

Seismic Retrofit of Tokyo Tower

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Summary

The Tokyo Tower, a popular tourist spot, is a television tower with a broadcast radius of 100 km in the Kanto region of Japan. In 2003, the tower had begun ground-wave digital broadcasting. This new service required the installation of a new antenna and transmitter room, which had increased the dead weight of the tower by approximately 10%. The increased dead weight will amplify the seismic responses of the tower, which was designed under the former aseismic design code. To control these seismic responses and ensure the safety in the current code, it was decided to reinforce the tower using vibration control dampers.

Due to the effect of the dampers, the story shear force responses, particularly at the location where the damper is installed, are reduced by 20-30%, and the stresses in the columns (induced by bending moments) and the diagonal members (induced by story shear forces) at the middle levels of the tower become lower than the elastic limit, which means that this method effectively reduces seismic responses using only a fraction of the dampers.

This document also describes the reinforcement of the tower body as part of the digitization work, and the painting of the tower body as part of the maintenance work.



Fig. 1. (1958 and Present)

Keywords: retroaction to current seismic design code; long life; vibration control dampers; predominant flexural deformation; environmental preservation; Tokyo Tower

1. Introduction

The tower was designed by Nikken Sekkei Komu Co., Ltd., (presently Nikken Sekkei Co., Ltd.) under the editorship of Tachu Naito (a professor at Waseda University at that time), and constructed by Takenaka Corporation in 1958. The tower rises 333 m and is topped by an analog television broadcasting antenna, called a super-gain, which begins at a height of 250 m above the