INTISARI

Pergerakan lempeng menyebabkan aktivitas kegempaan masih cukup sering terjadi di Indonesia. Oleh karena itu, banyak bangunan mengalami kerusakan dan diharuskan untuk dapat segera beroperasi kembali, sehingga dibutuhkan penanganan yang efektif dan efisien. Metode retrofitting yang diterapkan pada penelitian ini terbuat dari poliester resin sebagai bahan pengikat tunggal (selain penggunaan semen sebagai kontrol benda uji). Masalah yang dibahas adalah tentang mempelajari efisiensi dan kelayakan beton resin dalam meningkatkan kinerja seismik dari sambungan balok-kolom.

Dalam rangka mencapai tujuan, sebanyak tiga buah benda uji sambungan balok-kolom interior beton bertulang difabrikasi. Kolom memiliki penampang persegi berukuran 300 mm dengan panjang bentang sebesar 3500 mm, sedangkan balok memiliki penampang persegi panjang berukuran 170 mm x 300 mm dengan panjang bentang sebesar 1800 mm pada tiap bentang. Metode pengujian dan kriteria penerimaan mengacu pada ACI T1.1-01. Pertama, seluruh benda uji awal diuji hingga mencapai salah satu dari kriteria kerusakan yang telah diisyaratkan. Setelah itu, benda uji tersebut di-retrofit dengan menggunakan beton normal (BKMR-2) dan beton resin (BKMR-1 dan BKMR-3). Seluruh benda uji yang telah di-retrofit diuji hingga mencapai tahap pembebanan siklus maksimum. Hasil data pengujian kemudian dianalisis untuk memperoleh nilai hysteretic loops, envelope curve, equivalent energy elastic-plastic curve, hysteretic energy, potential energy, equivalent viscous damping ratio, stiffness, ductility, seismic response modification factor (R), dan pola retak.

Hasil penelitian menunjukkan bahwa beban maksimum yang dicapai oleh benda uji BKMR-1 dan BKMR-3 pada respon negatif secara berurutan meningkat sebesar 22.5% and 14.1%, sedangkan pada respon positif secara berurutan meningkat sebesar 21.9% and 10.9%, dibandingkan dengan benda uji BKMR-2. Jumlah total energi yang terdisipasi oleh benda uji BKMR-1 dan BKMR-3 lebih besar dari benda uji BKMR-2. Selain itu, kekakuan elastis dari benda uji BKMR-1, BKMR-2, dan BKMR-3 pada respon negatif secara berurutan meningkat sebesar 43.3%, 17.4%, and 15.2%, sedangkan pada respon positif secara berurutan meningkat sebesar 40.1%, 43.7%, and 7.5%. Berdasarkan hasil analisis dengan menggunakan SAP 2000, benda uji BKMR-1, BKMR-2, dan BKMR-3 secara berurutan mampu menahan 5.65, 4.67, 5.16 kali beban gempa yang didesain menurut SNI 1726:2012. Oleh karena itu, dapat disimpulkan bahwa metode retrofitting yang diusulkan mampu meningkatkan kekuatan sambungan. Beton polimer (beton resin) menyajikan beberapa keunggulan antara lain: waktu pengerasan yang cepat, kekuatan yang tinggi, permeabilitas yang sangat rendah, meningkatkan serangan terhadap zat kimia, dan durabilitas yang tinggi. Akan tetapi, dalam penerapannya memiliki beberapa kerugian antara lain biaya yang tinggi.

***Kata kunci**: Sambungan balok-kolom; Retrofitting; Beton Resin; Beton Polimer; Pengkajian kinerja seismik; Gempa.*

ABSTRACT

The plate movement causes the seismic activities are still fairly common occurred in Indonesia. Therefore, many of the buildings were damaged and they should be back in operation immediately, thus the effective and efficient treatments are needed. The retrofitting method applied in this study is made by polyester resins as single binder (beside the use of cement as control specimen). The problem being addressed is by studying the efficiency and suitability of the resin concrete to improve the seismic performance of beam-column joints.

To meet the objectives, three interior reinforced concrete beam-column joint specimens were constructed. The column had a 300 mm square section with length of 3500 mm, while the beams had 170 mm by 300 mm rectangular section with length of 1800 mm in each span. The testing method and acceptance criteria refer to ACI T1.1-01. First, all the pre-retrofit specimens were tested until achieving one of the damage criteria that had been prescribed. Then, these specimens were retrofitted using normal concrete (BKMR-2) and resin concrete (BKMR-1 and BKMR-3). All the retrofit specimens were tested until achieving the maximum cyclic loading stage. The experimental data were then analyzed to obtain hysteretic loops, envelope curve, equivalent energy elastic-plastic curve, hysteretic energy, potential energy, equivalent viscous damping ratio, stiffness, ductility, seismic response modification factor (*R*), and crack patterns.

The results showed that the achieved maximum load of specimens BKMR-1 and BKMR-3 in the negative response increased by 22.5% and 14.1%, respectively, while in the positive response increased by 21.9% and 10.9%, respectively, compared to specimen BKMR-2. The total amount of energy dissipated by specimens BKMR-1 and BKMR-3 were greater than the specimen BKMR-2. In addition, the elastic stiffness of specimens BKMR-1, BKMR-2, and BKMR-3 in the negative response increased by 43.3%, 17.4%, and 15.2%, respectively, while in the positive response increased by 40.1%, 43.7%, and 7.5%, respectively. Based on the analysis results generated using SAP 2000, specimens BKMR-1, BKMR-2, and BKMR-3 were able to withstand 5.65, 4.67, and 5.16 times the earthquake load designed according to SNI 1726:2012, respectively. Therefore, it could be concluded that the proposed retrofitting method was able to increase the joint strength. Polymer concrete (resin concrete) presents some advantages such as: rapid hardening, high mechanical strengths, very low permeability, improve resistance to chemical attack, and high durability. However, its application has some disadvantages, such as a high cost.

Keywords: Beam-column joint; Retrofitting; Resin concrete; Polymer concrete; Seismic assessment; Earthquake.