

# Protecting Reinforced Concrete Structures with Thermal Sprayed Zinc Anodes

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## Abstract

Metallic zinc coatings protect steel from corrosion by acting first as a barrier coating and more importantly as a sacrificial anode. Zinc will provide galvanic protection to the steel. As such, concrete structures reinforced with plain or black steel showing signs of distress can be galvanically protected with external zinc anodes. Thermal sprayed metallic zinc coatings on the exposed surface of the concrete can be electrically connected to the steel reinforcement and provide corrosion protection to the steel.

Thermal sprayed zinc coatings were successfully tested as anodes in cathodic protection systems for reinforced concrete structures in the United States. Subsequent installations were made on numerous structures, including three historic reinforced concrete bridges in the state of Oregon. The 20-plus-year performance confirms that the service life of reinforced concrete structures can be significantly and economically extended by using metallic zinc anodes to protect the plain steel reinforcement from further corrosion.

**Keywords:** Thermal sprayed zinc; sacrificial anode; corrosion; zinc; rebar.

## 1 Introduction

Corrosion of black steel reinforcement (rebar) is an important cause of concrete degradation. Due to carbonation, the pH of a concrete structure will decrease with time, which increases the susceptibility of the rebar to corrosion. Exposure to chlorides, whether by atmospheric deposition of

chlorides in marine environments or through use of road de-icing salts during winter maintenance periods, can also initiate corrosion of the rebar. The build-up of corrosion products on the reinforcing steel surface exert pressure on the concrete which lead to cracking and spalling of the concrete cover. Initial signs of rebar corrosion are red rust staining seeping out of cracks in the concrete. If left