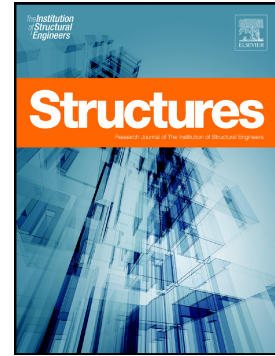


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Hiroyuki Nakahara, Hao Yin

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## Self-Centering Capacity of a Structural Frame Composed of Steel-Jacketed Concrete Columns and Steel Beams

Hiroyuki NAKAHARA<sup>1</sup> and Hao YIN<sup>2</sup>

*1. Graduate School of Engineering, Nagasaki University, Nagasaki, Japan*

*E-mail: nakaharahiroyuki@nagasaki-u.ac.jp*

*2. Department of Engineering, A Plus Design Consultancy Co., Ltd., Sichuan, China*

*E-mail: yinhao7176@163.com*

### Abstract

A structural frame composed of steel-jacketed concrete columns and steel beams with damage control capacity has been studied for the structural performances through the experiments. Four specimens, which were 1/3 scaling model of cruciform subassemblies, were made and subjected to cyclic force in order to be investigated on its self-centering capacities mainly. The test results showed that this structure remained lower damage after the cyclic loading test than the normal reinforced concrete structure. The load carrying capacities of the specimens were estimated through full plastic moment of the section of the column by taking into consideration of the confining effect of concrete jacketed by steel tube.

### 1. Introduction

In 1995, Hyogo-ken Nanbu Earthquake attacked Kobe City in Japan and killed more than six thousand people. Although the earthquake broke down some buildings completely, most of reinforced concrete buildings remained with slight damages. The remained buildings were, however, removed because of its residual deformations and apparent cracks. To decrease the number of removed buildings which still possessed enough seismic performances, many researchers focused on the damage control for the buildings after earthquakes.

The damage control capacity includes the reducing the residual deformation and the preventing the noticeable cracks, which bring users anxieties to collapse the building. Based on the purpose of making the damage controlled building, the authors proposed structural frame which was composed of steel beams and concrete columns jacked by steel tubes referred to the experimental work by Yoshimura [5], who showed that the jacketed concrete column possessed efficient ductility. The column included diaphragms to connect steel beams. The cruciform specimen was made by combining the pre-casted column and steel beams each other by bolts.

There are many papers which focused on the self-centering behaviors of many kinds of structural types. These studies are summarized and overviewed by Pessiki [1] which reviews 55 references about the studies of self-centering behaviors mainly conducted by researchers in Lehigh University. The post-tensioned concrete wall was investigated by Seo et.al. [3]. The post-tensioned steel connections by Ricles et.al. [2]. Our test specimens include these typical features: 1) steel-jacketed concrete columns which fail in flexure were used, 2) new diaphragm was proposed and used, 3) there is no longitudinal bar but tensile tendons which

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