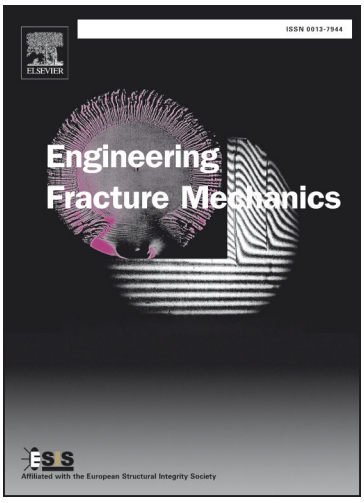

A displacement-based inverse analysis method to estimate in-situ Young's modulus of steel rust in reinforced concrete

Qifang Liu, Ray Kai Leung Su

PII: S0013-7944(17)31240-7
DOI: https://doi.org/10.1016/j.engfracmech.2018.02.017
Reference: EFM 5875

To appear in: *Engineering Fracture Mechanics*

Received Date: 21 November 2017
Revised Date: 22 January 2018
Accepted Date: 12 February 2018

Please cite this article as: Liu, Q., Kai Leung Su, R., A displacement-based inverse analysis method to estimate in-situ Young's modulus of steel rust in reinforced concrete, *Engineering Fracture Mechanics* (2018), doi: https://doi.org/10.1016/j.engfracmech.2018.02.017

A displacement-based inverse analysis method to estimate in-situ Young's modulus of steel rust in reinforced concrete

Qifang Liu, Ray Kai Leung Su[1]

Department of Civil Engineering, The University of Hong Kong, Pokfulam Road, Hong Kong, PRC

Abstract

The in-situ Young's modulus of rust is an important parameter in corrosion analyses. In this paper, the in-situ Young's modulus of rust in reinforced concrete is determined by a displacement-based inverse analysis method. The full field displacements of the surface of concrete in an accelerated corrosion test are first monitored by digital image correlation. The process of rust expansion which in turn induces concrete cracks is then modelled by using a smeared crack model. It is observed that the critical expansion displacement causing the crack of concrete surface is controlled by the mechanical properties of the materials and the geometry of the specimen but not the rate of corrosion and environmental conditions. The non-destructive testing method of rust presented in this study may also be applied to other granular materials.

Keywords: reinforced concrete structures; steel rebar corrosion; smeared crack model; Young's modulus of rust; digital image correlation

[1] Corresponding author. Tel.:+852 2859 2648
E-mail address: klsu@hku.hk (RKL Su)