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Standard Guide for Developing a Training Program for Personnel Performing Coating and Lining Work Inspection for Nuclear Facilities[1]

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1. Scope

1.1 This guide is intended to assist those responsible for developing a program for the indoctrination and training of personnel performing coating and lining inspection work for nuclear facilities.

1.2 It is recognized that organizations and job responsibilities vary widely among utilities and also among various support and service companies. It is the responsibility of the user of this guide to identify the appropriate subject matter for its program and its specific needs.

1.3 Users of this guide must ensure that coating and lining work complies not only with this guide, but also with the licensee's plant-specific quality assurance program and licensing commitments.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D16 Terminology for Paint, Related Coatings, Materials, and Applications
D610 Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
D714 Test Method for Evaluating Degree of Blistering of Paints
D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers
D2240 Test Method for Rubber Property—Durometer Hardness
D2583 Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
D3276 Guide for Painting Inspectors (Metal Substrates)
D3359 Test Methods for Measuring Adhesion by Tape Test
D3363 Test Method for Film Hardness by Pencil Test
D3843 Practice for Quality Assurance for Protective Coatings Applied to Nuclear Facilities
D3925 Practice for Sampling Liquid Paints and Related Pigmented Coatings
D4138 Practices for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive, Cross-Sectioning Means
D4212 Test Method for Viscosity by Dip-Type Viscosity Cups
D4214 Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
D4258 Practice for Surface Cleaning Concrete for Coating
D4259 Practice for Abrading Concrete
D4260 Practice for Liquid and Gelled Acid Etching of Concrete
D4261 Practice for Surface Cleaning Concrete Masonry Units for Coating
D4262 Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces
D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
D4285 Test Method for Indicating Oil or Water in Compressed Air
D4414 Practice for Measurement of Wet Film Thickness by Notch Gages
D4417 Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
D4537 Guide for Establishing Procedures to Qualify and Certify Personnel Performing Coating and Lining Work Inspection in Nuclear Facilities
D4538 Terminology Relating to Protective Coating and Lining Work for Power Generation Facilities
D4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
D4610 Guide for Determining the Presence of and Removing Microbial (Fungal or Algal) Growth on Paint and Related Coatings
D4752 Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
D4787 Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

D4940 Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blasting Abrasives
D5144 Guide for Use of Protective Coating Standards in Nuclear Power Plants
D5162 Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates
D5163 Guide for Establishing a Program for Condition Assessment of Coating Service Level I Coating Systems in Nuclear Power Plants
D5402 Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs
D6132 Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Gage
D6237 Guide for Painting Inspectors (Concrete and Masonry Substrates)
D6386 Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
D6677 Test Method for Evaluating Adhesion by Knife
D7091 Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals
D7167 Guide for Establishing Procedures to Monitor the Performance of Safety-Related Coating Service Level III Lining Systems in an Operating Nuclear Power Plant
D7234 Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
D7682 Test Method for Replication and Measurement of Concrete Surface Profiles Using Replica Putty
E337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)
F1869 Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
F2170 Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
G12 Test Method for Nondestructive Measurement of Film Thickness of Pipeline Coatings on Steel
G62 Test Methods for Holiday Detection in Pipeline Coatings

2.2 *ASME Codes and Standards:*[3]

ASME Boiler and Pressure Vessel Code, Section XI Rules for Inservice Inspection of Nuclear Power Plant Components

2.3 *International Organization for Standardization (ISO):*[4]

ISO 8502–03 Preparation of Steel Substrates before Application of Paint and Related Products — Tests for the Assessment of Surface Cleanliness — Part 3: Assessment of Dust on Steel Surfaces Prepared for Painting (Pressure-Sensitive Tape Method)

2.4 *SSPC: The Society for Protective Coatings Standards:*[5]

