

## **Rebar corrosion risk due to free chloride under tropical conditions**

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### **Abstract:**

Corrosion of reinforcement embedded in concrete is one of the major durability problems posing a serious threat to the life of R. C. structures. In recent years, several cases of corrosion damage in R. C. structures have been reported even in the northern zone of India which is far away from the chloride bearing marine environment. The chloride analysis of concrete in such structures has indicated that the free chloride ion concentration in concrete pores is more than the threshold limit of rebar corrosion in many instances. The likely source of chloride in such structures seems to be the ingredients of concrete itself during the construction.

In the present research work a detailed corrosion study on sufficiently large sized laboratory cast beams, simulating the *in-situ* conditions, has been performed where  $\text{CaCl}_2$  was admixed in three different concentrations to promote the rebar corrosion for facilitating the study in short period of time. Under this experimental investigation, measurements of half-cell potential (corrosion potential) of rebar, ohmic resistance of concrete, and the corrosion rate of rebar were carried out on the beam specimens. Water-soluble chloride (free chloride) and pH measurements for the concrete and its ingredients, and pH measurement of concrete were also performed. It has been demonstrated through this investigation that free chloride content of concrete is very closely related to corrosion risk and therefore shall be used as the limiting criteria in the codal provisions rather than total chloride. Further, susceptibility of concrete structures to significant corrosion risk is also demonstrated under exposure to tropical climate (i.e. composite monsoon climate) and alternate wetting-drying condition.