



ANSI/NACE No. 13/SSPC-ACS-1
Item No. 21122

ANSI/NACE/SSPC Standard Practice

Industrial Coating and Lining Application Specialist Qualification and Certification

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ISBN 1-57590-215-X

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Foreword

This NACE/SSPC joint standard sets forth the requirements for qualification and certification of an industrial coating and lining application specialist, referred to hereafter as an *Application Specialist*. The qualification and certification process is a stepwise achievement process that includes all aspects of surface preparation and coating application for steel and concrete surfaces of complex industrial structures. The intended audience includes personnel involved in developing education and certification programs for the training and assessment of the skills and knowledge of an Application Specialist or assessing the training and certification programs available either on the open market or from an in-house source.

The body of the standard provides the requirements for qualification and certification of an Application Specialist.

Appendix A (mandatory) defines the competency requirements or the minimum “Body of Knowledge” for each qualification level that provides a basis to allow applicants to achieve qualification in a Certified Application Specialist Program. Appendix A provides requirements for Section 5 of this standard.

Appendix B (mandatory) describes the level of competency required for each qualification level. Appendix B provides required information for use with Appendix A for the development of a learning skills program associated with the Body of Knowledge in Appendix A.

Appendix C (nonmandatory) provides information on desirable workplace skills (reading text, document use, and numeracy) that should be considered by those attempting to both nurture and assess a candidate’s overall skills level.

Appendix D (nonmandatory) provides a list of acceptable training programs.

This standard may be used to validate or assess a candidate’s (e.g., an employee’s or potential employee’s) knowledge and skills level based on qualification in a certification program operated under this standard. One of the goals of this standard is to recognize and record in an outline format the minimum overarching elements in the Body of Knowledge as these elements relate to a candidate’s competency levels of learning and skills.

Government and industry are striving for long-term reliability of equipment and operations. Corrosion mitigation of steel and concrete structures by coatings and linings is relevant to achieving that goal. Coating application also combines corrosion mitigation with aesthetic appeal in both the public and private sectors. The success of coatings and linings is heavily dependent on the qualifications of the Application Specialist. The study “Corrosion Costs and Preventive Strategies in the United States”¹ identified an annual expenditure of 108.6 billion USD on protective coatings and linings. As much as 71% of that annual expenditure may be affected by work performed by an Application Specialist.

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This standard is designed to qualify the Application Specialist through a broad range of classroom instruction and associated work experiences.

This standard was originally published in 2007 and revised in 2016 by the joint Task Group (TG) 320, "Coating and Lining Applicator Qualification." TG 320 is administered by Specific Technology Group (STG) 04, "Coatings and Linings, Protective: Surface Preparation," and is composed of representatives from NACE International, The Society for Protective Coatings (SSPC), and the International Union of Paint and Allied Trades (IUPAT).⁽¹⁾ This standard is published under the auspices of NACE's STG 04 and SSPC's Coating Applicator Qualification Committee.

In NACE/SSPC standards, the terms *shall*, *must*, *should*, and *may* are used in accordance with Paragraph 2.2.1.8 of the Agreement Between NACE International and SSPC: The Society for Protective Coatings. The terms *shall* and *must* are used to state mandatory requirements. The term *should* is used to state something considered good and is recommended but is not mandatory. The term *may* is used to state something considered optional.

⁽¹⁾ International Union of Painters and Allied Trades (IUPAT), 1750 New York Avenue NW, Washington, DC 20006.

Standard Practice

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Section 1: General

1.1 Scope

1.1.1 This standard provides criteria for the education, training, experience, knowledge, and skills required of an Application Specialist to prepare and apply protective coatings. This standard may be used for certification of Application Specialists for other substrates or conditions, as considered appropriate by facility owners, contractors, or certifying agencies.

1.1.2 This standard applies to qualification of an Application Specialist. The qualification levels for Application Specialists are summarized in Section 4, Table 1.

Section 2: Definitions

The definitions of many of the corrosion-related terms used in this standard can be found in NACE/ASTM⁽²⁾ G193² or the "SSPC Protective Coatings Glossary."³

Application Specialist: An individual who engages in surface preparation and application of protective coatings and linings.

Specialty Endorsements: Advanced knowledge and demonstrated competency in specialty areas beyond the core Body of Knowledge.

Section 3: Body of Knowledge

3.1 The basis for the qualification of an Application Specialist shall consist of:

3.1.1 Body of Knowledge, and

3.1.2 Test requirements.

3.2 The Body of Knowledge shall consist of:

3.2.1 A list of required areas of knowledge and skills; and

3.2.2 Required level of competency for each area of knowledge and skill.

3.3 The core areas of the Body of Knowledge include:

3.3.1 Environmental, safety, and health;

3.3.2 Process control;

3.3.3 Materials;

⁽²⁾ ASTM International (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

3.3.4 Surface preparation; and

3.3.5 Application.

3.4 The specialty endorsements of the Body of Knowledge listed in Table 2 include:

3.4.1 Installation of polymer coatings and linings on concrete floors and secondary containment;

3.4.2 Waterjetting (High-pressure water cleaning [HPWC] and ultrahigh-pressure waterjetting [UHPWJ]);

3.4.3 Electrostatic spray;

3.4.4 Plural component spray;

3.4.5 Powder coating processes;

3.4.6 Specialty pipeline coating installations; and

3.4.7 Thermal spray coating processes.

Section 4: Qualification Levels and Requirements for Application Specialist

4.1 This standard sets forth requirements for three basic qualification levels—Level I, Level II, and Level III—for an Application Specialist. These qualification levels are summarized in Table 1. In addition, requirements are set forth to attain endorsements for Level II. The specialty endorsements are listed in Table 2 in Section 5.

