Reinforcement Corrosion and the Use of Galvanized Steel

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Abstract

This paper presents an overview of the causes and effects of the corrosion of steel reinforcement in concrete and strategies that can be adopted to counteract this insidious problem. If reinforcement corrosion can be avoided, or at least minimized, the risk of cracking, rust staining, spalling and delamination of concrete, which collectively may lead to a reduction in the structural integrity of concrete, can be significantly reduced. In this way, the effective life of reinforced concrete can be extended without the need for expensive repair and rehabilitation, much of which is undertaken purely for aesthetic reasons. The cost of undertaking this type of work is a significant drain on already scarce resources.

Galvanizing, the coating of steel with zinc, is a well-known and widely-utilized method for the protection of steel reinforcement embedded in concrete. The history of the use of galvanizing steel in concrete extends over a period of more than 70 years. Recent experience indicates an increasing use of galvanized steel in a variety of concrete structures exposed to a range of environmental conditions including the most severe topical marine and industrial environments. This paper also reviews the characteristics of galvanizing as it relates to concrete reinforcement, its structural and corrosion performance, design considerations, and common world-wide applications. Though additional cost is incurred when steel reinforcement is galvanized, this extra cost represents a very small investment against the risk of premature deterioration and possible failure of concrete structures well before their design life is reached.

The information presented here is extracted from the recently published book Galvanized Steel Reinforcement in Concrete, SR Yeomans (Editor), Elsevier, 2004. In preparing this overview, extensive referencing other than to individual chapters in the book was not provided. Reference should be made to the full text of the book for detail of the topics considered in brief here.

Keywords: Steel reinforcement, concrete, corrosion, durability, galvanizing, galvanized reinforcement, corrosion protection, design considerations, processing, and applications.