ICAT Industries Inc.

Manufacturers Qualified Application Procedure For CEL-375 Epoxy Coating Material Brush Grade, Spray Grade and Cartridges Reference CSA-Z245.30 MQAP Rev.2

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1 INTRODUCTION

ICAT CEL-375 is a 100% solids epoxy coating designed for underground corrosion protection of assets. Assets include, but are not limited to, pipe, valves, bends, fabricated assemblies and girth welds for corrosion and mechanical protection for abrasive service conditions including horizontal directional drills (HDD) and slip bores. Applicators of ICAT CEL-375 epoxy coating shall be trained and qualified by an ICAT Representative prior to use.

2 STANDARDS AND SPECIFICATION REFERENCE

- CSA Z245.30 Field-Applied External Coatings for Steel Pipeline Systems

SSPC/NACE/AMPP

- RP0105 – Liquid Epoxy Coatings for External Repair, Rehabilitation, and Weld Joints on Buried Steel Pipelines
- SP 1- Solvent Cleaning
- SP 2 – Hand Tool Cleaning
- SP 3 - Power Tool Cleaning
- NACE No. 2/SSPC-SP10- Near White Metal Blast Cleaning
- SP 7/NACE No. 4 - Brush-Off Blast Cleaning
- VIS 1 – Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
- VIS 3 – Guide and Reference Photographs for Steel Surfaces Prepared by Power and Hand-Tool Cleaning
- SP0287 – Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape
- SP0188 – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Surfaces

ASTM

- ASTM D4285 - Standard Test Method for Indicating Oil or Water in Compressed Air
- ASTM D4417 – Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
- ASTM D2240-15-Standard Test Method for Rubber Properties- Durometer Hardness

3 SAFETY RECOMMENDATIONS

ICAT CEL-375 can be harmful when absorbed through the skin from prolonged exposure.

Care should be taken to avoid breathing atomized coating material and fumes while spraying with plural component equipment, spray cartridges or during applications to pre-heated substrates using the appropriate respiratory protection.

For safety recommendations other than the following, please refer to the Safety Data Sheet (SDS).

3.1 EYE PROTECTION

Adequate eye protection shall be worn during any operations involving the CEL-375 that could result in transfer, splash, or particulate entry to the eyes. Examples are, but not limited to:

- Coating mixing
- Coating application
- Coating spraying
- Handling/cleaning of coating equipment

An eye wash should be available in the work area when applying coating materials, in particular plural or cartridge spray application.

Company approved side shield safety glasses and/or goggles shall be worn when handling, mixing, and applying coating material unless full face protection is worn.

3.2 SKIN PROTECTION

Personal protection equipment shall be worn to minimize or eliminate skin or clothing contact.

- Gloves should be worn to protect hands while handling coating materials.
- Nitrile gloves of appropriate thickness provide adequate protection, and these should be changed when coating material accumulates on them.
- Minimize transfer contact of the coating material by avoiding touching face or exposed skin with contaminated gloved hands.
- Any unmixed coating material should be washed from the skin using soap and water.

3.3 CLOTHING

Long sleeves and long pants should be worn at all times while mixing and applying CEL 375.

- Breathable materials such as cotton clothing should be worn.
- FRC clothing, when required at the jobsite, is acceptable.
- When spray application is performed, cotton coveralls or disposable coveralls that cover arms, torso and legs should be worn during all spray application.
- Remove any clothing that becomes contaminated with unmixed hardener component.

3.4 RESPIRATORY PROTECTION

For spray application, a half-face or full-face respirator shall be worn fitted with appropriate NIOSH approved organic vapor cartridge filters.

- When wearing half-face respirators during spray application, side shield glasses and/or goggles that prevent overspray contact with the eyes shall be worn.
- Full face respirators do not require the use of additional eye protection.
- For spray cartridge application, a company approved particulate mask or organic vapor cartridge type respirator, and appropriate eye protection should be worn.

3.5 FOOT PROTECTION

Company approved footwear should be worn during all coating operations.

- Closed-toe boots or shoes with tops at least four inches high, cover the ankle area when mixing brush grade kits on the ground.

3.6 IGNITION SOURCES

No welding, gas cutting, grinding or other spark producing task shall be performed in the coating area.

- Smoking is not allowed in the vicinity of the coating application process.
- No spark/flame producing source, including smoking, shall occur in the vicinity of enclosed spray equipment or spray application.

