# On modelling the influence of creep on corrosion-induced cracking in reinforced concrete

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## Abstract

Naturally occurring corrosion rates in reinforced concrete are so low that rust accumulates often over tens of years near the surface of the reinforcement bars before sufficient pressure in the surrounding concrete is generated to induce cracking in the concrete cover (Broomfield, 1997). To speed up the process in laboratory tests, corrosion setups with impressed currents are used in which the corrosion rate is controlled so that cracking of the concrete cover occurs within a few days. Extrapolating the results of these accelerated tests to those of naturally occurring corrosion requires an understanding of the influence of long-term creep deformations of concrete on the corrosion induced cracking process. In mathematical models in the literature, creep deformations are often ignored for accelerated but considered for natural corrosion rates in the form of a constant creep coefficient, which is used to reduce the Young modulus of concrete.

In this work, two numerical models are proposed to investigate the effect of creep on corrosion-induced cracking. The first approach is based on an elastic axisymmetric thick-walled cylinder combined with a plastic limit on the radial pressure induced by the accumulation of rust. The second model consists of a thick-walled cylinder discretised by a three-dimensional lattice (network) approach (Grassl and Davies, 2011) implemented in the finite element program OOFEM (http://www.oofem.org). Basic creep is predicted with the B3 model (Bažant and Baweja, 1995). Time dependence of strength of concrete is modelled using CEB-FIP Model code expressions.

## References

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