Table 1
Qualification Levels and Requirements for Application Specialist

Qualification Level	Requirements
Level I	Basic knowledge of industrial coatings, linings, and safety
Level II	Detailed knowledge and skills of industrial coatings and linings
Specialty Endorsements	Level II, plus detailed knowledge and skills of specialty areas as identified herein (see Table 2 in Section 5)
Level III	Level II, plus three or more specialty endorsements

4.2 The requirements associated with each qualification level include prerequisites, experience, and an appropriate degree of knowledge and skills as they relate to the Body of Knowledge elements in Appendix A. Table A1 in Appendix A provides the Body of Knowledge that is used to establish each qualification level based on appropriate competency requirements for each knowledge and skill element.

4.3 Level I qualification is intended for entry-level Application Specialists with limited relevant work experience. Level I Application Specialists customarily work with and under the supervision of Level II or Level III Application Specialists.

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4.3.1 Level I Definition—An individual with limited relevant work experience who is gaining on-the-job experience. Upon completion of Level I training, the individual shall possess basic knowledge and comprehension as defined in the Body of Knowledge in Appendix A, and will have the ability to imitate a mentor's activity while developing the ability to manipulate tools following instructions and obtaining sufficient practice.

4.3.2 Level I Qualification and Requirements

4.3.2.1 Successful completion of a skills assessment program measuring essential employability skills: text reading, document use, and numeracy (see Appendix C);

4.3.2.2 Successful completion of examinations on the Body of Knowledge (see Appendix A); and

4.3.2.3 Successful demonstration of the ability to read, comprehend and communicate in the language accepted by the contractual parties.

4.4 Level II qualification is intended for experienced Application Specialists, with a moderate skill level, who are able to work independently, while performing surface preparation and coating applicator work.

4.4.1 Level II Definition—An individual with a minimum of 3 years of relevant work experience that includes a minimum of 3,000 hours of verifiable relevant work experience and a minimum of 450 hours of verifiable documented craft training obtained throughout the period. Upon completion of the training, the individual has the ability to apply knowledge and demonstrate the ability to analyze while developing precision resulting in minimal rework. See Appendix D for a list of acceptable training programs.

Or:

4.4.2 Level II Definition—An individual with a minimum of 6 years of verifiable relevant work experience. The individual has the ability to apply knowledge and demonstrates the ability to analyze while developing precision, resulting in minimal rework.

4.4.3 Level II Qualification and Requirements

4.4.3.1 Successful completion of all Level I requirements; and

4.4.3.2 Successful completion of Level II examinations (refer to Section 6 for details of Level II core and specialty qualifications). See Appendix A.

4.5 Level II with Endorsements is intended for experienced Application Specialists with a moderate skill level, who are able to work independently, while performing surface preparation and coating applicator work and who have successfully completed a minimum of one of the specialty endorsements shown in Table 2 in Section 5.

4.5.1 Level II with Endorsements Definition—An individual who has successfully met all the requirements of Level II and has successfully completed a minimum of one of the specialty endorsements shown in Table 2 in Section 5. The individual has the ability to apply knowledge and demonstrates the ability to analyze while developing precision resulting in minimal rework.

4.5.2 Level II Endorsements—Qualification and Requirements

4.5.2.1 Successful completion of Level II examinations and a minimum of one of the specialty endorsements (shown in Table 2 in Section 5) examinations.

4.6 Level III qualification is intended for Application Specialists with advanced knowledge of coatings and linings and three or more endorsements.

4.6.1 Level III Definition—An individual who has previously met the requirements of Level II and a minimum of three of the specialty areas shown in Table 2, and has a minimum of 8 years of verifiable relevant work experience. The Level III Applicator has the skills required to evaluate and synthesize as demonstrated by the ability to make plans and sound judgments. Psychomotor skills are naturalized.

4.6.2 Level III Qualification and Requirements

4.6.2.1 Successful completion of Level III examinations.

Section 5: Examination Requirements for Level II Specialty Endorsement Qualifications

5.1 Table 2 lists the various examination requirements for Level II specialty endorsement qualifications.

Table 2
Level II Specialty Qualification Examination Requirements

	Specialty (Add-on) Endorsement Qualifications	
	Written Examination	Practical Examination
Coating of concrete	✓	✓
Waterjetting (HPWC and UHPWJ)	✓	✓
Electrostatic spray	✓	✓
Plural component spray	✓	✓
Powder coating processes	✓	✓
Specialty pipeline coating installations	✓	✓
Thermal spray coating processes	✓	✓

Section 6: Certification Program Requirements

6.1 Certification programs operated under this standard shall be developed and operated in accordance with ISO⁽³⁾ 17024.⁴

6.2 Certification examinations shall be based on the competency requirements in the Body of Knowledge for the qualification level that the candidate is striving to achieve.