4 TERMS, DEFINITIONS AND REQUIREMENTS

Surface Temperature for Application- Any surfaces to be coated or repaired shall be 10°C/50°F to 100°C/212°F. Surface temperatures below this recommended temperature will require preheating.

Batch Number- The batch number of ICAT CEL 375 is printed on the containers. The batch number relates to coating manufactured in one day.

Shelf Life- ICAT CEL 375 has a shelf life of 24 months from the date of manufacture when stored in unopened containers within the recommended conditions. The date of manufacture is printed on the containers. Coating that has an expired shelf life shall not be used.

Storage Conditions- Coating material shall be stored in original closed containers at 4°c/40°F to 50°C/122°F. Containers shall be stored in a dry area in an upright condition within the recommended temperature range.

Cutback- Bare steel area where pipes are welded together.

Overlap- Applied coating over existing coating adjacent to bare steel or a coating imperfection.

Dew Point- The surface temperature (varying according to pressure and humidity) below which water begins to condense on the surface.

- Surfaces to be prepared and coated shall be 3°C/5°F or more above the dew point.
- The surface of areas to be coated must remain 3°C/5°F above the dew point during preparation and coating application.

Tacky- The applied coating is tacky when coating transfers to finger when touched.

Touch Dry- Coating material does not transfer to finger when touched.

Thumbnail Soft- When coating can be indented with a thumbnail pushed firmly into the coating surface. Recoating can occur with no additional surface preparation during this stage.

Dry Hard- The applied coating can no longer be indented when thumbnail is pressed firmly into the surface. Holiday testing and repair, and handling including lowering in, or burial can occur once coating material is Dry Hard.

Recoat Window- The applied coating is still Thumbnail Soft. Additional coating thickness can be added while the coating is Thumbnail Soft. Once the coating material is Dry Hard, the surface must be abraded prior to the addition of coating material.

Coating Cure- Coating material is considered cured when the physical hardness is 80 or higher when tested with a Shore Type D Durometer in accordance with ASTM D2240.

Amine Blush- Amine blush is a chemical reaction that occurs between water, carbon dioxide and the amine component of epoxy coatings.
Amine blush is not detrimental to the performance of the coating but must be removed by appropriate surface preparation if additional coating thickness is to be applied. Amine blush can be removed by blasting, mechanical preparation, or hand sanding prior to application of additional coating.

Wet Film Thickness- Thickness of applied coating immediately following application. Surfaces preheated for coating application will render WFT measurements invalid due to the rapid drying of the coating.

Dry Film Thickness- Thickness of applied coating that is Dry Hard. Measurements to be taken with calibrated Type 1 Magnetic Pull Off Gauges or Type 2 electronic thickness gauge.

Standard Corrosion Coating Thickness- The standard corrosion coating dry film thickness range will be 508µm/20 mils minimum to 1.25 µm/50 mils maximum.

- Film thicknesses up to 2.03µm/80mils are not detrimental to the coating performance.

Abrasion Resistant Coating Thickness- The required dry film thickness range of coating applied for abrasion and impact resistance is 1.02 µm/40 mils minimum to 2.03 µm/80 mils maximum.

- DFT thickness above or below the minimum and maximum may adversely affect the coating performance in Abrasion Resistant service.

Holiday Testing- Electronic flaw detection of applied coating film.
Using a calibrated holiday detector with the appropriate contact probe, suggested testing voltages are:

- ICAT CEL 375 for Standard Corrosion Protection - 3,000DCV.
- ICAT CEL 375 for Abrasion Resistance - 5,000DCV.

5 COATING MATERIAL MIX RATIO

ICAT CEL-375 is 3 parts base (by volume) and 1 part hardener (by volume), 3:1, in all packaging options including plural component spray grade, brush grade kits, cartridge spray grade, cartridge weld coating kits and cartridge repair kits.

6 PACKAGING OPTIONS

ICAT CEL-375 is available in the following packaging options:

- Premeasured Brush Grade kits available in 1, 1.5, 2.0 and 2.5 liter kit sizes.
- 72 Liter Pail Sets of Spray Grade
- 800 Liter Drum Sets of Spray Grade
- 1 Liter Multi-Purpose Cartridge for spray, weld coating and repair
- 50Ml Repair Cartridges

7 SURFACE PREPARATION-ABRASIVE BLAST CLEANING-BARE STEEL

- Areas to be abrasive blasted shall be inspected for oil, grease, soil, moisture/ice, or any other visually evident contaminant.

