

SSPC: The Society for Protective Coatings

Industrial Coating and Lining Application Specialist Qualification and Certification

Section 1: Scope

1.1 This program provides criteria for the education, training, experience, knowledge, and skills required by an Application Specialist to prepare and apply protective coatings to steel and concrete surfaces of complex industrial structures. Facility owners, contractors, or certifying agencies may use this program for certification of Application Specialists for other substrates or conditions, as considered appropriate.

1.2 This program applies to qualification of an Application Specialist for work on new construction and maintenance of complex industrial structures.

Section 2: Definitions

Application Specialist: An individual who engages in surface preparation and application of protective coatings and linings to steel and concrete surfaces of complex industrial structures.

Body of Knowledge: A list of required areas of knowledge and skills used in development of training and examinations for qualification. These areas include basic knowledge of: surface preparation, coating materials and application techniques; proper operation of equipment; environmental, safety, and health requirements during the process of surface preparation and painting; contract specifications, industry standards and product data sheets; quality assurance and quality control.

Section 3: Qualification Levels for Application Specialist

3.1 This program sets forth requirements for three basic qualification levels – Level I, Level II, and Level III – for an Application Specialist. In addition, requirements are set forth to attain specialty endorsements for Level II. These qualification levels are summarized in Table 1.

Table 1: Qualification Levels for Application Specialist

Qualification Level	Requirements
Level I- TRAINEE	Basic knowledge of GOOD PAINTING PRACTICES
Level II	Detailed knowledge and skills of industrial coatings and linings. Successful completion of the hands-on certification exams for both coating application and abrasive blast cleaning
Level II plus Specialty Endorsement	Level II plus detailed knowledge and skills of specialty areas as identified herein.
Level III	Level II plus: <ul style="list-style-type: none"> • Basic supervisory knowledge and skills • Basic training knowledge and skills • Basic communication knowledge and skills

3.2 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 Annex A. Table A1 in Annex 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.

3.3 Basic Level I qualification is intended for entry-level/trainee Application Specialists. Level I Application Specialists customarily work with and under the supervision of Level II and Level III Application Specialists.

3.4 Level II certification is intended for experienced Application Specialists able to work independently.

3.5 Level III certification is intended for Application Specialists responsible for planning, oversight, evaluation and supervision of industrial coating and lining operations.

Section 4: Requirements for Each Qualification Level

4.1 Qualification Requirements – Level I

4.1.1 Successful completion of a skills assessment program (administered by the contractor or its designee) measuring essential employability skills: basic reading, writing and arithmetic, document use, and numeracy (see Annex C) evaluated in the language of the workplace (English initially, other languages in the future);

4.1.2 Successful completion of an SSPC-administered written examination on good painting practices;

4.2 Application Specialist Certification Requirements – Level II

4.2.1 Successful completion of all Level I requirements;

4.2.2 Qualify to take Level II examinations through Track A or Track B:

4.2.2.1 (Track A) a minimum of 2,000 hours of verifiable work experience plus a minimum of 150 hours of coating-related technical training or:

4.2.2.2 (Track B) a minimum of 3,000 hours of verifiable work experience.

4.2.3 Successful completion of Level II Certification examinations for **both** coating application **and** abrasive blast cleaning (refer to Section 5 for details of Level II qualifications).

4.3 Application Specialist Certification Requirements – Level III

4.3.1 Qualify to take Level III examinations by one of the following methods:

4.3.1.1 A minimum of 1,000 hours of related work experience after achieving qualification to Level II;

or

4.3.1.2 A minimum of 1,500 hours of verifiable work experience in inspection, supervision, or project management of coating-related work for complex industrial structures after completion of the requirements included in Paragraph 4.2.

4.3.2 Successful completion of the Level III Certification examination.

Section 5: Examination Requirements for Level II Core and Specialty Endorsements

5.1 Level II certification and specialty endorsement requirements shall consist of a combination of written examinations to assess knowledge and practical examinations to assess practical knowledge and skills.

