Cement & Concrete Composites 30 (2008) 1021–1022

Contents lists available at ScienceDirect

Cement & Concrete Composites

journal homepage: www.elsevier.com/locate/cemconcomp

Discussion

Comments on "Flexural behavior of concrete slabs with corroded bars"

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ARTICLE INFO

Article history:
Received 3 March 2008
Accepted 25 June 2008
Available online 4 July 2008

Keywords:
Pitting corrosion
Diameter loss
Faraday's law
Moment capacity

ABSTRACT

This paper presents a discussion on a paper authored by Chung et al. [Chung L, Najm H, Balaguru P. Flexural behaviour of concrete slabs with corroded bars. Cement Concr Compos 2008;30:184-93].

1. Discussion

The authors of [8] attempted to relate experimental results on reduction of flexural strength of reinforced concrete slabs due to varying degrees of corrosion of reinforcing steel bars and bond length with an analytical model. The work by the authors is very important for characterization of structural performance of corrosion damaged reinforced concrete structures. There are however some expressions and equations used by the authors that are questionable.

1. In modelling residual strength after the corrosion process, the authors used a theoretical mass loss from Faraday's law and they reference [4,11] as having reported an excellent correlation between actual mass loss and theoretical mass loss calculated using Faraday's Law. In contrast, according to [5,9] it is necessary to determine actual mass loss after the corrosion process as Faraday's Law underestimates actual mass loss for degrees of corrosion below 5% and overestimates mass loss for degrees of corrosion above 10%. To show a lack of confidence in Faraday's Law, other researchers such as [3] have developed other models to associate loss in bar diameter due to corrosion.
2. The authors of [8] re-express Faraday's Law to directly calculate percentage loss in bar diameter. Following work by [13] however, equation used by the authors to calculate the percentage loss in bar diameter is incorrect. Consequently, other equations developed by the authors of [8] that use the percentage loss in bar diameter such as the equation for flexural strength are equally incorrect.
3. The authors mention in the paper that with time, pitting corrosion extends over the bar resulting in relatively uniform corrosion. In contrast, other researchers such as [2] found that pitting corrosion is highest at high degrees of corrosion than at low degrees of corrosion.
4. The equation for ultimate moment capacity used by the authors follows a linear bending theory of stress–strain curve of concrete in compression. In contrast various design codes such as [1,6,7,14] as well as other researchers such as [10,12] use a non-linear bending theory to define the stress–strain relationship of concrete in compression.

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0958-9465/$ - see front matter © 2008 Published by Elsevier Ltd.
doi:10.1016/j.cemconcomp.2008.06.013

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