6.3 Practical examinations for Level II shall require the candidate to prepare and coat a test panel or test apparatus that mimics the efforts required to prepare and coat complex industrial structures. The examination and test panel or test apparatus shall test the candidate on his/her ability to:

- 6.3.1 Plan steps and procedures;
- 6.3.2 Set up and start abrasive blasting equipment;
- 6.3.3 Abrasive blast the test panel or test apparatus to a specific level of cleanliness and surface profile;
- 6.3.4 Assess, measure, and document the specified surface preparation;

Section 7: Requirements for Maintaining Qualification

7.1 Qualifications shall be valid for no more than 3 years. Qualifications shall be maintained by one of the following methods:

7.1.1 Successful completion of a minimum of 24 hours per year of verifiable documented industry-related training and 500 hours per year of verifiable relevant work experience; or

7.1.2 Successful completion of the qualification examination(s) for the qualification level (core or specialty) being maintained and 500 hours per year of verifiable relevant work experience.

References

1. FHWA-RD-01-156, "Corrosion Costs and Preventive Strategies in the United States" (Washington, DC: Federal Highway Administration,⁽⁴⁾ 2002).
2. NACE/ASTM G193 (latest version), "Standard Technology and Acronyms Relating to Corrosion" (Houston, TX: NACE and West Conshohocken, PA: ASTM, 2002).
3. "SSPC Protective Coatings Glossary (latest revision) (Pittsburgh, PA: SSPC).
4. ISO 17024—ISO/IEC 17024 (latest revision), "Conformity assessment—General requirements for bodies operating certification of persons" (Geneva, Switzerland: ISO).

⁽³⁾ International Organization for Standardization (ISO), 1 ch. de la Voie-Creuse, Case Postale 56, CH-1211 Geneva 20, Switzerland.

⁽⁴⁾ Federal Highway Administration (FHWA), U.S. Department of Transportation (DOT), 1200 New Jersey Ave. SE, Washington, DC 20590.

5. B.S. Bloom, B.B. Mesia, D.R. Krathwohl, "Levels of Cognition," in *Taxonomy of Educational Objectives, Vol. 1: The Affective Domain*, and *Vol. 2: The Cognitive Domain* (New York, NY: David McKay, 1964).
6. R.H. Dave, R.J. Armstrong et al., *Developing and Writing Behavioral Objectives* (Tucson, AZ: Educational Innovators Press, 1970).
7. "TOWES —Test of Workplace Essential Skills" (Calgary, AB, Canada: Bow Valley College⁽⁵⁾).

⁽⁵⁾ Bow Valley College, 345 6th Avenue SE, Calgary, AB T2G 4V1, Canada.

Appendix A
Body of Knowledge for Application Specialist Qualification
(Mandatory)

NOTE: The CR1 through CR3 designations for the Competency Requirements indicate levels of competency and psychomotor skills in accordance with Appendix B. The CR designation in each block applies to the entire associated section, not just the line item with which it is aligned.

Table A1

Body of Knowledge—Application Specialist Qualification			
	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
Knowledge and Skills Elements			
A1 Environmental, Safety, and Health			
A1.1 Local and Other Applicable Safety Codes, Practices, Standards, and Regulations			
A1.1.1 Working from scaffolds and ladders	CR1	CR1	CR3
A1.1.2 Fall protection	CR1	CR1	CR3
A1.1.3 Confined space	CR1	CR1	CR3
A1.1.4 Lock out/tag out	CR1	CR1	CR3
A1.1.5 Aerial lifts	CR1	CR1	CR 3
A1.1.6 Hazard communication (HAZCOM) and Safety Data Sheets	CR1	CR1	CR3
A1.1.7 Electrical grounding requirements	CR1	CR1	CR 3
A1.1.8 Working with hand and power tools	CR1	CR1	CR3
A1.1.9 Personal protective equipment (PPE)	CR2	CR2	CR3
A1.1.10 Selection and use of respiratory protection	CR2	CR2	CR3
A1.1.11 Hearing Conservation	CR2	CR2	CR2
A1.1.12 Avoiding heat related injury	CR2	CR2	CR2

Body of Knowledge—Application Specialist Qualification			
Knowledge and Skills Elements	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
A1.2 Safety Directly Related to Specific Materials/Equipment			
A1.2.1 Abrasive cleaning (both wet and dry methods)	CR1	CR2	CR3
A1.2.2 Waterjetting			CR3
A1.2.3 Exposure to high pressure lines (Hydraulic/Pneumatic)	CR1	CR1	CR1
A1.2.4 Exposure to toxic metals	CR1	CR1	CR1
A1.2.5 Exposure to hazardous substances	CR1	CR1	CR1
A1.2.6 Exposure to, use and disposal of hydrocarbon solvents	CR1	CR1	CR1
A1.3 Ventilation			
A1.3.1 Lower explosive limit (LEL)/upper explosive limit (UEL)	CR1	CR1	CR1
A1.3.2 Threshold limit value (TLV)/permissible exposure limit (PEL)	CR1	CR1	CR1
A1.3.3 Methods of ventilation	CR1	CR1	CR1
A1.4 Environmental			
A1.4.1 Waste minimization		CR1	CR3
A1.4.2 Handling and disposal of hazardous materials	CR1	CR2	CR2
A1.4.3 Working in and around containment systems		CR2	CR2
A1.4.4 Understanding VOC restrictions		CR1	CR2
A1.5 General Knowledge			
A1.5.1 Basic mathematical operations (Addition, Subtraction, Multiplication, Division, Averaging)	CR2	CR3	CR3