Table 2 shows the various examination eligibility requirements for Level II certification and specialty (add-on) endorsements.

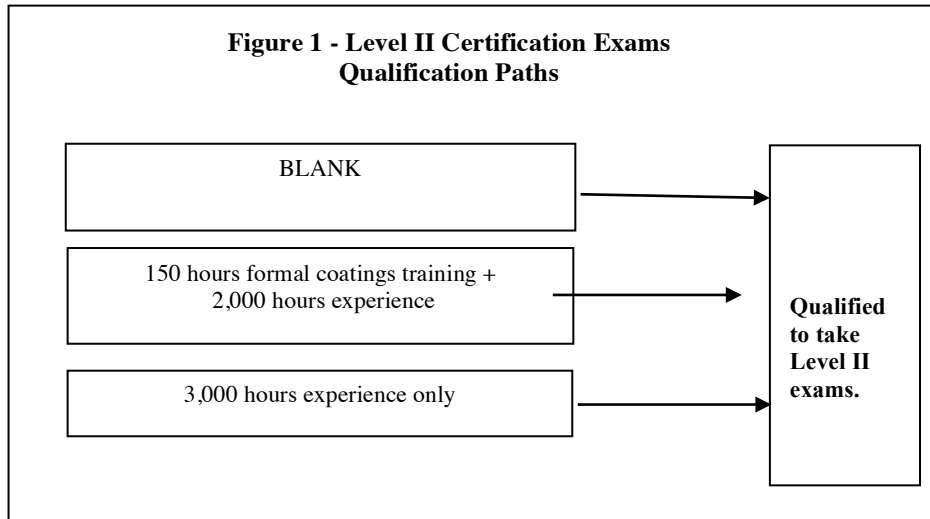


Table 2: Level II Certification and Specialty Endorsement Examination Requirements

	Level II Certification ^(A)			Specialty (Add-on) Endorsement ^(B)	
	Written Examination	Practical Examination		(optional)	
		Surface Preparation	Application	Written Examination	Practical Examination
Core area of Body of Knowledge	✓	✓	✓		
Coating of concrete floors and secondary containment	✓	✓	✓	✓	✓
HPWC & UHPWJ	✓	✓	✓	✓	✓
Electrostatic spray	✓	✓	✓	✓	✓
Plural component spray	✓	✓	✓	✓	✓
Powder coatings	✓	✓	✓	✓	✓
Specialty pipeline coatings	✓	✓	✓	✓	✓
Thermal spray coatings	✓	✓	✓	✓	✓

^(A) Level II certification assesses knowledge and skills in the core areas of the Body of Knowledge, and general knowledge of the specialty areas of the Body of Knowledge.

^(B) A Certified Application Specialist in one or more of the Specialty endorsements must pass the written and practical examinations for Level II Certification in addition to the written and practical examinations for the specialty endorsement.

Section 6: Certification Program Requirements

- 6.1 SSPC will operate this program in accordance with the requirements of ISO⁽¹⁾ 17024.²
- 6.2 SSPC will issue Level I qualification certificates upon verification of successful completion of requirements of Section 4.1.
- 6.2 Certification examinations (Levels II & III) 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 Properly set up, operate, and shut down abrasive blasting equipment;
 - 6.3.3 Abrasive blast the test piece or test apparatus to a specific level of cleanliness and surface profile;
 - 6.3.4 Inspect, assess, measure, and document the specified surface preparation;
 - 6.3.5 Mix and thin liquid coating materials;
 - 6.3.6 Set up and start coating application equipment;
 - 6.3.7 Set up and start spray, brush, or roller application as appropriate;
 - 6.3.8 Brush, roll, and/or spray coat the test panel or test apparatus;
 - 6.3.9 Inspect, assess, measure, and document the coating application (each coat and total coating system); and
 - 6.3.10 Clean up and dispose of waste.
- 6.4 The test panel shall be in accordance with ASTM⁽²⁾ D 4228³ or appropriate equivalent approved by SSPC.
- 6.5 The test material and equipment used for testing shall be appropriate for the qualification category sought and shall be approved by SSPC. The type of coating used shall be specified at time of testing. A variety of coating materials, surface preparation methods, and means of application shall be used to test the candidate's ability to handle various types of coatings and their surface preparation and application requirements as required by product data sheets.
- 6.6 Inspection and documentation of surface preparation and coating application shall be in accordance with ASTM D 5161.⁴