SSPC-AB 1 Mineral and Slab Abrasives
SSPC-AB 2 Cleanliness of Recycled Ferrous Metallic Abrasive
SSPC-AB 3 Ferrous Metallic Abrasive
SSPC-AB 4 Recyclable Encapsulated Abrasive Media
SSPC Guide 15 Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates
SSPC-PA1 Shop, Field and Maintenance Painting of Steel
SSPC-PA2 Measurement of Dry Paint Thickness with Magnetic Gage
SSPC-PA 9 Measurement of Dry Coating Thickness on Cementitious Substrates Using Ultrasonic Gages
SSPC-PA 10 Guide to Safety and Health Requirements for Industrial Painting Projects
SSPC-PA Guide 11 Protecting Edges, Crevices, and Irregular Steel Surfaced by Stripe Coating
SSPC-SP 1 Solvent Cleaning
SSPC-SP 2 Hand Tool Cleaning
SSPC-SP 3 Power Tool Cleaning
SSPC-SP 5/NACE No. 1 White Metal Blast Cleaning
SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning
SSPC-SP 7/NACE No. 4 Brush-Off Blast Cleaning
SSPC-SP 8 Pickling
SSPC-SP 10/NACE No. 2 Near-White Blast Cleaning
SSPC-SP 11 Power Tool Cleaning to Bare Metal
SSPC-SP 13/NACE No. 6 Surface Preparation of Concrete
SSPC-SP 14/NACE No. 8 Industrial Blast Cleaning
SSPC-SP 15 Commercial Grade Power Tool Cleaning
SSPC-SP 16 Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals
SSPC-VIS 1 Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC-VIS 2 Method of Evaluating Degree of Rusting on Painted Steel Surfaces
SSPC-VIS 3 Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning
SSPC-VIS 4/NACE VIS 7 Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting
SSPC-VIS 5/NACE VIS 9 Guide and Reference Photographs for Steel Surfaces Prepared by Wet Abrasive Blast Cleaning
SSPC-SP WJ 1/NACE WJ-1 Clean to Bare Substrate
SSPC-SP WJ 2/NACE WJ-2 Very Thorough Cleaning
SSPC-SP WJ 3/NACE WJ-3 Thorough Cleaning
SSPC-SP WJ 4/NACE WJ-4 Light Cleaning

2.5 *Federal Standards:*[6]

10 CFR 50 Appendix B Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
10 CFR 21 Reporting of Defects and Noncompliance

[3] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, http://www.asme.org.

[4] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.

[5] Available from Society for Protective Coatings (SSPC), 40 24th St., 6th Floor, Pittsburgh, PA 15222-4656, http://www.sspc.org.

[6] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

2.6 *ICRI Standards:*[7]

No. 03732P Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

2.7 *NACE Standards:*[8]

NACE SP0178 Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to be Lined for Immersion Service

NACE SP0188 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

3. Terminology

3.1 Definitions for use with this standard are shown in Terminology D4538 or other applicable standards.

4. Significance and Use

4.1 Personnel trained for coating and lining work inspection are required to perform examination/inspection tasks to verify conformance of coating and lining work to written requirements.

4.2 This guide provides guidance for development of an indoctrination and training program for training of personnel performing coating and lining work inspection.

4.3 Certification/qualification of personnel performing coating and lining work inspection is addressed in Guide D4537.

5. General Requirements for Training for Level I

5.1 As a minimum, training shall include sufficient information to ensure that the person performing coating and lining work inspection understands each of the following topics:

5.1.1 *Inspection Plans/Procedures*—Key points include elements, objectives, inspection points, standards, and implementation.

5.1.2 *Basic Corrosion Theory*—Key points include purpose of protective coating and linings, fundamental mechanisms of corrosion, corrosion cycle, the four items necessary for corrosion to occur, energy flow, galvanic corrosion, and basic methods of corrosion control.

5.1.3 *Coating and Lining Technology*—Key points include components of a coating or lining, coating or lining types, volatile organic compound (VOC), drying/curing mechanisms, application tolerances, application limitations, and normal use limitations.

5.1.4 *Quality Assurance*—Key points include philosophy, 10 CFR 50 Appendix B, elements of quality assurance (QA) program, written procedures, organizational structure, audits and 10 CFR 21.

