Studi eksperimen karakteristik dinamik balok beton dengan agregat daur ulang (RAC-Recycled Aggregate Concrete) di bawah pembebanan semi-siklik = Experimental study of concrete beam dynamic behavior with Recycled Aggregate Concrete (RAC) under semi-cyclic loading

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Abstrak

Balok merupakan elemen struktur yang utamanya menahan lentur dan geser dengan atau tanpa gaya aksial atau torsi. Tujuan penelitian ini adalah mengamati perubahan natural frekuensi terhadap pembebanan bertahap pada balok beton bertulang dengan agregat daur ulang. Studi dilakukan secara eksperimen, yakni menggunakan beton dengan agregat kasar daur ulang (kuat tekan fc’ 20,74 MPa). Balok yang digunakan berukuran 3000 × 150 × 250 mm3 yang diberi beban semi-siklik dengan metode pembebanan four-point loading. Pembebanan dilakukan dalam 4 siklus, yaitu siklus 2 ton, 4 ton, 6 ton, dan 8 ton. Respon struktur berupa grafik perpindahan vs beban dan waktu, regangan vs beban diolah dari hasil pengujian menggunakan Digital Image Correlation (DIC) dan pengukuran manual dengan LVDT, dial gauge, dan strain gauge. Karakteristik dinamik balok berupa frekuensi alami dan rasio redaman diperoleh dengan alat accelerometer. Hasil eksperimen tersebut dibandingkan dengan hasil perhitungan teoritis. Analisis menunjukan bahwa balok mencapai batas elastis pada beban 8000 kg. Frekuensi alami cenderung menurun terhadap penambahan beban, hal dikarenakan nilai kekakuan balok yang telah diberi beban akan turun akibat muncul retakan. Nilai rasio redaman pada balok RAC cenderung menurun terhadap penambahan pembebanan bertahap.

.....Beams are structural elements that primarily resist bending and shear with or without axial or torsional forces. The purpose of this study was to observe the natural frequency changes to the gradual loading of reinforced concrete beams with recycled aggregate. The study was conducted experimentally, using concrete with recycled coarse aggregate (compressive strength fc' 20.74 MPa). The beam used is 3000 × 150 × 250 mm3 which is given a semi-cyclic load with a four-point loading method. The loading is carried out in 4 cycles, namely 2 tons, 4 tons, 6 tons, and 8 tons. Structural responses in the form of graphs of displacement vs. load and time, strain vs. load were processed from the test results using Digital Image Correlation (DIC) and manual measurements with LVDT, dial gauge, and strain gauge. The dynamic characteristics of the beam in the form of natural frequencies and damping ratio were obtained by using an accelerometer. The experimental results are compared with the results of theoretical calculations. The analysis shows that the beam reaches its elastic limit at a load of 8000 kg. The natural frequency tends to decrease with increasing load, this is because the stiffness value of the beam that has been given a load will decrease due to cracks appearing. The value of the damping ratio in the RAC beam tends to decrease with the addition of gradual loading.