Kajian Permeabilitas, Kuat Lentur, dan Cepat Rambat Gelombang pada Roller Compacted Concrete (RCC) dengan 60% Fly Ash Sebagai Pengganti Komposisi Semen serta Beton Konvensional dengan Menggunakan Semen Portland Slag dan Semen Portland Komposit = Study of Permeability, Flexural Strength, and Ultrasonic Pulse Velocity of Roller Compacted Concrete (RCC) with 60% Fly Ash as a Substitute for Cement and Conventional Concrete Using Portland Slag Cement and Portland Composite Cement

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Abstrak

Penelitian ini bertujuan untuk menganalisis permeabilitas, kuat lentur (fr), cepat rambat gelombang (v), serta perkembangan cepat rambat gelombang pada sampel roller compacted concrete (RCC), beton konvensional dengan portland slag cement (PSC), dan beton konvensional dengan portland composite cement (PCC). Penelitian ini dilakukan menggunakan metode observasi laboratorium meliputi pengujian permeabilitas untuk menentukan ketahanan beton terhadap penetrasi air, pengujian kuat lentur untuk menentukan ketahanan beton terhadap gaya lentur, serta pengujian cepat rambat gelombang dengan metode non-destruktif yaitu pengujian ultrasonic velocity pulse (UPV). Hasil penelitian didapatkan koefisien permeabilitas beton RCC sebesar 27.865×10-6 cm/s; koefisien permeabilitas beton konvensional PSC sebesar 1.037×10-6 cm/s; dan koefisien permeabilitas beton konvensional PCC sebesar 9.739×10-6 cm/s menunjukkan bahwa semakin rendah permeabilitas beton, maka semakin baik kemampuannya dalam menahan tekanan air. Hasil penelitian didapatkan kuat lentur beton RCC dengan target fc’ 15 MPa sebesar 0.70 MPa; kuat lentur beton konvensional PSC dengan target fc’ 30 MPa sebesar 4.17 MPa; dan kuat lentur beton konvensional PCC dengan target fc’ 30 MPa sebesar 4.02 MPa menunjukkan bahwa kuat lentur meningkat seiring dengan peningkatan mutu beton. Hasil penelitian beton umur 28 hari didapatkan cepat rambat gelombang beton RCC sebesar 3365.67 m/s; cepat rambat gelombang beton konvensional PSC sebesar 4627.48 m/s; dan cepat rambat gelombang beton konvensional PCC sebesar 4702.41 m/s menunjukkan bahwa semakin tinggi cepat rambat gelombangnya maka menyatakan bahwa beton semakin padat dan semakin sedikit porositas beton. Dalam penelitian ini ditemukan adanya korelasi antara kuat lentur dan kecepatan rambat gelombang dengan persamaan empiris pada beton RCC yaitu fr = 0.0002v; persamaan empiris pada beton konvensional dengan PSC yaitu fr = 0.0009v; dan persamaan empiris pada beton konvensional dengan PCC yaitu fr = 0.0009v.

.....This research aims to analyse the permeability, flexural strength (fr), ultrasonic pulse velocity (v) and ultrasonic pulse velocity evolution of roller compacted concrete (RCC), conventional Portland Slag Cement (PSC) and onventional Portland Composite Cement (PCC) samples. This research was carried out using laboratory observation methods, including permeability testing to determine the resistance of concrete to water penetration, flexural strength testing to determine the resistance of concrete to bending forces, and ultrasonic pulse velocity testing using a non-destructive method, namely ultrasonic pulse velocity (UPV) testing. The results showed that the permeability coefficient of RCC concrete was 27.865×10-6 cm/s, the permeability coefficient of conventional PCC concrete was 1.037×10-6 cm/s, and the permeability

coefficient of conventional PCC concrete was 9.739×10-6 cm/s, indicating that the lower the permeability of concrete, the better its ability to resist water pressure. The results obtained flexural strength of RCC concrete with target fc' 15 MPa of 0.70 MPa; flexural strength of PSC conventional concrete with target fc' 30 MPa of 4.17 MPa; and flexural strength of PCC conventional concrete with target fc' 30 MPa of 4.02 MPa show that flexural strength increases with increasing concrete quality. The results of 28-day-old concrete research obtained ultrasonic pulse velocity of RCC concrete of 3365.67 m/s; ultrasonic pulse velocity of PSC conventional concrete of 4627.48 m/s; and ultrasonic pulse velocity of PCC conventional concrete of 4702.41 m/s show that the higher the wave propagation speed, it states that the denser the concrete and the less porosity of concrete. In this study it was found that there is a correlation between flexural strength and ultrasonic pulse velocity with the empirical equation for RCC concrete, fr = 0.0002v; the empirical equation for conventional concrete with PSC, fr = 0.0009v; and the empirical equation for conventional concrete with PCC, fr = 0.0009v.