Section 7: Requirements for Maintaining Certification

- 7.1 Certifications shall be valid for no more than three years. Certification shall be maintained by one of the following methods:

⁽¹⁾ International Organization for Standardization (ISO), 1 rue de Varembe, Case Postale 56, CH-1121 Geneva 20, Switzerland.

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

7.1.1 Successful completion of a minimum of 20 hours per year of training related to the candidates profession; **or**

7.1.2 For Level II: Successful completion of the Level II examinations.

7.1.3 For Level III: Maintenance of the Level II certification.

7.1.4 For Specialty Endorsement: Successful maintenance of Level II or III certification.

References

1. “Corrosion Costs and Preventive Strategies in the United States,” Report FHWA-RD-01-156 (Springfield, VA: National Technical Information Service⁽³⁾).
2. ISO 17024 – ISO/IEC 17024 (latest revision), “Conformity assessment – General requirements for bodies operating certification of persons” (Geneva, Switzerland: ISO).
3. ASTM D 4228 (latest revision), “Standard Practice for Qualification of Coating Applicators for Application of Coatings to Steel Surfaces” (West Conshohocken, PA: ASTM).
4. ASTM D 5161 (latest revision), “Standard Guide for Specifying Inspection Requirements for Coating and Lining Work (Metal Substrates)” (West Conshohocken, PA: ASTM).
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, in R.J. Armstrong et al., Developing and Writing Behavioral Objectives (Tucson, AZ: Educational Innovators Press, 1970).
7. Test of Workplace Essential Skills (TOWES). Bow Valley College, 332 - 6th Avenue SE, Calgary, AB T2G 4S6 Canada.

⁽³⁾National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

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

NOTE: The T1 through T6 designations for the competency requirements indicate levels of cognition and psychomotor skills in accordance with Annex B. The “T” 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 – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
Environmental, Safety, and Health				
<ul style="list-style-type: none"> • Local and Other Applicable Safety Codes, Practices, Standards, and Regulations <ul style="list-style-type: none"> ○ Rigging ○ Scaffolding and ladders ○ Fall Protection ○ Confined space including shrouding ○ Lock out – tag out ○ Aerial lifts ○ Hazard Communication (HazCom) ○ First Aid/CPR ○ Legal and regulatory requirements and compliance ○ Health ○ Electrical grounding requirements ○ Explosion proof lighting ○ Fire protection programs ○ Safety harnesses ○ Fall protection • Safety Related Directly to Specific Materials/Equipment <ul style="list-style-type: none"> ○ Abrasive blasting ○ Water blasting ○ Ventilation ○ Lead abatement ○ Hydrocarbon solvent exposure, use, and disposal • Ventilation <ul style="list-style-type: none"> ○ LEL/UEL ○ TLV/PEL ○ Dilution ○ Air Flow ○ Protection factors-internal and external • Environmental <ul style="list-style-type: none"> ○ Waste minimization ○ Handling and disposal of hazardous materials • Health <ul style="list-style-type: none"> ○ Chemical exposure ○ Dust exposure ○ Personal protection-eyes, hearing, shoes ○ Respirators-dust, chemical cartridge, air supplied 	T1	T3	T6	

