INTISARI

Penggunaan *CFRP* sebagai pilihan dalam revitalisasi komponen struktur saat ini sangat banyak digunakan dan dikembangkan. Perkuatan *CFRP* bertujuan untuk meningkatkan kapasitas lentur dan geser balok, namun pada penerapannya penambahan *CFRP* berpengaruh terhadap perubahan kekakuan dan pola keruntuhan balok tersebut. Frekuensi alami digunakan untuk menggambarkan perilaku dinamik dari komponen struktur dalam penelitian ini. Frekuensi alami struktur diambil dalam pengujian balok lentur dan geser.

Penelitian ini menggunakan enam buah benda uji yaitu tiga benda uji balok T dengan perkuatan *CFRP wrap* pengujian lentur (BC_l, BFR_1, BFR_2) dan tiga benda uji balok T dengan perkuatan *CFRP wrap* pengujian geser (BC_g, $BC1_g$, $BC2_g$). Data frekuensi diambil dalam empat kondisi pengujian bedasarkan waktu, yaitu kondisi awal, *firstcrack*, *CFRP* dan runtuh. Prosedur pengujian adalah pengujian frekuensi kondisi awal, pembebanan statis lentur/geser hingga retak awal, pengujian frekuensi kondisi *firstcrack*, perkuatan *CFRP* pada benda uji, pengujian frekuensi kondisi *CFRP*, pengujian beban berulang maksimum 30%, pengujian statis lentur/geser hingga runtuh, pengujian frekuensi kondisi runtuh.

Berdasarkan hasil pengujian, penambahan perkuatan *CFRP* meningkatkan nilai frekuensi alami benda uji BFR_1, BFR_2, $BC1_g$, $BC2_g$ berturut-turut sebesar 41,29%, 42,86%, 10,34%, 15%. Peningkatan frekuensi alami juga divalidasi dengan adanya peningkatan kekakuan benda uji BFR_1, BFR_2, $BC1_g$, $BC2_g$ berturut-turut sebesar 2,08%, 20,50%, 65,68%, 107,2%. Hasil pengujian lentur menunjukan benda uji tanpa perkuatan (BC_l) mengalami penurunan nilai frekuensi dari kondisi awal ke kondisi runtuh sebesar 29,8%, lebih besar dari benda uji dengan perkuatan BFR_1 (10,33%) dan BFR_2 (20,13%). Sedangkan, hasil pengujian geser menunjukan benda uji tanpa perkuatan (BC_g) mengalami penurunan nilai frekuensi dari kondisi awal ke kondisi runtuh sebesar 9,58%, lebih besar dari benda uji dengan perkuatan $BC1_g$ (7,10%) dan $BC2_g$ (6,74%). Berdasarkan data hasil pengujian, dapat disimpulkan bahwa terdapat peningkatan nilai frekuensi alami balok T dan penambahan kekakuan balok T akibat adanya penambahan perkuatan *CFRP wrap*. Perkuatan *CFRP wrap* dengan tujuan untuk meningkatkan kapasitas lentur dan geser balok T, juga meningkatkan frekuensi alami dan kekakuan balok tersebut.

Kata kunci: *CFRP*, Balok T, Frekuensi alami, Perkuatan

ABSTRACT

The use of CFRP as an option in revitalizing structure components today is very widely used and developed. CFRP strengthening aims to increase the bending and shear capacity of the beam, but in its application the addition of CFRP affects the changes in stiffness and the pattern of collapse of the beam. Natural frequencies were used to describe the dynamic behavior of structural components in this study. The natural frequency of the structure is taken in the testing of bending and shear beams.

This study used six test objects, that is three T-beam test objects with CFRP wrap of bending testing (BC_l, BFR_1, BFR_2) and threeT-beam test objects with CFRP wrap of shear testing (BC_g, $BC1_g$, $BC2_g$). Frequency data is taken in four time-based testing conditions, namely initial, firstcrack, CFRP and collapse conditions. Testing procedures are initial condition frequency testing, bending/shear static loading to initial cracking, firstcrack condition frequency testing, CFRP strengthening on test objects, CFRP condition frequency testing, 30% maximum repeating load testing, bending/shear static testing to collapse, collapsing condition frequency testing.

Based on the test results, the addition of CFRP strengthening increased the natural frequency value of test objects BFR_1, BFR_2, $BC1_g$, $BC2_g$ respectively by 41.29%, 42.86%, 10.34%, 15%. The increase in natural frequency was also validated by increased stiffness of test objects BFR_1, BFR_2, $BC1_g$, $BC2_g$ respectively by 2.08%, 20.50%, 65.68%, 107.2%. The results of the bending test showed that the test object without strengthening (BC_l) decreased in frequency value from the initial condition to the collapse condition by 29.8%, greater than the test object with a strengthening of BFR_1 (10.33%) and BFR_2 (20.13%). Meanwhile, the results of shear testing showed that the test object without strengthening (BC_g) decreased in frequency value from the initial condition to the collapse condition by 9.58%, greater than the test object with a strengthening of $BC1_g$ (7.10%) and $BC2_g$ (6.74%). Based on the test result data, it can be concluded that there is an increase in the natural frequency value of T-beams and the addition of stiffness of T-beams due to the addition of CFRP wrap strengthening. CFRP wrap strengthening with the aim of increasing the bending and shear capacity of the T-beam, also increases the natural frequency and stiffness of the beam.

Keywords: CFRP, T-beam, The Natural Frequency, strengthening