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**Corrosion of metals and alloys —
Test and evaluation method for the
corrosion of steel bar embedded
in concrete structure exposed to
total corrosion zones in marine
environments**

**First edition
2025-08**

*Corrosion des métaux et alliages — Méthode d'essai et
d'évaluation de la corrosion des barres en acier encastrées dans
des structures en béton exposées à des zones de corrosion totale
dans des environnements marins*

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Foreword

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Introduction

Reinforced concrete structures worldwide face increasing durability deterioration, primarily driven by environmental factors. In the marine environment, chloride-induced steel corrosion causes significant structural damage. This phenomenon occurs across multiple exposure zones defined by elevation: atmospheric, splash, tidal, immersion, and buried zones. Coastal infrastructure (e.g. docks, bridges, piers) typically spans several such zones simultaneously.

Existing corrosion testing methods focus on single-directional chloride penetration within isolated zones like the splash zone. While moisture fluctuations here accelerate corrosion, such unidirectional models fail to replicate real-world multi-zone interactions. This oversight leads to incomplete corrosion resistance assessments during material selection.

This document establishes a testing methodology that vertically and horizontally simulates chloride migration along steel bars. By simulating worst-case conditions in all corrosion zones, the method facilitates accurate corrosion distribution mapping (particularly chloride ingress), data-driven material selection for extended service life, cost-effective design that avoids overprotection (e.g. excessive component thickness) and accurate protection and repair along the length of concrete piers and columns. 3D scanning supplements traditional measurements and enables non-destructive 3D corrosion mapping without structural compromise.

This document proposes a device and a procedure to test the corrosion of steel bars in marine environments at all corrosion zones. The method describes the dimensions, standard configuration methods and test standard processes of standard components. The method should simulate the impact of different chloride salt environments along the length of steel bars in reinforced concrete components. However, the actual environment and test conditions differ widely, and this document cannot cover all possible scenarios. The objectives of testing can be achieved according to the parameters set out in this document. However, other methods exist, and users can choose test parameters based on their own situation.

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