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
Process control (including quality assurance & quality control)				
<ul style="list-style-type: none"> • Specifications, codes, and standards • Relevance and importance of specifications, codes, and standards • Definitions • Roles and Responsibilities • Legal and ethics issues • Using lessons-learned for continual improvement • Quality assurance and control programs 	T1	T2	T5	
<ul style="list-style-type: none"> • General Science knowledge <ul style="list-style-type: none"> ○ Fluid and gas dynamics <ul style="list-style-type: none"> ▪ Pressure vs. velocity ▪ Pressure-volume-temperature relationship ▪ Orifice mechanics ○ Basic electricity-direct and alternating current <ul style="list-style-type: none"> ▪ Resistance/conductivity ▪ Relationship of current, voltage and resistance ▪ Energy/powering equipment ▪ Electrical controls/instrumentation ○ Basic Chemistry <ul style="list-style-type: none"> ▪ Chemical reactions - related to paint and protective coatings ▪ Hazards and toxicity-coating materials ▪ Psychometric relationships ○ Physical properties related to paint and protective coatings <ul style="list-style-type: none"> ▪ Density ▪ Viscosity ▪ Mass/weight ▪ Hardness ▪ Flexibility ▪ Durability ▪ Porosity ▪ Weight per unit volume ▪ Coverage ▪ Volatiles ▪ Non-volatiles ○ Basic Physics <ul style="list-style-type: none"> ▪ Temperature ▪ Pressure ▪ Work 	T1	T2	T5	
<ul style="list-style-type: none"> • Work Planning <ul style="list-style-type: none"> ○ Process control ○ Procedures and work instructions ○ Work planning and sequencing 	T1	T2	T5	

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
<ul style="list-style-type: none"> • Develop and follow application procedures <ul style="list-style-type: none"> ○ Receipt and storage procedure ○ Product data sheets and MSDS ○ Mixing procedure-boxing, hand, power ○ Thinning procedure ○ Application procedures-brush, roller, spray, other ○ In-process measuring and monitoring (inspection) ○ Test panels <ul style="list-style-type: none"> • Value in qualifying personnel • Value in verifying process and procedures • Value to purchaser 	T1	T2	T5	
<ul style="list-style-type: none"> • In-process quality control <ul style="list-style-type: none"> ○ Documenting ambient conditions ○ Document materials ○ Document equipment-cleaning, application ○ Documenting work progress ○ Identify discrepancies <ul style="list-style-type: none"> ▪ Defects in work ▪ Deficiencies in quality system ○ Document discrepancies ○ Appropriate equipment-cleaning, application ○ Operate equipment ○ Maintain equipment 	T1	T2	T5	
<ul style="list-style-type: none"> • Test equipment <ul style="list-style-type: none"> ○ Accuracy level (+/- tolerances) ○ Verifying accuracy, e.g., equipment calibration ○ Basic gages ○ Test methods (destructive and non-destructive) 	T1	T2	T5	
<ul style="list-style-type: none"> • Ambient conditions (temperature, relative humidity, wind, moisture, etc) <ul style="list-style-type: none"> ○ Measure and record conditions ○ Have knowledge of measuring equipment – uses and limitations ○ Anticipate conditions based localized conditions on site-cooling towers, steam traps, etc. 	T1	T3	T6	
<ul style="list-style-type: none"> • Surface conditions – acceptability for coating application <ul style="list-style-type: none"> ○ Cleanliness – importance/recognition/remediation ○ Conformity to visual standards - importance/recognition/remediation ○ Impact on coating performance ○ Surface profile ○ Chemical contaminants 	T1	T3	T6	

