Manual on Maintenance Coatings for Nuclear Power Plants

Compiled by
ASTM SUBCOMMITTEE D33.10
ON PROTECTIVE COATINGS
MAINTENANCE WORK FOR POWER GENERATION FACILITIES

ASTM Manual Series: MNL 8
MENDEL A. PUSCHEL was one of a small but active group in the early history of ASTM Committee D33 on Protective Coating and Lining Work for Power Generation Facilities, known in the early years as ASTM Subcommittee D01.43. Mendel served in a variety of roles, giving input to various task groups from quality assurance of coating application to the advisory aspects of the power utilities. However, his main goal was to establish maintenance coating procedures for nuclear power plants, for which this manual is intended.

He gained first hand experience in his work interests at Consumers Power Company of Jackson, Michigan. There he served, at the time of his early retirement, as staff engineer of projects, Engineering and Construction.

Mendel graduated in 1957 from Michigan Technical Institute with a Bachelor of Science in Engineering and began working for Consumers Power Co. two years later. In 1989 he received the Engineer of the Year Award from the Jackson Chapter of the Michigan Society of Professional Engineers.

At the time of Mendel’s death he was the chairman of Subcommittee D33.10 on Protective Coatings Maintenance Work for Power Generation Facilities. We of ASTM D33 dedicate this manual to his memory. He was our friend, associate, and fellow engineer.
Contributors

John B. Adrian, Southern Co. Services, Inc.
Thomas I. Aldinger, Bechtel Corp.
Gerald E. Arnold, Carboline/Imperial
Willis C. Bates, Jr., J. L. Manta, Inc.
Chub D. Beckman, Sargent & Lundy Engineers
John L. Belko, Detroit Edison Co.
Dean M. Berger, Retired
Duane Bloemke, Desco Manufacturing Co., Inc.
Roberta P. Body, Palmer International, Inc.
Bryant W. Chandler, O. B. Cannon & Son, Inc.
Oliver B. Coggin, Retired
Victor G. Cusumano, Belzona Molecular, Inc.
Mario R. Diaz, U.S. Department of Energy
Arnold H. Fero, Westinghouse Nuclear Energy
Jerome Firtel, Ebasco Services, Inc.
Anthony L. Franchetti, Hammonton, NJ
Roger L. Gossett, Midway Industrial, Inc.
Scott W. Gray, Stone and Webster Engineering
Robert B. Green, Virginia Power
Gary R. Hall, Sauereisen Cements Co.
Steven J. Harrison, Carboline Co.
Douglas Hays, N. Charleston, SC
Curtis L. Hickcox, Keeler & Long, Inc.
Don A. Hill, Keeler & Long, Inc.
N. Aaron Hoijman, Enace Sa
Robert W. Hummel, Cook Paint & Varnish
William L. Hurst, Arizona Nuclear Power Project
Thomas A. Jones, Sherwin Williams Co.
Jitendra H. Kapasi, Dudick Corrosion/Proof, Inc.
Harlan H. Kline, Ameron
James B. Le Bleu, Florida Power & Light Co.
Ernest P. Liporto, Online Repair Systems
Henry L. Lomasney, Isotron Corp.
David J. Long, Keeler & Long, Inc.
John F. Mainieri, American Electric Power Service
Remo Martinella, Cise Spa
Michael J. Masciale, The Valspar Corp.
Ivano Mazza, Transerimento di Tecnologie
Anne Mcclindon, ASTM
William L. Miller, CIBA-Geigy Corp.
Loren B. Odell, Tech Construction Coatings
Richard R. Richardson, Southern California Edison
William W. Roberts, Jr., Washington Public Power
Dr. A. H. Roebuck, Fullerton, CA
Theodore Rudaitis, S. G. Pinney and Associates
Arthur W. Sauerborn, ENCO
Marc C. Schroeder, East Haddam, CT
Emil Senkowski, Jr., Philadelphia Electric Co.
Timothy B. Shugart, Iowa Electric Light & Power
John Strasser, Consolidated Edison
Kenneth B. Tator, KTA-Tator Inc.
Ralph A. Trallo, Oliver B. Cannon & Sons, Inc.
Alan C. Trojan, Wisconsin Electric & Power Co.
Bala Viswanath, Pacific Gas & Electric Co.
Alfred C. Von Nyvenheim, Warrenville, SC
Patrick A. Walker, U.S. Tennessee Valley Authority
Chris Wenzler, Elcometer, Inc.
Frank J. Witt, U.S. Nuclear Regulatory Commission
Foreword

