



Standard Guide for Developing a Training Program for Personnel Performing Coating and Lining Work Inspection for Nuclear Facilities¹

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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

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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.

- 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

- D4940 Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blasting Abrasives
- D5162 Practice for Discontinuity (Holiday) Testing of Non-conductive 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
- 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
- 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 *SSPC: The Society for Protective Coatings Standards:*⁴
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-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 Surfaces by Stripe Coating
- SSPC-SP1 Solvent Cleaning
- SSPC-SP2 Hand Tool Cleaning
- SSPC-SP3 Power Tool Cleaning
- SSPC-SP5/NACE No. 1 White Metal Blast Cleaning
- SSPC-SP6/NACE No. 3 Commercial Blast Cleaning
- SSPC-SP7/NACE No. 4 Brush-Off Blast Cleaning
- SSPC-SP8 Pickling
- SSPC-SP10/NACE No. 2 Near-White Blast Cleaning
- SSPC-SP11 Power Tool Cleaning to Bare Metal
- SSPC-SP12/NACE No. 5 Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
- SSPC-SP13/NACE No. 6 Surface Preparation of Concrete
- SSPC-SP14/NACE No. 8 Industrial Blast Cleaning
- SSPC-SP15 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
- 2.4 *Federal Standards:*⁵
10 CFR 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
10 CFR 21 Reporting of Defects and Noncompliance
- 2.5 *ICRI Standards:*⁶
No. 03732P Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
- 2.6 *NACE Standards:*⁷
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.

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 Society for Protective Coatings (SSPC), 40 24th St., 6th Floor, Pittsburgh, PA 15222-4656, <http://www.sspc.org>.

⁵ 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>.

⁶ Available from International Concrete Repair Institute (ICRI), 3166 South River Road, Suite 132, Des Plaines, IL 60018, www.icri.org.

⁷ Available from NACE International (NACE), 1440 South Creek Dr., Houston, TX 77084-4906, <http://www.nace.org>.

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 *Health Physics*—Key points include importance, as low as reasonably achievable (ALARA), and instructions set forth by the Health Physics Department.

5.1.5 *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**.

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

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

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

5.1.9 *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.

5.1.10 *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.

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

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

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

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

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

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

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

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

5.1.19 *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.

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

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

5.1.22 *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. 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 Inspector Credentials*—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 as contained 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; inspector training; nuclear; qualification and certification; training program

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