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
<ul style="list-style-type: none"> • Verification inspection (Recognize out-of-specification conditions) <ul style="list-style-type: none"> ○ Why ○ How to ○ How to document 	T1	T2	T5	
<ul style="list-style-type: none"> • Testing and evaluation methods for failure analysis and troubleshooting of coatings (existing and new) <ul style="list-style-type: none"> ○ Laboratory methods ○ Field methods ○ Batch retention ○ Dry film thickness/wet film thickness (DFT/WFT) ○ Hardness/cure ○ Microscopic analyses... 	T1	T1	T1	
Materials				
<ul style="list-style-type: none"> • Reasons for coating <ul style="list-style-type: none"> ○ Aesthetics ○ Corrosion prevention ○ Safety ○ Process aids ○ Environmental protection 	T1	T3	T6	
<ul style="list-style-type: none"> • Abrasives (new and recycled) <ul style="list-style-type: none"> ○ Types <ul style="list-style-type: none"> • Minerals • Slag • Metallic • Agricultural (corn cobs, walnut shells, etc.) • Specialty ○ Properties <ul style="list-style-type: none"> • Gradation – why/how to • Shape • Contamination - Identification/remediation • Condition (new or recycled?) ○ Testing <ul style="list-style-type: none"> • Qualification testing (is the abrasive on a QPL list?) • Batch testing • In-service testing ○ Receipt ○ Storage ○ Protection 	T1	T3	T5	

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
<ul style="list-style-type: none"> • Coating material properties <ul style="list-style-type: none"> ○ Chemical resistance ○ UV resistance ○ Gloss and Color retention ○ Corrosion resistance ○ Water resistance ○ Reflectivity ○ Hydrocarbon resistance ○ Heat resistance ○ Permeability 	T1	T3	T5	
<ul style="list-style-type: none"> • Coating materials <ul style="list-style-type: none"> ○ Convertible coatings <ul style="list-style-type: none"> • Epoxy • Alkyds ○ Non-convertible coatings <ul style="list-style-type: none"> • Asphalt • Coal tar • Vinyl ○ Pigments (Describe types of pigment and their various uses) ○ Thinners ○ Other additives- ○ Suitability for various service conditions <ul style="list-style-type: none"> • Underground • Immersion • Atmospheric • Chemical • Abrasion • Heat/baked coatings-reduce friction/drag • Anti-fouling • Insulating coatings • Product purity ○ Film formation/Curing mechanisms <ul style="list-style-type: none"> • Evaporation • Coalescence • Polymerization • Oxidation • Hydrolysis • CO₂ • Solvent evaporation ○ Film properties <ul style="list-style-type: none"> • Adhesive strength • Cohesive strength • Permeability • Each coat • Total film 	T1	T3	T5	

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
<ul style="list-style-type: none"> • Film repair ○ Material stewardship <ul style="list-style-type: none"> • Receipt and identification • Storage <ul style="list-style-type: none"> • Rotation • Protection <ul style="list-style-type: none"> • Exposure • Temperature • Relative humidity • Shelf life • Identification of materials for each coat ○ Identification of defective material ○ Disposal 				
<ul style="list-style-type: none"> • Coating Materials – Specialty <ul style="list-style-type: none"> ○ Types <ul style="list-style-type: none"> • Powder • Tapes • Shrink sleeves • Hot application coatings • Rubber coatings and sheet linings • Fiber reinforced plastic (FRP) • Extruded coatings • Fire resistant coatings • Non-drying coatings ○ Characteristics <ul style="list-style-type: none"> • Uses • Properties • Limitations/common problems • Surface preparation • Application • Composition 	T1	T1	T1	
Surface preparation				
<ul style="list-style-type: none"> • Basics of corrosion 	T1	T3	T5	
<ul style="list-style-type: none"> • Basics of surface preparation <ul style="list-style-type: none"> ○ Effects of mass, pressure, and velocity on abrasive blasting ○ Substrates <ul style="list-style-type: none"> ▪ Steel ▪ Galvanized surface ▪ Other metals ▪ Concrete ▪ Non-metallics 	T1	T2	T5	

