



## **ICAT INDUSTRIES INC.**

MQAP – Manufacturers Qualified Application Procedure – 5.3.2

With reference to CSA-Z245.30-14

May 15, 2017

### **ICAT CEL-375 100% Solids Coating System**

*(hereinafter referred to in this document as "CEL-375")*

THE ENCLOSED "PROJECT SPECIFIC RECOMMENDATIONS" ARE SUPPLIED BY ICAT INDUSTRIES INC. *(hereinafter referred to in this document as "ICAT")* AND ARE NOT INTENDED TO OVER-RIDE THE OWNERS PROJECT GUIDELINES.

#### **1.0 GENERAL**

1.1 CEL-375 100% Coating System is formulated and tested to be applied direct to metal to substrates such as, but not restricted to: mainline sections, new construction or rehabilitation projects, girth welds / field joints, elbows, T's, transitions, fittings, bends, slip bore / directional piping casings, carrier casings & valves.

1.2 The applicator of the CEL-375 shall be approved by the project owner as well as by ICAT Industries Inc. The applicator's personnel shall be properly trained and informed to all procedures regarding the necessary scopes for the project, as well as, properly trained on the heated plural component transfer equipment required for the application of the CEL-375 technology.



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### 2.0 Tools, Consumables, and Equipment Required

2.1 The size of the project, time of year and weather conditions will determine the total equipment package necessary on site to successfully complete the coating application, as further outlined and defined in this document.

2.2 All applications of CEL-375, except small patch areas using the CEL-375 Patch Kits, shall be carried out using an approved plural component hydraulic transfer pump, with a 3:1 mix ratio, and the following auxiliary equipment:

- Pre-cleaning equipment to accomplish SSPC-SP-1 (Section 3.2)
- Necessary pre-heat and in-line heaters to address the recommended transfer temperatures (Section 10.2),
- Compatible hose diameters and lengths
- Static mixers
- Spray gun & tips
- If satisfactory application temperatures (as noted in Section 10.2) cannot be maintained, heating equipment (indirect fired heaters, and/or pipe heating blankets, wind breaks).
- Temperature and relative humidity monitoring devices
- Wet and dry film calibration equipment
- Psychrometer
- Consumables (masking tape, brushes, rollers, poly/tarps, etc.)

2.3 For areas using the CEL-375 Patch Kits, the following equipment is required:

- Pre-cleaning equipment to accomplish SSPC-SP-1 (Section 3.2)
- heat equipment sufficient to bring surface temperature to that required for CEL-375 application (Section 7.3)
- sandpaper
- brushes, rollers, consumables, etc.
- Temperature and relative humidity monitoring devices
- Wet and dry film calibration equipment
- Consumables (masking tape, brushes, rollers, poly/tarps, etc.)



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### **3.0 Approved Solvents or Other Cleaning Agents to be Used to Clean the Steel and Adjacent Anti-Corrosion Barrier Prior to Surface Preparation**

3.1 The required cleanliness prior abrasive surface preparation must conform to SSPC-SP-1.

3.2 To achieve the SSPC-SP-1 cleanliness, a combination of one or more of the following procedures/agents may be used:

- power-washing with detergents, degreasers, HDIM Biodegradable Cleaner & fresh water rinsing
- wire brush and/or sandpaper and/or scrapers
- non-contaminating aromatic solvents including but not limited to water, acetone, xylene, toluene

### **4.0 Surface Preparation of the steel (including pre-cleaning, final surface profile, materials, and surface contamination)**

4.1 Prior to abrasive blasting, all contaminants such as chlorides, sulphides, oil, grease, dirt, clays or NDT magnetic particle / x-ray contrast aid products shall be removed in accordance with SSPC-SP1 utilizing the approved agents by the coating manufacturer. Clean water then shall be used as rinse.

4.2 Acceptable Chloride level is 5 PPM.

4.3 Prior to and at all times during abrasive blasting, the following conditions must be maintained:

- substrate must be dry and warmed to a surface temperature of 3C<sup>0</sup>/5F<sup>0</sup> above the dew point
- Maximum level of relative humidity for application is 90%



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4.4 The applicator shall use a contact thermometer, psychrometer and psychrometric charts or alternative equipment which provides equivalent accuracy to monitor these environmental requirements.

4.5 Surface profile:

- average 0.087mm (3.5 mils) to 0.125mm (5 mils)
- individual measurements shall not be less than 0.075mm (3.0 mils)
- measurements shall be taken with replica tape and spring micrometer in accordance with NACE SPO 287
- the substrate will be in accordance with SSPC-SP10 specification
- the applicator shall ensure the surface to be coated is monitored by regular checks with the SSPC-VIS-1 Standard.