Body of Knowledge—Application Specialist Qualification			
Knowledge and Skills Elements	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
A1.5.2 Basic geometry (Square Footage, Volume, Area, etc.)	CR2	CR2	CR3
A1.5.3 Basic applicator calculations (wet film thickness [WFT] to dry film thickness [DFT], % Solids by Volume + thinner, Theoretical Spread Rate, DFT by consumption etc.)		CR2	CR3
A1.5.4 Advanced calculations and formulas		CR1	CR3
A2 Process Control (including quality assurance and quality control)			
A2.1 Work Planning		CR3	CR3
A2.1.1 Process control		CR3	CR3
A2.1.2 Procedures and work instructions		CR3	CR3
A2.1.3 Work planning and sequencing		CR3	CR3
A2.1.4 Documenting work progress		CR3	CR3
A2.2 Develop and Follow Application Procedures			
A2.2.1 Receipt and storage procedure	CR1	CR2	CR2
A2.2.2 Product data sheets (PDS) and safety data sheets (SDS)	CR1	CR2	CR3
A2.2.3 Mixing procedure—boxing, hand, power	CR1	CR2	CR3
A2.2.4 Thinning procedure	CR1	CR2	CR3
A2.2.5 Application procedures—brush, roller, spray, other	CR1	CR2	CR3
A2.2.6 In-process measuring and monitoring	CR1	CR2	CR3
A2.3 Test Equipment			
A2.3.1 Accuracy level (+/- tolerances)		CR2	CR2
A2.3.2 Verifying accuracy and adjustment		CR2	CR2

Body of Knowledge—Application Specialist Qualification			
	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
Knowledge and Skills Elements			
A2.3.3 Use of basic gauges		CR2	CR2
A2.3.4 Basic test methods		CR2	CR2
A2.4 Ambient Conditions (temperature, relative humidity, wind, dew point)			
A2.4.1 Measure and document conditions		CR2	CR2
A2.4.2 Have knowledge of measuring equipment—uses and limitations		CR2	CR2
A2.4.3 Anticipate localized conditions based on site—cooling towers, steam traps, etc.		CR2	CR2
A2.5 Surface Conditions—Acceptability for Coating Application			
A2.5.1 Cleanliness—importance/recognition/remediation		CR2	CR2
A2.5.2 Conformity to visual guides and written standards (importance/recognition/remediation)		CR2	CR2
A2.5.3 Impact on coating performance		CR2	CR2
A2.5.4 Surface profile		CR2	CR2
A2.5.5 Nonvisible contaminants		CR2	CR2
A2.6 Verification Inspection			
A2.6.1 Importance of in-process verification		CR2	CR2
A2.6.2 How to determine conformance		CR2	CR2
A2.6.3 How to document conformance and nonconformance		CR2	CR2
A3 Materials			
A3.1 Reasons for Coating			

Body of Knowledge—Application Specialist Qualification			
	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
Knowledge and Skills Elements			
A3.1.1 Aesthetics	CR1	CR1	CR1
A3.1.2 Corrosion prevention	CR1	CR1	CR1
A3.1.3 Safety	CR1	CR1	CR1
A3.1.4 Process aids	CR1	CR1	CR1
A3.1.5 Environmental protection	CR1	CR1	CR1
A3.2 Abrasives (new and recycled)			
A3.2.1 Types and uses	CR1	CR3	CR 3
A3.2.2 Properties		CR3	CR3
A3.2.3 Testing			
A3.2.3.1 Batch testing		CR3	CR3
A3.2.3.2 In-service testing		CR3	CR3
A3.2.4 Receiving Materials		CR3	CR3
A3.2.5 Storage		CR3	CR3
A3.2.6 Protection from contamination		CR3	CR3
A3.3 Coating Materials			
A3.3.1 Coating generic types	CR1	CR2	CR2
A3.3.2 Single-component coatings	CR1	CR2	CR2
A3.3.3 Multi-component coatings	CR1	CR2	CR2
A3.3.4 Suitability for various service conditions	CR1	CR2	CR2
A3.3.5 Film formation/curing mechanisms	CR1	CR2	CR2
A4 Surface Preparation			
A4.1 Basics of Surface Preparation			