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
<ul style="list-style-type: none"> • Surface preparation standards (steel) <ul style="list-style-type: none"> ○ Identifying and documenting initial condition of the steel ○ Identification of surface irregularities requiring preparation (including weld condition) ○ Identification of steel condition prior to application ○ Identification of pre-preparation requirements ○ Solvent cleaning ○ Dry abrasive blasting standards ○ Power and hand tool cleaning standards ○ Water blasting standards 	T1	T3	T5	
<ul style="list-style-type: none"> • Equipment setup and operation-abrasive blasting <ul style="list-style-type: none"> ○ Equipment setup-compressor, blast pot, separators, etc ○ Equipment operation-all control valves ○ Hose and couplings layout ○ Nozzle management ○ Compressor sizing ○ Dust and debris control ○ Safety equipment 	T1	T2	T5	
<ul style="list-style-type: none"> • Identification of specified surface cleanliness <ul style="list-style-type: none"> ○ Visual ○ Non-visual ○ Flash rusting 	T1	T3	T5	
<ul style="list-style-type: none"> • Identification of acceptable surface profile and variables affecting surface profile <ul style="list-style-type: none"> ○ Measuring ○ Assessing 	T1	T3	T5	
<ul style="list-style-type: none"> • Identification of acceptable abrasive blasting conditions <ul style="list-style-type: none"> ○ Dew point ○ Temperature ○ Relative humidity ○ Dehumidification ○ Wind ○ Projecting conditions through initial cure ○ Surface temperature 	T1	T3	T5	
<ul style="list-style-type: none"> • Comparison of standards and requirements to varying substrate conditions: <ul style="list-style-type: none"> ○ New steel ○ Coated steel ○ Corroding steel ○ Weathering steel ○ New concrete ○ Existing concrete 	T1	T2	T5	

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
<ul style="list-style-type: none"> • Miscellaneous surface preparation <ul style="list-style-type: none"> ○ Power sources ○ Blast hose condition – internal/external wear and damage ○ Power and hand tool condition and wear ○ Protection of sensitive instrumentation and equipment 	T1	T3	T5	
Coating Application – Liquid Coatings				
<ul style="list-style-type: none"> • Ensure existence of appropriate procedures and work instructions 	T1	T2	T5	
<ul style="list-style-type: none"> • Mixing <ul style="list-style-type: none"> ○ Mixing requirements ○ Pre-mix requirements ○ Equipment/mixing blade ○ Time ○ Results ○ Thinning ○ Induction time ○ Pot life ○ Filtering/straining 	T1	T3	T5	
<ul style="list-style-type: none"> • Application Equipment - limits, strengths, and weaknesses of each <ul style="list-style-type: none"> ○ Safety ○ Types of equipment <ul style="list-style-type: none"> • Spray <ul style="list-style-type: none"> • Conventional • Airless • High Volume Low Pressure • Air-assisted airless • Brush and roller application • Squeegee • Mitt • Trowel ○ Acceptable conditions <ul style="list-style-type: none"> • Surface temperature/Relative humidity/Air temperature/Dewpoint • Condensation • Wind • Equipment selection • Equipment setup and adjustment • Equipment operation and maintenance • Over-spray control • Safety 	T1	T3	T5	
<ul style="list-style-type: none"> • Drying and Curing conditions <ul style="list-style-type: none"> ○ Ambient conditions ○ Heating (force curing) ○ Ventilation 	T1	T3	T5	

