

Abstrak

Dalam penelitian ini, size effect pada kekuatan geser balok beton tanpa agregat kasar diinvestigasi dengan membandingkan formula ACI 318-14, ACI 318-19, dan Eurocode 2. Spesimen balok beton memiliki lebar 6 cm, panjang 110 cm, rasio a/d 2,744, dan diameter agregat maksimum 0,6 mm. Tinggi balok divariasikan dari 6 cm hingga 18 cm dengan kuat tekan berkisar dari 58,51 MPa hingga 99,80 MPa. Balok diuji menggunakan pembebanan simetris dua titik, dengan dua batang longitudinal D16 dan tanpa sengkang. Dari analisis, ACI 318-19 memberikan prediksi terbaik, dengan strength ratio rata-rata ($SR = v_{test}/v_{code}$) sebesar 1,5086 dan COV sebesar 0,26. ACI 318-19 tidak menunjukkan trend menurun yang signifikan pada grafik SR vs kedalaman efektif dibandingkan dengan metode lain. Dari hasil plot tegangan geser ternormalisasi, $v\rho^{-1/3}(f'_c)^{-1/2}$, terhadap brittleness number, hasil pengujian menunjukkan perilaku size effect yang sesuai dengan hukum size effect Bazant dalam bentuk $v = 2,6\rho^{1/3}\sqrt{f'_c}(1 + \beta)^{-1/2}$ dengan $\beta = d/(25d_a)$. Untuk balok setinggi 18 cm, perilaku size effect cenderung mendekati mekanika fraktur elastis linear dengan asimtot miring sebesar $-1/2$.

Kata kunci: size effect, kekuatan geser beton, agregat kasar, Eurocode 2, ACI 318

Abstract

In this research, size effect on shear strength of concrete beams without coarse aggregates were investigated by comparing ACI 318-14, ACI 318-19, and Eurocode 2 formula. The concrete beam specimens have width of 6 cm, length of 110 cm, a/d ratio of 2.744, and maximum aggregate diameter of 0.6 mm. The beams depth was varied from 6 cm to 18 cm with compressive strength range from 58.51 MPa to 99.80 MPa. The beams tested using two-point symmetric loading, with two No.16 longitudinal bars and without stirrups. From the analysis, ACI 318-19 gives the best prediction, with average strength ratio ($SR = v_{test}/v_{code}$) of 1.5086 and COV of 0.26. ACI 318-19 didn't show significant downward trend on SR vs effective depth graph compared to other methods. From the plot of normalized shear stress, $v\rho^{-1/3}(f'_c)^{-1/2}$, against brittleness number, the test results shows size effect behavior that agrees well with Bazant's size effect law in the form of $v = 2,6\rho^{1/3}\sqrt{f'_c}(1 + \beta)^{-1/2}$ with $\beta = d/(25d_a)$. For beam height of 18 cm, the size effect behavior tend to approach the linear elastic fracture mechanics with inclined asymptote of $-1/2$.

Keywords: size effect, concrete shear strength, coarse aggregate, Eurocode 2, ACI 318