

Shear Behavior of Corroded RC Beams Considering Concrete Spalling Damage

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1 Abstract

Corrosion-induced concrete spalling damage and its effects on shear behavior of RC beams are investigated in the present study. An experimental test is proposed firstly to investigate the cracking and spalling of concrete covers induced by corrosion. Then, the effects of concrete spalling damage on shear capacity are clarified. Following, a simple model is proposed to quantify the section damage of concrete. And, a FE method is proposed to predict the shear behavior by considering the concrete spalling damage and bond degradation. Results show that steel corrosion induces firstly the cracking of concrete and then the spalling of concrete as the corrosion loss exceeds about 20%. The spalling angles is found to vary from 17° to 22° in present test. The slight corrosion loss less than 10% in stirrups and inclined bars has little effect on the degradation of shear capacity. The further corroded stirrups and inclined bars, and the accompanied concrete spalling damage decreases the shear capacity significantly. The proposed FE model by considering corrosion-induced steel area loss, concrete spalling damage and bond degradation has reasonable accuracy for shear behavior prediction of beams.

Keywords: RC beams; shear behavior; corrosion; concrete spalling damage; numerical simulation.