



# Standard Guide for Developing a Training Program for Coating Work Inspectors in Nuclear Facilities<sup>1</sup>

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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 inspection personnel for coating work in nuclear facilities.

1.2 It is recognized that organizations and job responsibilities vary widely among utilities and also among various support and service companies. Portions of the program may not be applicable in all cases. Therefore, it is the responsibility of each company to identify the appropriate subject matter for its organization and its site specific needs.

1.3 Users of this guide must ensure that coatings 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:

- D 16 Terminology for Paint, Related Coatings, Materials, and Applications<sup>2</sup>
- D 1005 Test Methods for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers<sup>2</sup>
- D 1186 Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base<sup>2</sup>
- D 1400 Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base<sup>2</sup>
- D 2092 Guide for Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting<sup>3</sup>
- D 2240 Test Method for Rubber Property—Durometer Hardness<sup>4</sup>
- D 2583 Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor<sup>5</sup>
- D 3276 Guide for Painting Inspectors (Metal Substrates)<sup>3</sup>

- D 3359 Test Method for Measuring Adhesion by Tape Test<sup>2</sup>
- D 3363 Test Method for Film Hardness by Pencil Test<sup>2</sup>
- D 3925 Practice for Sampling Liquid Paints and Related Pigment Coatings<sup>2</sup>
- D 4138 Method for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive Means<sup>3</sup>
- D 4212 Test Method for Viscosity by Dip-Type Viscosity Cups<sup>2</sup>
- D 4214 Test Method for Evaluating Degree of Chalking of Exterior Paint Films<sup>2</sup>
- D 4258 Practice for Surface Cleaning Concrete for Coating<sup>3</sup>
- D 4259 Practice for Abrading Concrete<sup>3</sup>
- D 4260 Practice for Acid Etching Concrete<sup>3</sup>
- D 4261 Practice for Surface Cleaning Concrete Unit Masonry for Coating<sup>3</sup>
- D 4262 Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces<sup>3</sup>
- D 4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method<sup>3</sup>
- D 4285 Test Method for Indicating Oil or Water in Compressed Air<sup>3</sup>
- D 4414 Practice for Measurement of Wet Film Thickness by Notched Gages<sup>2</sup>
- D 4417 Test Method for Field Measurement of Surface Profile of Blast Cleaned Steel<sup>3</sup>
- D 4537 Guide for Establishing Procedures to Qualify and Certify Inspection Personnel for Coating Work in Nuclear Facilities<sup>3</sup>
- D 4538 Terminology Relating to Protective Coating and Lining Work for Power Generation Facilities<sup>3</sup>
- D 4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion-Testers<sup>3</sup>
- D 4610 Guide for Determining the Presence of and Removing Microbial (Fungal or Algal) Growth on Paint and Related Coatings<sup>2</sup>
- D 4752 Test Method for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub<sup>3</sup>
- D 4787 Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates<sup>3</sup>
- D 4940 Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blasting Abrasives<sup>3</sup>

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee D33 on Protective Coating and Lining Work for Power Generation Facilities and is the direct responsibility of Subcommittee D33.04 on Quality Systems and Inspection.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 06.01.

<sup>3</sup> Annual Book of ASTM Standards, Vol 06.02.

<sup>4</sup> Annual Book of ASTM Standards, Vol 09.01.

<sup>5</sup> Annual Book of ASTM Standards, Vol 08.02.

D 5162 Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates<sup>3</sup>  
 E 337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet-Bulb and Dry-Bulb Temperatures)<sup>6</sup>

2.2 *The Society for Protective Coatings Standards (SSPC):*<sup>7</sup>

- SSPC-PA1 Shop, Field and Maintenance Painting
  - SSPC-PA2 Measurement of Dry Paint Thickness with Magnetic Gage
  - SSPC-SP1 Solvent Cleaning
  - SSPC-SP2 Hand Tool Cleaning
  - SSPC-SP3 Power Tool Cleaning
  - SSPC-SP5 White Metal Blast Cleaning
  - SSPC-SP6 Commercial Blast Cleaning
  - SSPC-SP7 Brush-Off Blast Cleaning
  - SSPC-SP8 Pickling
  - SSPC-SP10 Near-White Blast Cleaning
  - SSPC-SP11 Power Tool Cleaning to Bare Metal
  - SSPC-VIS1 Visual Standard for Abrasive Blast Cleaned Steel
  - SSPC-VIS3 Visual Standard for Power-and Hand-Tool Cleaned Steel
- 2.3 *Federal Standards:*
- 10 CFR 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants<sup>8</sup>
  - 10 CFR 21 Reporting of Defects and Noncompliance<sup>8</sup>

### 3. Significance and Use

3.1 Inspection personnel trained for coating work are required to perform examination/inspection tasks to verify conformance of coating work to written instructions/specifications.