4.6 Prior to coating, the surface prepared areas shall be dry air blasted to remove dust and debris, and shall be coated before any /rust blooming occurs, and prior to the end of the working day or placed in controlled environmental surrounding prior to coating application. Any cleaned steel showing rust stains or left uncoated overnight shall be re-blasted prior to coating application.

### **5.0 Surface Preparation of Adjacent Anti-Corrosion coatings (e.g., Cutback, Repairs)**

5.1 Prior to any surface preparation over areas of adjacent anti-corrosion coatings (e.g. cutbacks, repairs, etc.), the areas shall be cleaned according to the procedures in Section 3.2.

5.2 The existing coating / barrier system shall be feathered / cut back a minimum of 4cm (1.6") to 8cm (3.2") when coating adjacent to a bare steel substrate, such a girth welds.

5.3 Prior to over-coating over adjacent films or barrier systems, it is suggested to establish as much information as possible, such as what the existing system is, age of

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the system, integrity and adhesion of the existing system to the substrate; then contact ICAT and owner for insights and procedures to proceed.

5.4 Cleaned surfaces shall be dry air blasted to remove dust and debris, and shall be coated before any rust blooming occurs, and prior to the end of the working day or placed in controlled environmental surrounding prior to coating application. Any cleaned steel showing rust stains or left uncoated overnight shall be re-blasted prior to coating application.

### **6.0 Compatibility with Other Anti-Corrosion Coatings**

6.1 Typically the CEL-375 will tightly adhere to other alternative anti-corrosion / barrier systems when the substrate is prepared and the CEL-375 is applied and cured in accordance to the outlined procedures. To confirm the procedure of coating over alternative anti-corrosion / barrier systems, it is suggested to first establish as much information as possible, such as what the existing system is, age of the system, integrity and adhesion of the existing system to the substrate; then contact ICAT and owner for insights and procedures to proceed.

6.2 When over-coating an existing, adjacent or aged coating / barrier system such as a fusion bond epoxy, the existing coating should be checked for adhesion to substrate and integrity of itself. The existing system must be uniformly swept blasted to remove all existing gloss creating a mechanical surface profile suitable for over-coating.

### **7.0 Temperatures (Ambient, Substrate, and Dew Point) for Surface Preparation, Application, and Cure**

#### **7.1 Surface Preparation**

Prior to and at all times during abrasive blasting, the following two (2) conditions must be maintained:



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- substrate must be dry and warmed to a surface temperature of 3C°/5F° above the dew point
- Maximum level of relative humidity for application is 90%

### 7.2 Temperature of CEL-375 In Drums Prior to Application

Prior to the start of circulating the hose lines, the temperature of the CEL-375 Part A (base) and CEL-375 part B (catalyst) in the drums shall be minimum 40°C (104°F).

If warming/preheating is required, any one of the following procedures may be utilized:

- Place in a controlled environment of 20°C (68°F) for 12-18 hours
- Thermostatically controlled Full Wrap Drum Heating Blankets
- Indirect fired heat continually monitoring the process raising the temperatures of the materials slowly up to 20°C (68°F).
- The use of metal type narrow width band drum heaters are **not** permitted.

### 7.3 Application of Coating

These four (4) conditions must apply during all phases of the coating application:

- the substrate must be dry and warmed to a surface temperature of 3C°/5F° above the dew point to prevent oxidation to the part after cleaning.
- maximum level of relative humidity for application is 90%
- the minimum substrate temperature shall be 15°C (60°F)
- the maximum substrate temperature shall be 80°C (175°F)



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### 7.4 Pipe Surface Temperature

If the surface temperature of the pipe needs to be increased prior to coating application, these methods are acceptable:

- “heat and hoard” the section to be coated
- induction coils
- infrared heaters

### 8.0 Coating Thinning and Mixing Procedures

#### 8.1 Using Hydraulic Plural Component Pump

- Prior to application, Part A (base) material shall be mixed and during mixing, heated to a minimum temperature of 40°C (105°F). Either drum heating blankets or circulating in-line heaters can be used to heat the coating material in the drum.
- Prior to application, Part B (curing agent) shall be mixed and during mixing, heated to a minimum temperature of 40°C (105°F).
- Thinning of CEL-375 is NOT permitted.

#### 8.2 Patch Kits

- The CEL-375 patch/repair material is delivered in pre-measured kits.
- Only the mixing of full kits is allowed.
- Part A (grey resin/base) and Part B (amber catalyst/converter) labels must match for both material and size as specified on the containers.
- Uniformly mix the B component first to a homogenous texture, independent of the resin/base.
- Once mixed, then pour these contents of Part B into the part A resin/base. Mix at a slow speed with drill / Jiffy mixer or hand stir with stir sticks so as to not create a vortex and induce air into the mixture until a uniform color / viscosity is achieved making sure to thoroughly clean the sides and bottom of the container making sure no streaks or marble effect is visible.