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
<ul style="list-style-type: none"> • In-process measurement and monitoring <ul style="list-style-type: none"> ○ Wet film thickness ○ Film deficiencies ○ Other contaminants 	T1	T3	T5	
<ul style="list-style-type: none"> • After initial cure (and/or between coats) - measurement and monitoring <ul style="list-style-type: none"> ○ Dry film thickness ○ Amine blush ○ Film deficiencies - identification and rework procedures <ul style="list-style-type: none"> • Fisheyes • Craters • Misses • Blistering • Sagging • Wrinkling 	T1	T3	T5	
<ul style="list-style-type: none"> • Requirements for maintenance painting (overcoating) <ul style="list-style-type: none"> ○ Coating compatibility/compatibility tests ○ Feathering-in ○ Identify chalking and other contamination ○ Matching material and requirements to equipment ○ General knowledge of various application methods ○ Control of overspray ○ Containment ○ Outside factors 	T1	T3	T5	
<ul style="list-style-type: none"> • Application hazards 	T1	T3	T5	
Concrete & Masonry Coatings				
<ul style="list-style-type: none"> • Properties of concrete • Concrete surfaces—gunite, poured concrete, cinder block, concrete block • Surface preparation <ul style="list-style-type: none"> ○ mechanical methods-hand, power tools, grinding, ○ abrasive blasting ○ water blasting ○ acid etching • Surface preparation standards <ul style="list-style-type: none"> ○ Preparation standards ○ Identification of surface irregularities ○ Identification of surface condition prior to preparation ○ Identification of pre-preparation requirements ○ Problem areas-porosity, contamination, laitance, cracks, waxes • Coating application <ul style="list-style-type: none"> ○ Materials-fillers, surfacers, coatings/linings, reinforcements ○ Methods <ul style="list-style-type: none"> • Squeegee 	T1	T1	T1	T3

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
<ul style="list-style-type: none"> • Trowels • Spray • Screed • Hand layup • Surface finishing–sacking, stoning, troweling, synthetic surfacers, etc • Inspection and testing <ul style="list-style-type: none"> ○ Moisture and moisture vapor testing ○ Visual ○ Ultrasonic testing ○ Roughness • Documentation 				
HP Water Cleaning and UHP Waterjetting				
<ul style="list-style-type: none"> • Equipment safety devices • Personal protective equipment • Equipment setup <ul style="list-style-type: none"> ○ Hoses ○ Pumps ○ Lances ○ Robots • Equipment operation and maintenance <ul style="list-style-type: none"> ○ Hoses ○ Pumps ○ Lances ○ Robots • Surface preparation standards • Troubleshooting • Inspection and testing • Documentation 	T1	T1	T1	T3
Electrostatic Spray Equipment				
<ul style="list-style-type: none"> • Safety • Personal protective equipment (PPE) • Equipment <ul style="list-style-type: none"> ○ Setup ○ Operation ○ Maintenance ○ Safety • Application • Troubleshooting • Documentation 	T1	T1	T1	T3
Plural Component Spray Equipment				
<ul style="list-style-type: none"> • Safety • Personal protective equipment (PPE) 	T1	T1	T1	T3

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
<ul style="list-style-type: none"> • Equipment <ul style="list-style-type: none"> ○ Setup ○ Operation ○ Maintenance ○ Safety • Application of coating materials • Troubleshooting • Inspection and testing <ul style="list-style-type: none"> ○ Visual ○ Measuring • Documentation 				
Powder Coatings				
<ul style="list-style-type: none"> • Safety • Personal protective equipment (PPE) • Materials <ul style="list-style-type: none"> ○ Thermosetting ○ Thermoplastic • Types of setup (process) <ul style="list-style-type: none"> ○ Surface preparation ○ Powder application methods ○ Heating/curing methods • Inspection and testing <ul style="list-style-type: none"> ○ Visual ○ Measuring • Documentation 	T1	T1	T1	T3
Thermal Spray Coatings and Equipment				
<ul style="list-style-type: none"> • Safety • Personal protective equipment (PPE) • Types • Materials <ul style="list-style-type: none"> ○ Zinc ○ Aluminum ○ Al-Zn ○ Other • Sealers • Substrates <ul style="list-style-type: none"> ○ Steel ○ Concrete ○ Other • Surface preparation • Application methods <ul style="list-style-type: none"> ○ Arc spray ○ Flame spray ○ Plasma Spray ○ Application of sealer 	T1	T1	T1	T3

