Load carrying capacity of concrete structures with corroded reinforcement.

Abstract

Corrosion of reinforcing bars is one of the main causes which induces an early deterioration of concrete structures, reducing their residual service life. With regard to this subject, the Brite/Euram project BE-4062 started in 1992 and some models are being developed for the assessment of concrete structures affected by steel corrosion and other deterioration mechanisms.

This paper summarizes and discusses the results of some research work carried out with corroded concrete beams, under the mentioned project. Reinforcement was corroded by means of adding calcium chloride to the mixing water and applying a current density of $100 \, \mu A/cm^2$. This value corresponds to ten times the corrosion intensity $I_{corr}$ measured in highly corroding concrete structures. It has been shown that corrosion increases both the deflections and the crack widths at service load, and reduces the strength at ultimate load. Beside, corrosion modifies the type of failure in concrete beams with usual ratios of.
Beside, corrosion modifies the type of failure in concrete beams with usual ratios of reinforcement. Whereas sound tested beams failed by bending, deteriorated beams failed by shear. Pitting at links and cracking and spalling of top concrete cover, due to corrosion of reinforcement, have been shown as the most relevant damages in the tested beams. Finally, a conservative value of either the ultimate bending moment or the ultimate shear force can be predicted by using RC conventional models, as those included in Eurocode 2, and considering the reduced section of both steel and concrete due to corrosion of reinforcement.

Keywords
corrosion; concrete; load carrying capacity

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