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- Thinning of the CEL-375 is not permitted.

### 9.0 Coating thickness range;

9.1 Normal Recommended Thickness range: 30 – 40 mils TDFT, with minimum low of 25 mils TDFT and maximum highs of 60 mils TDFT, in a single coat application

9.2 If slight field bends are implemented due to stress potentials during the bending process, ICAT does not recommend an excess of 40 mils TDFT.

9.3 Consult ICAT for any application recommendation outside the above noted thicknesses.

9.4 Measurement of D.F.T. with magnetic gauges in accordance to SSPC-PA-2 Method 3

### 10.0 Coating Application Method

10.1 The CEL-375 shall be spray applied to the project specified dry film thickness (DFT) relevant to the project scope as outlined within the project ITP, in a single application, utilizing an approved airless plural component hydraulic transfer pump set at 3-1 mix ratio, equipped with the necessary pre-heat and in-line heaters to address the recommended transfer temperatures, hose diameters and lengths, static mixer(s) sizes and location(s), spray gun & tip sizing with regulated clean air pressures, all in accordance to the product manufacturers application guidelines to transfer the CEL-375 in accordance to the project specification.

10.2 The in-line heaters in the circulating pumping/hose system are regulated and monitored such that the part A base / resin side is set at 65°C (150°F) and the part B converter / activator side is set at 65°C (150°F).

10.3 When application is implemented with heated plural component spray equipment a transfer mix ratio check is a recommended start up practice for each and every day of coating application to confirm proper mix ratio of the coating system.





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10.4 Brush & roll application shall be implemented in areas where spray application is not feasible or to welds, fayed surfaces, sharp edges and difficult areas to access. These areas shall receive a pre-coat application by brush / roll prior to spray application. Brush and roll procedures can also be implemented for final spot / holiday repairs. The CEL-375 material is available in small pre-measured patch / repair kits. For CEL-375 Patch Kits, mixing of full kits only is the recommended procedure.

10.5 Thinning of the CEL-375 is not permitted.

10.6 MEK or a pure ketone is the preferred solvent for equipment cleanup.

### 11.0 Discontinuity (Holiday) Testing

11.1 Testing according to NACE SPO 188 or equivalent

11.2 Holiday detection may be carried out when the CEL-375 has cured sufficiently to withstand contact with the brush without marking. For guidance, this will typically be after a minimum of 4 hours at an ambient temperature of 20°C or when coating has reached a hardness of Shore D-60, (which is 80% of its fully cured Shore D Hardness of D-75), in accordance with ASTM D2240.

11.3 The operating voltage shall be 125 volts/mil and shall, in no circumstances, exceed a total specified film thickness voltage.

11.4 All holidays, imperfections and damaged areas shall be identified with waterproof markers. All markings shall be sufficiently distant from the holiday, imperfection or damaged area to allow surface preparation and patching to take place without detriment to the adhesion of the coating.

11.5 All holiday detectors shall be calibrated at the beginning of every work day and additionally when requested.



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### 12.0 Coating Curing Schedule

12.1 CEL-375 curing mechanism is based on time at temperature of the applied technology to a substrate supported by surrounding environments. Determining factors to achieve cure to service will be but not limited to; ambient / substrate temperatures, coating transfer temperature, winds / ventilation, humidity and film build.

12.2 Estimated time/temperature for cure:

- 25°C (77°F) - 24 hours

12.3 Cure for service is confirmed when the applied film reaches a Shore D Hardness of 75 in accordance to ASTM D 2240.

12.4 Force Cure

- If ambient temperatures are lower than that required to maintain the surface temperatures as noted in section 7.3 above, once the CEL-375 application is "tack free", the application can be wrapped with Thermostatically Controlled Pipe Heating Blankets to assist with the curing process.
- Force cure, Time @ Temperature information is available upon request from ICAT.

### 13.0 Recoat and Repair Method

13.1 If additional film build is required or minor defects need to be addressed to meet the project specification, additional material can be applied while the preceding application is still "thumb nail" soft with no surface preparation providing these areas are clean and dry. If the maximum over-coating interval exceeds 3 hours @ 25°C (77°F) or Durometer Shore D readings are in excess of 50, the surface must be uniformly abraded by removing all exposed gloss prior to additional coating application.



