An Experimental Study on Seismic Performance of Concrete-Filled Steel Piers

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Abstract

Cyclic loading experiments for SM570 steel piers filled with concrete were carried out to obtain basic data on the seismic performance. On the basis of the survey results of the existing steel bridge piers of the Tokyo Metropolitan expressway in Japan, model parameters, such as axial-force ratio and slenderness ratio were selected in consideration of effect on seismic performance, especially ductility after yielding. Furthermore, a design method for retrofitting existing SM570 steel piers designed according to an old design code was investigated based on the deformation performance obtained in the experiment.

 Keywords: rectangular section, SM570, seismic performance

1 Introduction

In previous studies, [1-5], several methods for evaluating the seismic performance of steel piers have been proposed. Among them, the seismic performance evaluation method for rectangular-section concrete filled steel bridge piers made of SM400, SM490, and SM490Y (tensile strength 400, 490, and 490 N/mm^2, respectively) standardized in Japanese Industrial Standard (JIS) has been specified in the Japanese seismic design code, [6-8], based on past extensive experimental and numerical researches after Hyogo ken Nanbu Earthquake, [9].

On the other hand, there is little information on the seismic performance of rectangular section concrete filled steel bridge piers of SM570 (tensile strength 570 N/mm^2 : High Tensile Strength Steel) steel grade in JIS. However, a large number of SM570 steel bridge piers exist in Japan, which were designed before Hyogo ken Nanbu Earthquake within the elastic range by using the relatively small design earthquake ground motion. In addition, SM570 steel is higher strength, but