

©2018 NACE International, 15835 Park Ten Place, Suite 200, Houston TX 77084, USA. All rights reserved. Reproduction, republication or redistribution of this standard in any form without the express written permission of the publisher is prohibited. Contact NACE International by means of our website www.nace.org, email FirstService@nace.org, or (phone) 281-228-6223 for reprints of this standard.

NACE Publication 11100 Item Number 24204 Reaffirmed 2018-06-25 Approved March 2000

NACE Publication 11100 Reference Electrodes for Atmospherically Exposed Reinforced Concrete Structures

This NACE International technical committee report represents a consensus of those individual members who have reviewed this document, its scope, and provisions. Its acceptance does not in any respect preclude anyone from manufacturing, marketing, purchasing, or using products, processes, or procedures not included in this report. Nothing contained in this NACE report is to be construed as granting any right, by implication or otherwise, to manufacture, sell, or use in connection with any method, apparatus, or product covered by Letters Patent, or as indemnifying or protecting anyone against liability for infringement of Letters Patent. This report should in no way be interpreted as a restriction on the use of better procedures or materials not discussed herein. Neither is this report intended to apply in all cases relating to the subject. Unpredictable circumstances may negate the usefulness of this report in specific instances. NACE assumes no responsibility for the interpretation or use of this report by other parties.

Users of this NACE report are responsible for reviewing appropriate health, safety, environmental, and regulatory documents and for determining their applicability in relation to this report prior to its use. This NACE report may not necessarily address all potential health and safety problems or environmental hazards associated with the use of materials, equipment, and/or operations detailed or referred to within this report. Users of this NACE report are also responsible for establishing appropriate health, safety, and environmental protection practices, in consultation with appropriate regulatory authorities if necessary, to achieve compliance with any existing applicable regulatory requirements prior to the use of this report.

CAUTIONARY NOTICE: The user is cautioned to obtain the latest edition of this report. NACE reports are subject to periodic review, and may be revised or withdrawn at any time without prior notice. NACE reports are automatically withdrawn if more than 10 years old. Purchasers of NACE reports may receive current information on all NACE publications by contacting the NACE *First*Service Department, 15835 Park Ten Place, Houston, TX 77084-5145 (tel: +1 281-228-6200, email: firstservice@nace.org).

NACE International 15835 Park Ten Place Houston, Texas 77084-5145 +1 281-228-6200

© 2018 NACE International

This is a preview. Click here to purchase the full publication.

NACE technical committee reports are intended to convey technical information or state-of-the-art knowledge regarding corrosion. In many cases, they discuss specific applications of corrosion mitigation technology, whether considered successful or not. Statements used to convey this information are factual and are provided to the reader as input and guidance for consideration when applying this technology in the future. However, these statements are not intended to be requirements or recommendations for general application of this technology, and must not be construed as such.

Foreword

The objective of this technical committee report is to provide a state-of-the-art overview of the characteristics of and the installation method for reference electrodes commonly used in atmospherically exposed reinforced concrete structures. It is intended as a technical resource for engineers responsible for assessment of reinforced concrete structures or the corrosion control design for such structures. It is also useful to owners involved in these decisions. It is beyond the scope of this report to fully address all factors associated with the selection and use of reference electrodes in steel-reinforced concrete. Additional reference electrodes are being developed by several manufacturers for use in this application.

This technical committee report was prepared in 2000 by Work Group T-11-4f,* a component of Task Group (TG) T-11-4 on Cathodic Protection of Reinforcing Steel in Concrete. This TG was subsequently replaced by TG 921,* "Use of Reference Electrodes for Atmospherically Exposed Reinforced Concrete Structures," which is administered by Specific Technology Group (STG) 01, "Reinforced Concrete," and sponsored by STG 05, "Cathodic/Anodic Protection." This report was reaffirmed with editorial changes by STG 01 in 2018. It is issued by NACE International under the auspices of STG 01.

Description

Provides a state-of-the-art overview of the characteristics of and the installation method for reference electrodes commonly used in atmospherically exposed reinforced concrete structures. This report is intended as a technical resource for engineers responsible for assessment of reinforced concrete structures or the corrosion control design for such structures. It is also useful to owners involved in these decisions.

Key Words

Reinforced concrete, reference electrodes, TG 921

* Chairman John Olson III, Electrochemical Devices Inc., Belmont, MA.

©2018 NACE International, 15835 Park Ten Place, Suite 200, Houston TX 77084, USA. All rights re

This is a preview. Click here to purchase the full publication.

2 — NACE Publication 1110

Introduction

The costs of damage due to corrosion of reinforced concrete continue to increase. Concrete structures such as bridges, parking garages, buildings, and marine docks exposed to chlorides from either deicing salts or the local environment are subject to deterioration due to corrosion.

Chlorides that are introduced into the reinforced concrete structure initiate corrosion by destroying the passive film that is naturally formed on steel in concrete. The corrosion products of steel occupy several times the volume of the steel itself and exert tensile stresses on the surrounding concrete. Cracking of the concrete develops, and, ultimately, spalling of the concrete takes place. This can render the structure unsound for use.

Definitions	4
Use of Reference Electrodes	4
Properties of an Ideal Reference Electrode	5
Reference Electrodes in Use Today	6
Portable Reference Electrodes	6
Typical Procedure for Taking Potential Readings	7
Embedded Reference Electrodes	7
Installation of Embedded Reference Electrodes	8
Interpretation of Data	9
Carbonated Concrete	10
Potential Measurements	10
References	11
Bibliography	11
Appendix A: Measurement Errors and Ways to Minimize Them	12

Figures

Figure 1: Relative Potentials of Selected Reference Electrodes and Probes Used in Concrete. Potentials are in Volts unless otherwise indicated	5
Figure 2: Typical Installation of Embedded Reference Electrodes	9
Figure A1: Electrolytic Bridge Schematic	13
Figure A2: Junction Potential Error in Concrete	14

Tables

Table 1: Ag/AgCI/KCI Potentials vs. Standard Hydrogen Electrode (SHE) at 25 °C	7
Table 2: SCE and Ag/AgCI/KCI Potentials Corresponding to the CSE Potentials Related to the Probability of Corrosion Activity on Atmospherically Exposed Structures as Given in ASTM C876	0
Table A1: Indication of Risk of Steel Corrosion Exposed to Different Environments Based on Potential Measurements	4

sei wri

w٧

©2018 NACE International, 15835 Park Ten Place, Suite 200, Houston TX 77084, USA. All rights re-