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Prediction of service deflection for ultra-high-performance fiber-reinforced concrete beams reinforced with GFRP bars

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Abstract: *The flexural behavior of ultra-high-performance fiber-reinforced concrete (UHPFRC) beams reinforced with internal glass fiber-reinforced polymer (GFRP) bars was experimentally investigated. Large–sized beams with four different reinforcement ratios (ρ = 0.53–1.71%) were fabricated and tested. All test beams maintained very stiff load-deflection response beyond the first cracking and satisfied the serviceability crack width criteria of ACI 440.1R and CAN/CSA S806 and deformability requirement by CAN/CSA-S6. Higher reinforcement ratio showed better flexural performances such as higher post-cracking stiffness, maximum moment capacity, ductility, and deformability. The effective moment of inertia equation from the current ACI 440.1R code, which is based on Bischoff's model, significantly overestimated the service deflections of UHPFRC beams with GFRP bars because of its inappropriate first cracking prediction and moment of inertia equation at cracked section. Therefore, alternative equations for predicting first cracking moment and moment of inertia of cracked section in strain-hardening zone for UHPFRC were suggested, and it was verified through comparison with the measured service deflections.*

Keywords: A. Glass fibres; C. Analytical modelling; Ultra-high-performance fiber-reinforced concrete

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