5.1.5 *Engineering Specifications*—Key points include elements, purpose, and inspection role defined.

5.1.6 *Coating and Lining Work Procedures*—Key points include purpose and elements.

5.1.7 *Nuclear Documents*—Key points include regulations, material qualifications, personnel qualifications, and safety related versus non-safety related.

5.1.8 *Pre-Job and Job Conferences*—Key points include purposes, participants, conflicts, specifications versus procedures versus standards, material specifics, job specifics, exempt areas, inaccessible areas, and limited access areas.

5.1.9 *Materials Receiving, Storage and Handling*—Key points include materials for surface preparation, cleaning, coating and lining, thinning, inspecting, labeling, controlled storage, shelf life, safety/fire, disposal, inventory control, and material safety data sheets.

5.1.10 *Safety*—Key points include health, fire, general and job specific.

5.1.11 *Pre-Surface Preparation Inspection*—Key points include how, and what to look for on concrete and steel.

5.1.12 *Surface Preparation Methods/Equipment*—Key points include importance, methods for concrete/steel, equipment, compressed air cleanliness and standards.

5.1.13 *Surface Preparation Inspection*—Key points include contaminants, degree of cleanliness, profile/roughness, methods, equipment, and dust removal.

5.1.14 *Calibration and Proper Use of Inspection Instruments*—Key points include use and calibration.

5.1.15 *Environmental Measurements*—Key points include purpose, procedures, temperatures, relative humidity (RH), dew point (DP), wind velocity, and weather.

5.1.16 *Mixing Methods/Equipment*—Key points include temperature, mixing, thinning, sweat-in or induction period, agitation, pot life, and equipment.

5.1.17 *Application Methods/Equipment*—Key points include methods, equipment, equipment cleanliness, compressed air cleanliness, limitations, and recognizing problems.

5.1.18 *Application Inspection*—Key points include wet film thickness, environmental conditions, cure requirements between coats, dry film thickness, final cure, cleanliness between coats, inspection methods, and inspection equipment.

5.1.19 *Coating and Lining Defects*—Key points include types, probable cause, remedies, and inspection techniques.

5.1.20 *Remedial Action*—Key points include surface preparation, materials, application, curing, and inspection.

5.1.21 *Documentation*—Key points include purpose, forms, deviations, and processing.

6. General Requirements for Training for Level II

6.1 The Requirements of Level I stated in Section 5.

6.2 *Inspection Plan Preparation*—Key points include preparation of inspection plans.

6.3 *Verification of Credentials of Personnel Who Perform Inspections*—A person designated as Level II can verify the qualification and certification of a person designated as Level I.

6.4 *Implementation of QA Program*—The person performing coating and lining inspection work must understand how the inspections relate to the QA Program requirements and how to prepare inspection procedures to implement the applicable QA Program requirements.

[7] Available from International Concrete Repair Institute (ICRI), 3166 South River Road, Suite 132, Des Plaines, IL 60018, www.icri.org.

[8] Available from NACE International (NACE), 1440 South Creek Dr., Houston, TX 77084-4906, http://www.nace.org.

7. General Requirements for Training for Level III

7.1 The Requirements of Level II stated in Section 6.

7.2 *Procedure for Implementation of QA Programs*—Preparing and approving procedures for the implementation of a QA program.

7.3 *Training Program Evaluation*—Evaluating the adequacy of programs used to train coating and lining inspectors.

7.4 *Verification of Credentials of Personnel Who Perform Inspections*—A person designated as Level III can verify the qualification and certification of persons designated as Level I or II.

8. Program Specific Requirements

8.1 In addition to the generalized training recommended in Sections 5, 6, and 7 personnel performing coating and lining work inspection must be trained in those documents listed in Section 2 at least to the extent that the standards are referenced in the project specific requirements. Include additional documents as necessary to meet project requirements.

9. Keywords

9.1 coating and linings work inspection; inspection; inspection training; nuclear; qualification and certification; training program