J Steel Struct Constr 2017, 3:3(Suppl)
DOI: 10.4172/2472-0437-C1-006

A new concept of crack analysis of reinforced concrete members

Gintaris Kaklauskas
Vilnius Gediminas Technical University, Lithuania

The current study proposes a new concept of crack analysis of reinforced concrete (RC) members. The novel philosophy behind the proposed concept is to establish the mean crack spacing and width through the compatibility of the stress-transfer and mean deformation approaches by equating the mean strains of the tensile reinforcement defined analytical techniques. The concept considers primary cracks at the stage of stabilised cracking assuming that a single RC block of a length of the mean crack spacing represents the averaged deformation behaviour of the cracked member. Based on the experimental evidence, reinforcement strain within the block is characterized by a strain profile consisting of straight lines. The latter represent three different zones that are described by different bond characteristics. Crack spacing is defined as the sum of lengths of these zones within the length of the block. The proposed concept holds the features of a simplicity and mechanical soundness: it involves the least amount of empiricism and is devoid of empirically established effective area of concrete. Aside from the predictive capabilities, the model proposes a tool for constitutive modelling. A preliminary statistical analysis of mean crack spacing using limited test data has demonstrated good predictive capabilities of the model resulting in 15% of the coefficient of variation. The proposed approach allows a critical assessment of the classical bond theory in regard to its fundamental statement relating crack spacing to / ef ratio. A preliminary study has shown that the larger are the member's section depth and the reinforcement ratio, the more the classical approach deviates from reality. It can be deduced that crack spacing is mostly governed by four geometrical parameters given in the order of importance: section height, reinforcement ratio, bar diameter and cover. The influence of bar diameter on crack spacing is very much dependent on reinforcement ratio. For the members with large reinforcement ratio the effect of bar diameter on crack spacing is insignificant. For lightly reinforced members, variation in bar diameter may result in a significant change in spacing. The above findings strongly oppose the conventional understanding on cracking of RC structures accepted for many decades.

gintaris.kaklauskas@vgtu.lt