Evaluation of Seismic Capacity related to Damage Degree for Repaired Reinforced Concrete Members

Kazushi TAKIMOTO
Senior Research Engineer
Shimizu Corporation
Tokyo, Japan
k.takimoto@shimz.co.jp

Tadatomo WATANABE
Vice-President
Hokubu Consultant Co.LTD
Sapporo, Hokkaido, Japan
chuho@hokubu-c.co.jp

Tatsuya NIHEI
Researcher
Hokkaido Railway Company
Sapporo, Hokkaido, Japan
t-nihei@jrhokkaido.co.jp

Terukatsu SASAYA
Deputy Manager
Fujita Corporation
Atsugi,Kanagawa, Japan
sasaya@fujita.co.jp

Satoshi TSUCHIYA
President
Coms Engineering Corporation
Tokyo, Japan
satoshi@comse.co.jp

Natsuo HARA
President
Shinka Shokuhin Co.LTD
Tokyo, Japan
nhara@shinka-s.co.jp

Yukihiro TANIMURA
General Manager
Railway Technical Research Institute
Kokubunji, Tokyo, Japan
tanimura@rtri.or.jp

Masaru OKAMOTO
Senior Researcher
Railway Technical Research Institute
Kokubunji, Tokyo, Japan
dai@rtri.or.jp

Summary

This paper describes the evaluation of seismic capacity related to damage degree for repaired reinforced concrete members, based on experimental results of lateral cyclic loading tests with column specimens. The analytical seismic capacity evaluation of repaired reinforced concrete members was also investigated.

The following conclusions have been obtained from this study. The ductility of repaired RC members was significantly affected by the buckling of the longitudinal reinforcing bars in the primary loading. The mechanical behaviors of repaired RC members can be analyzed by considering damage history and repairs. The initial stiffness of repaired RC members can be calculated using stiffness reduction ratios. The maximum strength of repaired RC members can be calculated by considering the strain hardening of the longitudinal reinforcing bars.

Keywords: restorability, damage degree, repair effect, reinforced concrete members, seismic capacity, buckling, initial stiffness, maximum load

1. Introduction

Recently, specifications and guidelines for reinforced concrete (RC) structures have shifted to a performance-based design system in Japan. Restorability is one of the basic performance requirements in the performance-based design, the same as safety and serviceability. Restorability is a performance requirement that confirms easy recovery of performance if local failure of a structure occurs due to an accidental action, such as an earthquake of an unusually high magnitude. It is necessary to evaluate the damage degree to a structure by an earthquake, and evaluate the repair effect.

Since the mechanical properties of repaired RC members have not yet been well studied, this paper investigates the damage degree and the repair effect of RC members, using cyclic loading test results relating to the repair effect. We also perform frame analysis for repaired RC members, and compare the analytical results with the experimental results. In addition, we proposed a calculation method for initial stiffness and the maximum strength of repaired RC members.

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