Body of Knowledge—Application Specialist Qualification			
Knowledge and Skills Elements	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
A4.1.1 Effects of mass, velocity, air volume and pressure, nozzle and hose size, etc., on abrasive blast cleaning productivity	CR1	CR2	CR2
A4.1.2 Process effect on substrates	CR1	CR2	CR2
A4.2 Surface Preparation Standards on Metal Substrates			
A4.2.1 Identifying and documenting initial condition of the steel		CR3	CR3
A4.2.2 Identification of surface irregularities requiring remediation (including weld condition)		CR3	CR3
A4.2.3 Identification of steel condition before application		CR3	CR3
A4.2.4 Identification of preparation requirements		CR3	CR3
A4.2.5 Solvent cleaning		CR3	CR3
A4.2.6 Dry abrasive blast cleaning standards		CR3	CR3
A4.2.7 Power and hand tool cleaning standards		CR3	CR3
A4.2.8 Wet abrasive blasting standards		CR3	CR3
A4.2.9 Waterjetting (WJ) standards			CR3
A4.3 Equipment Setup and Operation—Abrasive Blasting			
A4.3.1 Safety equipment and PPE	CR2	CR3	CR3
A4.3.2 Equipment setup—compressor, blast pot, separators, etc.	CR2	CR3	CR3
A4.3.3 Equipment operation—all control valves	CR2	CR3	CR3
A4.3.4 Hose and couplings layout	CR2	CR3	CR3
A4.3.5 Nozzle management		CR3	CR3

Body of Knowledge—Application Specialist Qualification			
Knowledge and Skills Elements	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
A4.3.6 Compressor sizing		CR3	CR3
A4.3.7 Dust and debris control		CR3	CR3
A4.4 Identification of Specified Surface Cleanliness			
A4.4.1 Use of visual guides and written standards		CR2	CR2
A4.4.2 Identification of nonvisible surface contaminants		CR2	CR2
A4.4.3 Identification of flash rusting		CR2	CR2
A4.4.4 Identification of rust back		CR2	CR2
A4.5 Identification of Acceptable Surface Profile and Variables Affecting Surface Profile			
A4.5.1 Measuring and documenting surface profile		CR2	CR2
A4.5.2 Methods and procedures for assessing surface profile		CR2	CR2
A4.6 Identification of Acceptable Abrasive Blasting Conditions for Final Blast			
A4.6.1 Dew point		CR2	CR2
A4.6.2 Surface temperature		CR2	CR2
A4.7 Hand Tool Cleaning			
A4.7.1 Safety and PPE	CR1	CR2	CR2
A4.7.2 Methods and equipment	CR1	CR2	CR2
A4.7.3 Standards and inspection		CR2	CR2
A4.8 Power Tool Cleaning			
A4.8.1 Safety and PPE	CR1	CR2	CR2
A4.8.2 Methods and equipment	CR1	CR2	CR2

Body of Knowledge—Application Specialist Qualification			
Knowledge and Skills Elements	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
A4.8.3 Standards and inspection		CR2	CR2
A4.9 Waterjetting			
A4.9.1 Safety and PPE	CR1	CR1	CR3
A4.9.2 Waterjetting methods and equipment	CR1	CR1	CR3
A4.9.3 Standards and inspection			CR2
A4.10 Chemical Stripping			
A4.10.1 Safety and PPE	CR1	CR2	CR2
A4.10.2 Methods and materials		CR2	CR2
A4.11 Concrete Surface Preparation			
A4.11.1 Surface contamination and defects		CR1	CR3
A4.11.2 Surface cleaning and repair		CR1	CR3
A4.11.3 Surface preparation methods and equipment		CR1	CR3
A4.11.4 Standards and inspection		CR1	CR3
A5 Coating Application—Liquid Coatings			
A5.1 Verify Existence of Appropriate Procedures and Work Instructions		CR2	CR2
A5.2 Mixing			
A5.2.1 Follow mixing requirements (per Specification or PDS)	CR1	CR2	CR2
A5.2.2 Follow premix requirements (per Specification or PDS)	CR1	CR2	CR2
A5.2.3 Use proper equipment / mixing blade	CR1	CR2	CR2

Body of Knowledge—Application Specialist Qualification			
Knowledge and Skills Elements	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
A5.2.4 Document time and ambient conditions		CR2	CR2
A5.2.5 Proper use of thinner (per Specification or PDS)	CR1	CR2	CR2
A5.2.6 Follow induction time	CR1	CR2	CR2
A5.2.7 Observe pot life	CR1	CR2	CR2
A5.2.8 Filtering/straining	CR1	CR2	CR2
A5.2.9 Observe shelf life	CR1	CR2	CR2
A5.3 Application Equipment—Limits, Strengths, and Weaknesses of Each			
A5.3.1 Safety	CR1	CR2	CR2
A5.3.2 Types of equipment	CR1	CR2	CR2
A5.3.2.1 Spray	CR1	CR2	CR2
A5.3.2.1.1 Conventional	CR1	CR2	CR2
A5.3.2.1.2 Airless	CR1	CR2	CR2
A5.3.2.1.3 High-volume low-pressure	CR1	CR1	CR2
A5.3.2.1.4 Air-assisted airless		CR1	CR2
A5.3.2.2 Brush and roller application	CR1	CR2	CR2
A5.3.2.3 Squeegee		CR1	CR2
A5.3.2.4 Mitt	CR1	CR1	CR2
A5.3.2.5 Trowel		CR1	CR2
A5.3.3 Acceptable environmental conditions			
A5.3.3.1 Surface temperature/relative humidity/air temperature/dew point		CR2	CR2
A5.3.3.3 Wind		CR2	CR2

