Corrosion Effect of Stray Currents and the Techniques for Evaluating Corrosion of Rebars in Concrete

Victor Chaker EDITOR

AST STP 906

CORROSION EFFECT OF STRAY CURRENTS AND THE TECHNIQUES FOR EVALUATING CORROSION OF REBARS IN CONCRETE

A symposium sponsored by ASTM Committee G-1 on Corrosion of Metals Williamsburg, VA, 28 Nov. 1984

ASTM SPECIAL TECHNICAL PUBLICATION 906 Victor Chaker, Gilbert Associates, Inc., editor

ASTM Publication Code Number (PCN) 04-906000-27



Library of Congress Cataloging-in-Publication Data

Corrosion effect of stray currents and the techniques for evaluating corrosion of rebars in concrete.
(ASTM special technical publication; 906)
"ASTM publication code number (PCN) 04-906000-27." Includes bibliographies and index.
1. Reinforcing bars - Corrosion - Congresses.
2. Stray current corrosion - Congresses I. Chaker, Victor. II. American Society for Testing and Materials.
Committee G-1 on Corrosion of Metals. III. Series.
TA445.5.C67 1986 620.1'37 85-30618
ISBN 0-8031-0468-5

Copyright © by AMERICAN SOCIETY FOR TESTING AND MATERIALS 1985 Library of Congress Catalog Card Number: 85-30618

NOTE

The Society is not responsible, as a body, for the statements and opinions advanced in this publication.

> Printed in Baltimore, MD January 1986

Foreword

The symposium on the Corrosion Effect of Stray Currents and the Techniques for Evaluating Corrosion of Rebars in Concrete was presented at Williamsburg, VA, 28 Nov. 1984. The symposium was sponsored by ASTM Committee G-1 on Corrosion of Metals. Victor Chaker, Gilbert Associates, Inc., presided as chairman of the symposium and is editor of this publication.

Related ASTM Publications

Laboratory Corrosion Tests and Standards, STP 866 (1985), 04-866000-27

Corrosion of Metals in Association with Concrete, STP 818 (1983), 04-8180000-27

Corrosion of Reinforcing Steel in Concrete, STP 713 (1980), 04-713000-27

A Note of Appreciation to Reviewers

The quality of the papers that appear in this publication reflects not only the obvious efforts of the authors but also the unheralded, though essential, work of the reviewers. On behalf of ASTM we acknowledge with appreciation their dedication to high professional standards and their sacrifice of time and effort.

ASTM Committee on Publications

ASTM Editorial Staff

Susan L. Gebremedhin Janet R. Schroeder Kathleen A. Greene William T. Benzing

Contents

Introduction	1
Historical Background — CHARLES B. SANBORN	3
Corrosion of Steel in Portland Cement Concrete: Fundamental Studies —CARL E. LOCKE Discussion	5 14
Accelerated Rebar Corrosion When Connected to Lightning Conductors and Protection of Rebars with Needles Diodes Using Atmospheric Electricity — THEODOR SKOULIKIDIS, AZISTARCHO TSAKOPOULOS, AND TONIA MOROPOULOS	15
Application of a Polymeric Anodemesh for Cathodic Protection to a Reinforced Concrete Structure — KENNETH J. DRACHNIK	31
The Determination of the Corrosion Rate of Steel Embedded in Concrete by the Polarization Resistance and AC Impedance Methods—CARMEN ANDRADE, VICTOR CASTELO, CRUZ ALONSO, AND JOSÉ A. GONZALEZ	43
Corrosion Susceptibility of Reinforced Earth Systems: Field Surveys — DAVID WHITING	64
The Use of Anodic Polarization to Determine the Effectiveness of Calcium Nitrite as an Anodic Inhibitor — NEAL S. BERKE	78
Detection and Considerations of Corrosion Problems of Prestressed Concrete Cylinder Pipe — PAUL S. ROTHMAN AND ROBERT E. PRICE	92
X-Ray Permeability of Corrosion Products as a Measure of the Rate of Corrosion of Rebars and of Prediction of Concrete Cracking — THEODOR SKOULIKIDIS, DIMITRIOS MARINAKIS, AND GEORG BATIS	108
Terra Theraic and Magnesium Oxide with Induced Defects as Additives on Concrete for the Protection of Rebars — THEODOR SKOULIKIDIS, DIMITRIOS MARINAKIS, AND	
GEORG BATIS	118
Summary	131
Index	139

ISBN 0-8031-0468-5