3.2 With the use of this guide, those responsible for indoctrination and training, should be able to develop an appropriate program for training inspection personnel involved in coating work.

3.3 It should be understood that mastery of the subject matter addressed in this guide will not by itself result in the certification of inspectors. Certification of inspection personnel for coating work can be obtained as outlined in Guide D 4537.

3.4 This guide may be modified for use in nonnuclear facilities.

### 4. General Requirements for Training for Level I

4.1 As a minimum, training shall include sufficient information to ensure that the inspector understands each of the following topics:

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

4.1.2 *Basic Corrosion Theory*—Key points include purpose of protective coatings, fundamental mechanisms of corrosion,

corrosion cycle, the four items necessary for corrosion to occur, energy flow, galvanic corrosion, and basic methods of corrosion control.

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

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

4.1.5 *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.

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

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

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

4.1.9 *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.

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

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

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

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

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

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

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

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

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

4.1.19 *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.

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

<sup>6</sup> Annual Book of ASTM Standards, Vol 11.03.

<sup>7</sup> Available from The Society of Protective Coatings, (SSPC), 40 24th St., 6th Floor, Pittsburgh, PA 1522-4656.

<sup>8</sup> Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

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

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

## **5. General Requirements for Training for Level II**

5.1 The Requirements of Level I Stated in Section 4.

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

5.3 *Verification of Inspector Credentials*—The requirements for qualification and certification of a Level I inspector or another Level II inspector.

5.4 *Implementation of QA Program*—The inspector must understand how the inspections relate to the QA Program requirements and how to prepare inspection procedures to implement the applicable QA Program requirements.

## **6. General Requirements for Training for Level III**

6.1 The Requirements of Level II Stated in Section 5.

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

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

6.4 *Verification of Inspector Credentials*—The requirements for qualification and certification of Level I and II inspectors or another Level III inspector.

## **7. Commentary**

7.1 The documents covered in Table 1 are some of the standards, test methods, or guides for established inspection techniques with which a coatings work inspector should become proficient.

## **8. Plant Specific Requirements**

8.1 In addition to the generalized training recommended in Sections 4, 5, 6, and 7, the inspector must be trained in site specific requirements.

## **9. Keywords**

9.1 coatings work inspection; inspection; inspection training; inspector training; nuclear; qualification and certification

**TABLE 1 Standards Addressing Recommended Areas of Proficiency**

ASTM STANDARDS	
D 16	Terminology Relating to Paint, Varnish, Lacquer, and Related Products
D 1005	Test Methods for Measurement of Dry Film Thickness of Organic Coatings Using Micrometers
D 1186	Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base
D 1400	Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base
D 2092	Practices for Preparation of Zinc-Coated Galvanized Steel Surfaces for Paint
D 2240	Test Method for Rubber Property Durometer Hardness
D 2583	Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
D 3276	Guide for Painting Inspectors (Metal Substrates)
D 3359	Test Method for Measuring Adhesion by Tape Test
D 3363	Test Method for Film Hardness by Pencil Test
D 3925	Practice for Sampling Liquid Paints and Related Pigment Coatings
D 4138	Method for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive Means
D 4212	Test Method for Viscosity by Dip-Type Viscosity Cups
D 4214	Method for Evaluating Degree of Chalking of Exterior Paint Films
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D 4259	Practice for Abrading Concrete
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D 4263	Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
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D 4538	Terminology Relating to Protective Coating and Lining Work for Power Generation Facilities
D 4541	Test Method for Pull-Off Strength of Coatings Using Portable Adhesion-Testers
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E 337	Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet-Bulb and Dry-Bulb Temperatures)
SSPC STANDARDS	
SSPC-PA1	Shop, Field and Maintenance Painting
SSPC-PA2	Measurement of Dry Paint Thickness with Magnetic Gage
SSPC-SP1	Solvent Cleaning
SSPC-SP2	Hand Tool Cleaning
SSPC-SP3	Power Tool Cleaning
SSPC-SP5	White Metal Blast Cleaning
SSPC-SP6	Commercial Blast Cleaning
SSPC-SP7	Brush-Off Blast Cleaning
SSPC-SP8	Pickling
SSPC-SP10	Near-White Blast Cleaning
SSPC-SP11	Power Tool Cleaning to Bare Metal
SSPC-VIS1	Visual Standard for Abrasive Blast Cleaned Steel
SSPC-VIS3	Visual Standard for Power-and Hand-Tool Cleaned Steel

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