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Editorial

Serviceability refers to the capability of the structure to perform the functions for which it was designed and constructed while exposed to a specific environment. The structure should, therefore, be able to resist or withstand for its service life all the intended loads and environmental conditions without excessive deterioration, wear or failure. Generally concrete is capable of withstanding a wide range of environments. The copious use of deicing salts during the last three decades however, has resulted in corrosion induced damage to many structures in the built environment. Estimates of the cost of damage and repair exceed a billion dollars both in Europe and the USA.

Given the high financial cost of repairing or replacing deteriorated structures a number of methods are being used to extend the life of reinforced concrete structures. These include (i) low permeability concrete cover, (ii) coatings for the concrete surface, (iii) surface coatings to the reinforcement e.g. epoxy coated rebar, (iv) electrochemical methods e.g. cathodic protection, chloride removal and (v) corrosion inhibitors.

One of the most effective means of protecting reinforcing steel from corrosion is through the provision of an adequate cover of quality concrete. The concrete should have low permeability to moisture, carbon dioxide, chlorides and other de-passivating agents. The answer to the durability problem, in severe environments, therefore, must lie in improving the efficiency and effectiveness of the concrete itself. In today's concrete chemical admixtures play a pivotal role in enhancing its durability by affording low water/cement ratios and delaying the initiation of chloride induced corrosion.

The use of corrosion inhibitors in concrete is now well established. Although new materials are being developed and tested, the range of inhibitors presently available can be summarized as follows:

- Proprietary formulations of vapour-phase inhibitors, based on volatile amino alcohols that create a molecular barrier layer on the steel to inhibit corrosion.
- Inorganic anodic inhibitors such as calcium nitrite.
- Sealers such as monofluorophosphate that hydrolyze in the concrete to provide a very alkaline environment.

Corrosion inhibitors are applicable in many situations in both new construction—designed protection so that the rate of change of concrete properties is negligible—and in repair to arrest the prevailing corrosion, increase the chloride threshold for initiation of corrosion and life expectancy of the concrete structure.

The purpose of this special issue was to provide a practical and readable guide that presents the broad underlying concepts for the Architect, consulting engineer, contractor and technicians. The authors discuss the scope, function, mechanism and attributes of the different types of corrosion inhibitors and their application in new construction and repair and rehabilitation of deteriorated concrete structures.

The paper on the chemistry of corrosion inhibitors describes the chemical aspects of corrosion of steel in concrete, effects of the inhibitors on the hydration of cement; test procedures used to evaluate corrosion and the various types of corrosion inhibitors currently used. Calcium nitrite is the most widely used corrosion inhibiting admixture because it can be readily used in the general scheme of concreting and also its effectiveness in delaying the onset of corrosion of the rebar. The paper on the prediction of the long-term durability of steel using these admixtures elaborates the manner in which the admixture produces its effects. A five-year field survey and lab study of eight commercial corrosion inhibitors is presented in the paper titled "Electrochemical evaluation of the performance of corrosion inhibitors in concrete bridges". The multifunctional benefits—corrosion protection and resistance to chemical attack—of a water-based organic corrosion inhibitor consisting of amines and fatty acid esters is discussed in the paper on "Multifunctional Corrosion Inhibitors". Some complex issues related to the effectiveness of corrosion inhibitors is presented in the paper titled " Corrosion Inhibitors and other Protective Systems in Concrete Repair: Concepts and Misconceptions"; the discussion is based on an analysis of the differences in electrochemical behaviour in new and repaired structures. The usefulness of migratory corrosion inhibitors in protecting rebar in concretes exposed to a sea-water environment is described in the paper "Studies on the performance of Migratory Corrosion Inhibitors in Protection of Rebar in Concrete in a Sea water Environment". A description of the use of

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mixed organic and inorganic inhibitors both as admixtures and surface applied inhibitors is the subject of the paper "Amino Alcohol Based Corrosion Inhibitors".

Drawing from their many years of laboratory and field experience the authors discuss how corrosion inhibitors are use in today's construction. Their contribution to this special issue through the important articles they authored and the painstaking reviews provided by the reviewers is gratefully acknowledged.

Guest Editor

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