Body of Knowledge—Application Specialist Qualification			
Knowledge and Skills Elements	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
A5.4 Equipment Selection			
A5.5 Equipment Setup and Adjustment		CR3	CR3
A5.6 Equipment Operation and Maintenance		CR3	CR3
A5.7 Overspray Control	CR1	CR3	CR3
A5.8 Safety	CR1	CR3	CR3
A5.9 Drying and Curing Conditions			
A5.9.1 Ambient conditions		CR2	CR2
A5.9.2 Heating (force curing)		CR1	CR1
A5.9.3 Ventilation		CR1	CR1
A5.9.4 Dehumidification		CR1	CR1
A5.10 In-Process Measurement and Monitoring			
A5.10.1 WFT	CR1	CR2	CR3
A5.10.2 Film deficiencies		CR2	CR2
A5.10.3 Other contaminants		CR2	CR2
A5.11 After Initial Cure (and/or between coats) — Measurement and Monitoring			
A5.11.1 DFT		CR1	CR2
A5.11.2 Amine blush		CR1	CR2
A5.11.3 Film deficiencies—identification and rework procedures		CR2	CR3
A5.12 Requirements for Maintenance Coating (Overcoating)			
A5.12.2 Feathering-in		CR2	CR3

Body of Knowledge—Application Specialist Qualification			
Knowledge and Skills Elements	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
A5.12.3 Identify chalking and other contamination		CR2	CR3
A5.12.4 Matching material and requirements to equipment		CR1	CR2
A6 Coating of Concrete			
A6.1 Properties of Concrete		CR1	CR3
A6.2 Concrete Surfaces—Gunite, Poured Concrete, Cinder Block, Concrete Block			CR3
A6.3 Surface Preparation		CR1	CR3
A6.3.1 Mechanical methods—hand, power tools, or grinding		CR1	CR3
A6.3.2 Dry and wet abrasive blasting		CR1	CR3
A6.3.3 Water cleaning (WC) and WJ			CR3
A6.3.4 Acid etching			CR3
A6.4 Surface Preparation Standards			
A6.4.1 Preparation standards (e.g., NACE, SSPC, etc.)		CR1	CR3
A6.4.2 Identification of surface irregularities			CR3
A6.4.3 Identification of surface condition before preparation			CR3
A6.4.4 Identification of pre-preparation requirements			CR3
A6.4.5 Problem areas—porosity, contamination, laitance, cracks, waxes, form releases			CR3
A6.5 Coating Application			
A6.5.1 Materials—fillers, surfacers, coatings/linings, reinforcements			CR3
A6.5.2. Squeegee		CR1	CR3

Body of Knowledge—Application Specialist Qualification			
	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
Knowledge and Skills Elements			
A6.5.3 Trowels		CR1	CR3
A6.5.4 Spray		CR2	CR3
A6.5.5 Screed		CR1	CR3
A6.5.6 Hand lay-up		CR1	CR3
A6.5.7 Surface finishing—sacking, stoning, troweling, synthetic surfacers, aggregate broadcast, etc.		CR1	CR3
A6.6 Inspection and Testing			CR2
A6.6.1 RH, moisture and moisture vapor emission testing			CR2
A6.6.2 Ultrasonic DFT Measurement			CR2
A6.6.3 Roughness			CR3
A6.7 Documentation			CR3
A7 Operation of Waterjetting (HPWC and UHPWJ) Equipment			
A7.1 Equipment Safety Devices			CR3
A7.2 PPE		CR1	CR3
A7.3 Equipment Setup			
A7.3.1 Hoses			CR3
A7.3.2 Pumps			CR3
A7.3.3 Lances			CR3
A7.3.4 Robots			CR3
A7.4 Equipment Operation and Maintenance			
A7.4.1 Hoses			CR3
A7.4.2 Pumps			CR3

Body of Knowledge—Application Specialist Qualification			
	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
Knowledge and Skills Elements			
A7.4.3 Lances			CR3
A7.4.4 Robots			CR3
A7.4.5 Troubleshooting			CR3
A8 Set-up and Use of Electrostatic Spray Equipment			
A8.1 Safety		CR1	CR3
A8.2 PPE		CR1	CR3
A8.3 Equipment			
A8.3.1 Setup			CR3
A8.3.2 Operation			CR3
A8.3.3 Maintenance			CR2
A8.3.4 Safety			CR3
A8.4 Application			CR3
A8.5 Troubleshooting			CR3
A9 Set-up and Use of Plural-Component Spray Equipment			
A9.1 Safety		CR2	CR3
A9.2 PPE		CR2	CR3
A9.3 Equipment		CR1	CR3
A9.3.1 Setup			CR3
A9.3.2 Operation			CR3
A9.3.3 Maintenance			CR3
A9.3.4 Safety		CR2	CR3
A9.4 Application of Coating Materials		CR2	CR3

