

Corrosion of Metals in Association with Concrete

John E. Slater



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CORROSION OF METALS IN ASSOCIATION WITH CONCRETE

A manual sponsored by ASTM
Subcommittee G01.14 on
Corrosion of Reinforcing Steel
and Metal Properties Council

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Foreword

This manual is the result of a request by ASTM, in particular by Subcommittee G01.14 on Corrosion of Reinforcing Steel, to the Metal Properties Council for a comprehensive appraisal of the many aspects of corrosion of metals in concrete. Acting through its Subcommittee 8 on Corrosion (William R. Martin, chairman), MPC organized a task group to plan and supervise the project. Dr. A. R. Cook served as task group chairman and obtained the participation of a broadly based and highly knowledgeable group. The membership consisted of K. C. Clear, E. Escalante, J. M. Gaidis, K. C. Hover, F. LaQue, H. M. Maxwell, W. J. McCoy, C. B. Sanborn, D. Stark, I. L. Stern, and D. E. Tonini.

The project was motivated by recognition that the possible deterioration of reinforced concrete structures is of national and international concern. For example, marine and offshore structures such as piling and drilling platforms are in widespread and growing use. In the future, fixed and floating platforms of reinforced concrete using reinforcing bar and prestressed steel, and reinforced concrete pipe structures, are likely to become important. In addition, the spalling and failure of bridge decks when exposed to road salt or ocean spray and especially, but not exclusively, in association with freeze-thaw conditions, is a problem of mammoth proportions.

The importance of the bridge deck problem is emphasized by estimates made by the U. S. Federal Highway Administration. The cost of repairing existing bridges built before 1974 on the interstate system will be over \$1.6 billion, and the installation of protective systems would cost another \$1.2 billion. Specifically, 560 bridges on the interstate system were judged in need of major restoration. Over 3400 bridges are considered to be in need of moderate restoration. (Little corrosion of rebar will be in evidence where minor restoration is involved.) Presently, annual repair costs are estimated to be in the hundreds of millions of dollars.

The purpose of this project, then, was as follows:

1. Assess the most advanced technology and theories and determine their limitations.
2. Evaluate the situation regarding industry standards.
3. Accumulate and report on practical experience concerning the deterioration of reinforced structures and its prevention.
4. Identify profitable areas for research into and development of corrosion prevention measures.
5. Resolve in an unbiased and noncommercial way conflicting views regarding test methods and equipment, monitoring techniques, protective measures, and design practices.

The task group selected Dr. John Slater, then of Packer Engineering Associates, as the principal investigator after reviewing proposals from a number of highly regarded contractors. The project was supported equally by the Metal Properties Council and the U. S. Department of Energy acting through Argonne National Laboratory and OTEC Biofouling, Corrosion Materials Branch (Dr. J. B. Darby, project manager).

Dr. Slater's report is considered to be a concise yet thorough state-of-the-art report. It was thoroughly reviewed by the task group prior to acceptance.

The Metal Properties Council is pleased to have been of service to ASTM and especially to Subcommittee G01.14 in this important project. It is hoped that this manual will provide a basis for future standards work.

Martin Prager

Associate Director, Metal Properties Council
Inc., New York, NY

Related ASTM Publications

Atmospheric Corrosion of Metals, STP 767 (1982), 04-767000-27

Underground Corrosion, STP 741 (1981), 04-741000-27

Electrochemical Corrosion Testing, STP 727 (1981), 04-727000-27

Geothermal Scaling and Corrosion, STP 717 (1980), 04-717000-27

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

Stress Corrosion Cracking — The Slow Strain-Rate Technique, STP 665 (1979),
04-665000-27

Compilation of ASTM Standards in Building Codes, 20th Edition, 1982,
03-002082-10

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