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Corrosion Management of Atmospherically Exposed Reinforced Concrete Structures

ABSTRACT

This standard provides a structure for maintaining a Corrosion Management System for existing atmospherically exposed conventionally reinforced concrete structures. Risk-based management of corrosion may maintain the safe operation of structures and plants and minimize the risk of unexpected failures and unplanned closures and outages. Corrosion management may require investigation and evaluation by qualified corrosion, materials, and structural engineering personnel, depending on the nature and extent of the distress.

KEYWORDS

Corrosion, corrosion management system, reinforced concrete, TG 400.

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Foreword

*In NACE standards, the terms **shall, must, should,** and **may** are used in accordance with the definitions of these terms in the* NACE Publications Style Manual*. The terms **shall** and **must** are used to state a requirement, and are considered mandatory. The term **should** is used to state something good and is recommended, but is not considered mandatory. The term **may** is used to state something considered optional.*

This NACE International standard practice provides a structure for setting up and maintaining a Corrosion Management System (the System) for existing atmospherically exposed conventionally reinforced concrete structures. This standard is concerned with the risk-based management of corrosion to maintain the safe operation of structures and plants and to minimize the risk of unexpected failures and unplanned closures and outages.

The System may require investigation and evaluation by qualified corrosion, materials, and structural engineering personnel, depending on the nature and extent of the distress.

This standard is intended for use by corrosion specialists, civil engineers, structural engineers, and asset owners involved with the maintenance, management, and operation of reinforced concrete structures susceptible to corrosion-induced deterioration.

This standard was prepared in 2012 by NACE TG 400, "Corrosion Management of Atmospherically Exposed Reinforced Concrete Structures," which is administered by Specific Technology Group (STG) 01, "Reinforced Concrete," and sponsored by STG 08, "Corrosion Management." The TG is composed of manufacturers, users, consulting engineers, and other interested parties. This standard represents a consensus of those members. It was reaffirmed (with editorial revisions) by STG 01 in 2017. It is issued by NACE under the auspices of STG 01.

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Section 1: General

1.1 Corrosion management is the part of an overall management system that is concerned with the development, implementation, review, and maintenance of the corrosion policy for the owners of fixed assets. This standard is not intended to be all encompassing. This standard is not concerned with the actual techniques used to carry out evaluations, which are covered by other NACE standards.[1,2]

1.1.1 Because of the properties inherent in reinforced concrete and different exposure conditions, corrosion of reinforced concrete structures has unique characteristics and associated consequences when compared to other assets that suffer from corrosion. Corrosion management of reinforced concrete therefore requires unique knowledge and skills.

1.2 To establish the System for atmospherically exposed reinforced concrete assets, the Owner shall establish a corrosion policy, either standalone or within an overall integrity management policy and system. The Owner and managers of the assets shall identify the risks to safety and to the business resulting from the effects of corrosion. The requirements of national health and safety legislation shall also be incorporated into the System. The environmental impacts of corrosion and of corrosion control and mitigation techniques shall be considered as part of the System.

1.3 The System shall establish an objective of cost-effective life extension of reinforced concrete structures while ensuring safe and reliable operation with minimum disruption to all aspects of the operation of the structure during inspection and rehabilitation. To achieve this objective, the System shall include the following steps:

1.3.1 Planning and Implementation: Review of reinforced concrete structure condition, inspection planning, identification of damage mechanisms, selection and application of remedial measures and monitoring their performance and effectiveness (e.g., measure of cathodic protection [CP] performance, use of inspection/embedded sensors for assessment of repair/inhibition, etc.).

1.3.2 Evaluate Performance of the Corrosion Management Team (the Team): Have actions been completed, have data been collected and reviewed as planned, etc.? What could have been done better? Adjust planning/procedures to reflect experience (good and bad).

1.3.3 Independent Audit: Review of actions of the Team by external verifiers.

1.4 The benefits from the implementation of the System are often realized in the medium-to-long term so the Owner should be steadfast in the initial stages. Like any change in general that can lead to tangible benefits in the medium-to-long run, the implementation of the System can cause initial disruption and inefficiencies.

Section 2: Definitions

Owner: The legal entity responsible for the atmospherically exposed reinforced concrete assets that are the subject of the System.

Section 3: Electrochemical Realkalization

3.1 Objectives shall be established. The principal objective is the cost-effective life extension of the owner's atmospherically exposed reinforced concrete assets while ensuring safe and reliable operation with minimum disruption to users of the