Body of Knowledge—Application Specialist Qualification			
	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
Knowledge and Skills Elements			
A9.5 Troubleshooting		CR1	CR3
A10 Application of Powder Coatings			
A10.1 Safety		CR1	CR3
A10.2 PPE		CR1	CR3
A10.3 Materials			
A10.3.1 Thermosetting		CR1	CR3
A10.3.2 Thermoplastic		CR1	CR3
A10.4 Types of Setup (process)			CR 3
A10.4.1 Surface preparation		CR2	CR3
A10.4.2 Powder application methods			CR3
A10.4.3 Heating/curing methods			CR3
A10.5 Inspection and Testing			CR2
A11 Set-up and Use of Thermal Spray Coating (TSC) Equipment			
A11.1 Safety		CR1	CR3
A11.2 PPE		CR1	CR3
A11.3 Materials			
A11.3.1 Zinc		CR1	CR3
A11.3.2 Aluminum		CR1	CR3
A11.3.3 85% Zinc/15% Aluminum		CR1	CR3
A11.3.4 Other Alloys			CR3
A11.4 Sealers		CR1	CR3

Body of Knowledge—Application Specialist Qualification			
	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
Knowledge and Skills Elements			
A11.5 Surface Preparation			
A11.5.1 Steel		CR1	CR3
A11.5.2 Concrete		CR1	CR3
A11.6 Application Methods			
A11.6.1 Arc spray		CR1	CR3
A11.6.2 Flame spray		CR1	CR3
A11.6.3 Plasma spray		CR1	CR3
A11.6.4 High Velocity Oxygen Fuel		CR 1	CR 3
A11.6.5 Application of sealer		CR1	CR3
A11.7 Equipment Selection/Setup/Operation			CR2
A11.8 Equipment Selection			CR2
A11.9 Process and Work Instructions			CR3
A11.10 Testing of Applied TSC			
A11.10.1 DFT			CR1
A11.10.2 Bend test			CR1
A11.10.3 Adhesion test			CR1
A11.11 Documentation			CR2
A12 Installation of Specialty Pipeline Coatings			
A12.1 Safety		CR1	CR3
A12.2 PPE		CR1	CR3
A12.3 Materials			
A12.3.1 Tape wraps		CR1	CR3

Body of Knowledge—Application Specialist Qualification			
	Competency Requirements		
	Level I	Level II	Specialty/ Endorsement (L2E) & (L3)
Knowledge and Skills Elements			
A12.3.2 Heat-shrink sleeves		CR1	CR3
A12.3.3 Hot applications			CR3
A12.3.4 Powder coatings			CR1
A12.3.5 Cold-applied mastics		CR1	CR3
A12.3.6 Other			CR1
A12.4 Installation Methods			
A12.5 Equipment Selection/Setup/Operation			CR3
A13 Basics of Corrosion	CR1	CR1	CR1

Appendix B
Competency
(Knowledge and Skills Requirements)
(Mandatory)

B1 This system of identifying competency requirements is based on the six “Levels of Cognition” in Bloom’s Taxonomy of Cognition⁵ and Dave’s definition of the Psychomotor Taxonomy⁶ required to perform satisfactorily on written and practical examinations. For the purpose of clarity, industry subject matter experts have reduced the original six levels of “Cognition” to three basic levels of “Competency” designated as CR1, CR2, and CR3; where “CR” is defined as “Competency Requirement.”

B2 The three levels shall be used to develop the minimum requirements for written and practical assessment examinations. Associated with each level is a brief description of the level based on Bloom for the “Cognitive” and Dave for the “Psychomotor.” Table B1 briefly defines each level as it relates to cognition and psychomotor skills.

Table B1
Three Levels of Competency

Domain	Competency Requirement 1 (CR1)	Competency Requirement 2 (CR2)	Competency Requirement 3 (CR3)
Cognitive	Possesses Knowledge and demonstrates Comprehension	Can apply Knowledge and demonstrates the ability to Analyze	Can Evaluate and Synthesize i.e. make judgments, necessary adjustments and plans
Psychomotor	Can Imitate a mentor's activities and is developing the ability to Manipulate after following instructions and practicing	Developing Precision and consistency Articulation minimizing re-work	Actions are Naturalized and second nature not requiring significant forethought

B3 Three Levels of Competency Based on Bloom's Taxonomy (Revised)

The three levels of competency are presented below in rank order from least complex to most complex along with how they relate to Bloom's original Taxonomy (original terminology is provided in parentheses).

B3.1 Competency Requirement 1 (CR1):

B3.1.1 Knowledge. (Also commonly referred to as recognition, recall, or rote knowledge.) Able to remember or recognize terminology, definitions, facts, ideas, materials, patterns, sequences, methodologies, principles, etc. Example verbs: arrange, define, duplicate, label, list, memorize, name, order, recognize, relate, recall, repeat, reproduce, and state.

B3.1.2 Comprehension. (Able to read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.) Example verbs: classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, and translate.

B3.2 Competency Requirement 2 (CR2):

B3.2.1 Application. (Able to apply ideas, procedures, methods, formulas, principles, theories, etc., in job-related situations.) Example verbs: apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, practice, schedule, sketch, solve, use, and write.

B3.2.2 Analysis. (Able to break down information into its constituent parts and recognize the parts' relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario.) Example verbs: analyze, appraise, calculate, categorize, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, and test.