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13.2 When repairing or over-coating an existing or aged cured coating application the existing coating should be checked for adhesion to substrate and integrity of itself. The existing system must be uniformly swept blasted, sanded or ground / feathered / cut back a minimum of 4cm (1.5") to 8cm (3") on tightly adhered coatings to remove all existing gloss creating a mechanical surface profile suitable for over-coating.

13.3 Prepared surfaces shall thoroughly cleaned be dry air blasted or uniformly wiped to remove any / all dust and debris prior to over-coating.

13.4 Smaller spot repairs for bench marks, holidays or application non-conformances can be repaired with CEL-375 Repair Kits by mixing full kits only and applied by brush / roll material to address the project specification. Thinning of the CEL-375 is not permitted.

13.5 Larger areas requiring repairs are recommended to be prepared in the same manner as above and then sprayed and cured as previously documented to address the project specification.

### **14.0 Time to Backfill:**

Backfilling times are dependent on substrate temperature of the applied coating and these times will be extended at lower temperatures. Backfill can take place after the coating has exceeded a Shore Hardness of D-60, which is 80% of its fully cured Shore Hardness of D-75.

### **15.0 Storage and Handling**

15.1 CEL-375 does not require special climate controlled transportation. The product should be stored indoors within a dry environment and in a sealed container (drum, pail, cartridge, etc.) to prevent moisture penetration.



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### 15.2 Temperature limitations

Preferable storage temperatures should be between 1°C (34°F) and 27°C (80°F), not to exceed 45°C (113°F).

### 15.3 Humidity

As long as CEL-375 is stored and sealed in original shipping drums/cases, humidity from outside sources has no effect.

### 15.4 Protection from Elements (e.g., snow, rain, sunlight)

Store in dry environment in a building or container.

If previously opened drums are stored outside, cover drums with plastic wrap/tarp to prevent water contamination.

### 15.5 Protection from contaminants (e.g. dust, water, chemicals);

Store in dry environment in a sealed building or container. If stored outside, cover drums with plastic wrap / tarp to prevent contamination from airborne particulate.

### 15.6 Expiration Date

CEL-375 has a shelf life of 2 years when stored in a sealed container to prevent moisture penetration.

The product can be used past the 2-year shelf life, with no detriment to performance, upon internal testing conducted by ICAT.

### 15.7 Protection from Physical Damage

Store CEL-375 as noted in this Section 15.0.



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When moving material with fork trucks from transport to storage to placement with application/transfer equipment (eg. Forklift), follow proper handling and operating procedures to avoid any damage to drums.

Do not triple stack drum kits.

### 16.0 Batch Numbers

16.1 Batch numbers specify the manufacturing start date of a placed order.

16.2 For Example: 150723A -1

15 = year  
07 = month  
23 = day  
A = component,  
1 = 1<sup>st</sup> batch

16.3 This batch number will be deemed finished on completion of work order where upon a new batch number will commence on start of a new work order

### 17.0 SAFETY

17.1 Before and during use, observe all safety labels on packaging and containers.

17.2 Consult and follow all requirements noted on CEL-375 Manufacturer MSDS Sheets and drums.

17.3 Abide by all the local or national safety regulations for handling, storage and disposal of generated waste.



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**Table 1 – Test Results for ICAT CEL-375 as per Table 1 (System FC-1) CSA Z245.30-14**

Test	Acceptance Criteria	Test Method	Test Result	Pass/Fail
Thickness	MQAP	SSPC-PA2	n/a	n/a
Shore D Hardness	MQAP	CSA Z245.30 Clause 12.1	75	n/a
24 hour Cathodic Disbondment @ 65°C	6.5 mm maximum radius	CSA Z245.20 Clause 12.8	1.89 mm	pass
28 day Cathodic Disbondment @ 20°C	8.5 mm maximum radius	CSA Z245.20 Clause 12.8	2.33 mm	pass
28 day Cathodic Disbondment @ 80°C (max temp)	10.0 mm maximum radius	CSA Z245.20 Clause 12.8	6.12 mm	pass
0.75° Flexibility	No Cracking	CSA Z245.20 Clause 12.11	No Cracking	pass
1.5 J Impact Resistance	No Holidays	CSA Z245.20 Clause 12.12	No Holidays	pass
Adhesion to Steel Substrate	Rating of 1 or 2	ISO 21089-3, Annex C	Rating 1	pass
Adhesion to Existing Coating	Rating of 1 – 3	ISO 21089-3, Annex C	Rating 1	pass
28 day Adhesion to Steel at 75°C	Rating of 1 – 3	CSA Z245.20 Clause 12.14	Rating 2	pass
28 day Adhesion to Existing Coating at 95°C	Rating of 1 – 3	CSA Z245.20 Clause 12.14	Rating 2	pass