compression-bending capacity.

1 Introduction

Concrete-filled steel tube (CFST) has the advantages of high bearing capacity, good seismic performance, and convenient construction. It has been used more and more in domestic high-rise buildings and long-span bridge towers. However, as the building height and bridge span continue to increase, the size of the components also continues to increase. However, due to the

limitations of processing and construction, the size of a single CFST cannot be too large, so the CFST lattice column is gradually applied in engineering. When CFST lattice column is applied to the cable tower of a super-span suspension bridge, the aerodynamic shape of the tower itself needs to be considered. Therefore, this study proposed a new type of cable tower, a steel box-concrete filled steel tube (BCFST) composite tower. BCFST comprises of four CFST columns inside, which