B3.3 Competency Requirement 3 (CR3):

B3.3.1 Synthesis. (Able to make judgments regarding the value of proposed ideas, solutions, methodologies, etc., by using appropriate criteria or standards to estimate accuracy, effectiveness,

economic benefits, etc.) Example verbs: arrange, assemble, collect, compose, construct, create, design, develop, formulate, manage, organize, plan, prepare, propose, set up, and write.

B3.3.2 Evaluation. (Able to put parts or elements together in such a way as to show a pattern or structure not clearly there before; able to identify which data or information from a complex set is appropriate to examine further or from which supported conclusions can be drawn.) Example verbs: appraise, argue, assess, attach, choose, compare, defend, estimate, evaluate, judge, predict, rate, core, select, support, and value.

B4 Five Categories of Psychomotor Skills ⁷

The psychomotor domain includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution. The five major categories of psychomotor skills listed in order of increasing difficulty are listed below, along with the level with which they are associated:

B4.1 Competency Requirement 1 (CR1):

B4.1.1 Imitation. Observing and patterning behavior after someone else. Performance may be of low quality. Example: Copying a work of art.

B4.1.2 Manipulation. Being able to perform certain actions by following instructions and practicing. Example: Creating work on one's own, after taking lessons, or reading about it.

B4.2 Competency Requirement 2 (CR2):

B4.2.1 Precision. Refining, becoming more exact. Few errors are apparent. Example: Working and reworking something, so it will be "just right."

B4.2.2 Articulation. Coordinating a series of actions, achieving harmony and internal consistency. Example: Producing a video that involves music, drama, color, sound, etc.

B4.3 Competency Requirement 3 (CR3):

B.4.3.1 Naturalization. Having high-level performance become natural, without needing to think much about it. Examples: LeBron James playing basketball, Tiger Woods hitting golf ball, etc.

Definitions of Associated Terms

Cognition: The act or process of knowing; perception. Also, the product of such a process; something thus known, perceived, etc.

Cognitive: Of or pertaining to the mental processes of perception, memory, judgment, and reasoning, as contrasted with emotional and volitional processes.

Psychomotor: Of or pertaining to movement produced by action of the mind or will.

Taxonomy: The science, laws, or principles of classification or systematics, resulting in division into ordered groups.

Appendix C Skills Assessment Program (Nonmandatory)

This appendix is considered nonmandatory, although it may contain mandatory language. It is intended only to provide supplementary information or guidance. The user of this standard is not required to follow, but may choose to follow, any or all of the provisions herein.

C.1 Test of Workplace Essential Skills (TOWES)⁷ has been used successfully to measure a candidate's abilities in three essential domains—*“Reading Text, Document Use, and Numeracy.”* Other skills assessment programs to measure these abilities may be available. Essential skills are enabling skills required for all types of work. Skills such as reading text or numeracy help people perform the tasks required by their occupation and other daily activities. They provide a foundation for learning other skills and enhance people's ability to adapt to workplace change. Essential skills are not technical skills but rather the skills people use to carry out a wide variety of occupational tasks and activities.

C.2 A list of essential skills defined by Human Resources and Social Development Canada (HRSDC)⁽⁶⁾ are:

- (a) Reading Text
- (b) Thinking Skills
- (c) Document Use
- (d) Problem Solving
- (e) Numeracy
- (f) Decision Making
- (g) Writing
- (h) Job Task Planning and Organizing
- (i) Oral Communicating
- (j) Finding Information
- (k) Computer Use
- (l) Significant Use of Memory
- (m) Working with Others
- (n) Continuous Learning

C.3 Definitions of Associated Terms

⁽⁶⁾ Human Resources and Social Development Canada (HRSDC), 300 Laurier Ave. West, Ottawa, ON K1A 0J6 Canada.

Numeracy: Able to use or understand numerical techniques of mathematics.

Appendix D Examples of Acceptable Training (Nonmandatory)

This appendix is considered nonmandatory, although it may contain mandatory language. It is intended only to provide supplementary information or guidance. The user of this standard is not required to follow, but may choose to follow, any or all of the provisions herein.

NOTE: All training submitted for consideration must be documented and verifiable. Documentation should include: Title/Topic, content/items covered, date, time, duration of training.

- (a) Toolbox Safety Meetings
- (b) Annual Safety Meetings
- (c) Safety Refreshers
- (d) Site-Specific Safety Meetings
- (e) Competent Person Training
- (f) OSHA Training
- (g) MSHA Training
- (h) First Aid/CPR/AED
- (i) Safety Training from Alliance Safety Council or similar organizations
- (j) Product Training
- (k) Craftworker Upgrade or Improvement Programs
- (l) Equipment Training
- (m) Industry* Courses, Workshops, and online
 - a. *NACE, SSPC, PDCS, ICRI, MPI, AGC, ASA, Coating Society, et al
- (n) Industry* Certifications
- (o) Attendance at Industry* or related chapter, national or international events
- (p) Attendance at Pro Shows or Trade Shows
- (q) Team member in Painters Competition
- (r) QA/QC/Inspection/Quality Management
- (s) Supervisor Training
 - a. Adult Education: English as Second Language (ESL)
- (t) GED, High School Equivalency, or higher education
 - a. Blueprint Reading
 - b. Communication Skills
 - c. Computer Skills
- (u) Other training/education as acceptable to the certification body