Body of Knowledge – Transition Plan				
	Competency Requirements			
	Level I	Level II	Level III	Specialty
Knowledge/Skill Items				
<ul style="list-style-type: none"> • Equipment selection/setup/operation • Material selection • Equipment selection • Process and work instructions • Inspection and testing <ul style="list-style-type: none"> ○ Visual ○ Destructive testing <ul style="list-style-type: none"> ▪ DFT ▪ Bend test ▪ Adhesion test ○ Measuring • Documentation 				
Specialty Pipeline Coatings (tapes, heat shrink sleeves, hot applications, powder coatings, cold-applied mastics)				
<ul style="list-style-type: none"> • Safety • Personal protective equipment (PPE) • Types • Materials <ul style="list-style-type: none"> ○ Tape wraps ○ Heat shrink sleeves ○ Hot applications ○ Powder coatings ○ Cold-applied mastics ○ Other • Application methods • Equipment selection/setup/operation • Material selection • Rockshielding • Overview of CP systems • Equipment selection • Process and work instructions • Inspection and testing <ul style="list-style-type: none"> ○ Visual ○ Destructive testing ○ Measuring • Documentation 	T1	T1	T1	T3

Annex B
Cognition
(Knowledge and Skills Requirements)
(Mandatory)

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.

Six levels of competency, designated T1 through T6, shall be used to develop the minimum requirements for written and practical assessment examinations. Associated with each level of competency shown here is a brief description of the specific descriptor from Bloom for the cognitive domain and from Dave for the psychomotor domain. However, for convenient and accurate interpretation of the descriptors the cited references, or the amplifying information in the annexes, shall be consulted.

Six Levels of Competency

T1

- **Cognitive domain**—Knowledge
- **Psychomotor domain**—Imitation—Manipulation

T2

- **Cognitive domain**—Comprehension
- **Psychomotor domain**—Naturalization

T3

- **Cognitive domain**—Application
- **Psychomotor domain**—Naturalization

T4

- **Cognitive domain**—Analysis
- **Psychomotor domain**—Naturalization

T5

- **Cognitive domain**—Synthesis
- **Psychomotor domain**—Naturalization

T6

- **Cognitive domain**—Evaluation
- **Psychomotor domain**—Naturalization

Six Levels Of Cognition Based on Bloom’s Taxonomy (Revised)

The six levels of cognition are presented below in rank order from least complex to most complex (original terminology is provided in parentheses).

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, state.

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, translate.

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, write.

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, test.

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, write.

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, judge, predict, rate, core, select, support, value, evaluate.

Five Categories of Psychomotor Skills as Described by Dave⁶

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:

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

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.

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

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

Naturalization. Having high-level performance become natural, without needing to think much about it. Examples: Michael Jordan playing basketball, Nancy Lopez hitting a 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.

Annex C

BASIC WORKPLACE/CONSTRUCTION INDUSTRY Skills Assessment Program

(Mandatory)

UNDER THE TRANSITION PROGRAM, IT WILL BE THE RESPONSIBILITY OF THE CANDIDATE'S EMPLOYER OR OTHER THIRD PARTY SELECTED BY THE THE CANDIDATE, IF THE CANDIDATE IS UNEMPLOYED, TO CERTIFY THAT THE CANDIDATE HAS THE ESSENTIAL WORKPLACE SKILLS TO WORK IN THE CONSTRUCTION INDUSTRY. THE ASSESSMENT IS TO BE DONE USING THE "Test of Workplace Essential Skills (TOWES)"⁷⁷ PROGRAM OR AN EQUIVALENT. THE TOWES TEST has been used successfully to measure a candidate's abilities in three essential domains – "*Reading Text, Document Use, and Numeracy.*" 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.

A listing of essential skills defined by Human Resources and Social Development Canada (HRSDC)⁽⁴⁾ are:

Reading Text
Document Use
Numeracy
Writing
Oral Communicating
Computer Use
Working with Others

Thinking Skills:
Problem Solving
Decision Making
Job Task Planning & Organizing
Finding Information
Significant Use of Memory
Continuous Learning

Definitions of Associated Terms

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

⁽⁴⁾ Human Resources and Social Development Canada (HRSDC), 300 Laurier Ave. West, Ottawa, ON K1A 0J6 Canada.