Experimental service life prediction of rebar corroded R.C. structure

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Abstract:

In the present investigation, an experimental methodology for service life prediction of rebar-corroded reinforced concrete (RC) structure has been suggested. This methodology is based on the cumulative damage theory. The final failure is assumed to be the result of the effects of the two modes of failure. The first mode considered is the natural corrosion of rebar from the time of depassivation followed by the second mode, which is the accelerated corrosion of rebar caused by anodic electrolysis under the impressed anodic current for a short period. The actual cracking of the specimens after applying an optimal anodic current for a given period has been carried out by splitting under physical load. Thus, a large intensity of impressed current could cause cracking by effect other than corrosion and a very small intensity of impressed current could take a long time for appreciable damage. The reduction in failure tensile stress of concrete is correlated with intensity and duration of the impressed current, and from this relationship, the time required for cracking, under impressed current, is determined corresponding to the zero residual tensile stress at failure of concrete.

To demonstrate the utility of the suggested experimental methodology, the service lives of a number of RC core-shaped specimens, having different corrosion rates and cover thicknesses, were determined and compared with the results obtained through another model suggested elsewhere in literature.