This publication was sponsored by ASTM Committee D33 on Protective Coating and Lining Work for Power Generation Facilities. Its creation and maintenance is the responsibility of Subcommittee D33.10 on Protective Coatings Maintenance Work for Power Generation Facilities. This subcommittee is composed of representatives from various organizations involved with corrosion control by use of protective coatings. Subcommittee members include individuals from utilities, architect-engineer-constructors, coating inspection services, and other interested parties. The information presented herein reflects a consensus of the subcommittee (the list of contributors is on the facing page, members of D33.10 as of 5 Feb. 1990).

This manual was prepared to address a need perceived by ASTM Committee D33 for guidance in selecting and applying maintenance coatings in nuclear plants but is not to be considered a standard. In addition to servicing as that source, this document has the equally necessary role of acting as a focal point for a rapidly changing technology. While the subcommittee considers the information contained in this manual to be state of the art, the book offers limited historical data upon which to establish detailed requirements or methodologies. Accordingly, the user will find this edition rather general.

The procedures described herein may involve hazardous materials, operations, and equipment. This manual does not purport to address all the safety problems associated with their use. It is the responsibility of the user of this manual to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.

Mendel A. Puschel
Acronyms

3M  Minnesota Mining and Manufacturing
ACI  American Concrete Institute
ALARA  As low as reasonably achievable
ANSI  American National Standards Institute
ASTM  American Society for Testing and Materials
BWR  Boiling water reactor
CFR  Code of Federal Regulations
DBA  Design basis accident
DWV  Drain, waste, and vent
ECCS  Emergency core cooling system
EPA  Environmental Protection Agency
ESS  Engineered safety system
FSAR  Final safety analysis report
HEPA  High efficiency particulate air
HVAC  Heating, ventilation, and air conditioning
LOCA  Loss of coolant accident
MSHA  Mine Safety and Health Administration
NACE  National Association of Corrosion Engineers
NBS  National Bureau of Standards
NFPA  National Fire Protection Association
NIOSH  National Institute of Occupational Safety and Health
NRC  Nuclear Regulatory Commission
OSHA  Occupational Safety and Health Act
PWR  Pressurized water reactor
QA/QC  Quality assurance/quality control
QC  Quality control
RHR  Residual heat removal
Reg. Guide  Regulatory Guide
SAR  Safety analysis report
SSPC  Steel Structure Painting Council
SSPC-SPII  Steel Structures Painting Council—Surface Preparation
UT  Ultrasonic test
## Contents

**Chapter 1** — Protecting Surfaces in a Nuclear Plant  
*by Don Hill*  
1

**Chapter 2** — The Significance of Maintenance Coating  
*by Mendel Puschel and John Cavallo*  
3

**Chapter 3** — Surveillance Plan for In-Service Coatings  
*by Mendel Puschel and Timothy Shugart*  
5

**Chapter 4** — Preparing for Maintenance Painting  
*by Timothy Shugart*  
7

**Chapter 5** — Planning and Scheduling Maintenance Coating Work  
*by Ralph Trallo*  
13

**Chapter 6** — Qualification of Nuclear Grade Maintenance Coatings  
*by S. J. Oechsle*  
15

**Chapter 7** — Coating Materials  
*by Michael Masciale*  
18

**Chapter 8** — Practical Methods of Surface Preparation for Maintenance Painting  
*by John Cavallo*  
23

**Chapter 9** — Practical Methods of Coating Application  
*by Robert Ikenberry and W. C. Bates*  
27

**Chapter 10** — Inspection  
*by Don Hill*  
29

**Chapter 11** — Safety  
*by Ralph Trallo*  
34

**Appendix A** — Glossary of Terms  
36

**Appendix B** — ASTM Standards  
40