- The surface shall be cleaned prior to blasting in accordance with SSPC SP1 Solvent Cleaning when contaminants are identified.
- Always perform this cleaning prior to abrasive blasting.

Abrasive blast cleaning of the steel surface and roughening of adjacent coating shall be performed with equipment supplied with adequate water and oil separation from the air stream.
A blotter test, ASTM D 4285 can be performed on the airstream from the blast nozzle with the abrasive flow shut off to verify air cleanliness.

- Abrasive shall be sharp, angular, and produce an anchor pattern profile of 63.5µm/2.5mils to 127µm/5.0mils.
- Abrasive shall be approved by the Asset Owners specification.
- **Note: 100% steel shot shall not be used**.

Steel surfaces to be coated shall be blasted to a SSPC SP-10/NACE #2 Near-White surface cleanliness.

- Surface temperature shall be 3°C/5°F above the dew point prior to blasting and shall remain 3°C/5°F above the dew point until coating application is complete.
- Surfaces <3°C/5°F above the dew point shall be preheated.

Preheating can be accomplished with direct flame, induction, or infrared heat to raise the surface temperature.

- Surface temperature shall not exceed 100°C/212°F, or the Owners specification, whichever is lower.
- Any areas preheated with direct flame shall be sweep blasted after heating in accordance with SSPC SP7/NACE #4 Brush Off Blast Cleaning prior to coating application.

Blast cleaned surfaces shall be coated the same day.

- Any blasted surfaces left overnight, or that show evidence of flash rust, shall be reblasted to achieve the required NACE No. 2/SSPC-SP10- Near White Metal Blast.

Abrasive Blasting will extend a minimum of 50mm/2” onto the parent coating on either side of the blasted steel.

- The blast on the parent coating shall be a uniform sweep in accordance with SSPC SP7/NACE#4 Brush Off Blast Cleaning and produce a uniform roughness removing all gloss.
- Sharp edges shall be transitioned during surface preparation to achieve a smooth transition from the bare steel to the existing coating.

Upon completion of blast preparation, surfaces shall be cleaned with dry compressed air and/or a clean, dry paintbrush to remove any abrasive residue. **NOTE:** It is advisable to blow off abrasive on the top of the pipe for several feet from the coating area to prevent windblown abrasive onto the applied coating.

8 SURFACE PREPARATION- COATING REPAIRS

The area to be repaired shall be clean and free of any contaminants.

- If contaminates are evident, the area to be repaired shall be cleaned in accordance with SSPC SP-1 Solvent Cleaning.
- The area to be repaired shall be a minimum of 3°C/5°F above the dew point.
- Surfaces less than 3°C/5°F above the dew point shall be preheated.
- Preheating can be accomplished with a hot air gun or acceptable alternative. **Direct flame is not acceptable**.

Coating repairs more than 152mm/6 inches diameter can be abrasive blast cleaned in accordance with section 6 above or prepared with an MBX® Bristle Blaster®.

- Any evident oxide contamination shall be removed.
- Adjacent coating shall be roughened for 25mm/1 inch.

Coating repairs less than152mm/6-inch diameter can be abraded with 80 grit carborundum cloth, file, MBX® Bristle Blaster® or abrasive blasting to roughen the coating surface for repair.

- Any evident oxide contamination shall be removed.
- Adjacent coating shall be roughened for 25mm/1 inch.

Following preparation, all surfaces shall be cleaned with clean, dry compressed air or clean paintbrushes. All visible blasting residue shall be removed. Rags SHALL NOT be used to remove surface contaminants from the preparation process.

Note: A Company approved particle mask should be worn for all sanding and MBX® Bristle Blaster® preparation of the coating surface.

9 PREHEATING PRIOR TO COATING APPLICATION

Preheating shall not contaminate the blasted surface or cause flash rust.

- If flash rusting occurs, blasting must be performed to restore the surface to a NACE No. 2/SSPC-SP10- Near White Metal Blast prior to coating application.

When surfaces to be coated are below 10°C/50°F or accelerated drying/curing of the coating is required, the surfaces can be preheated up to 100°C/212°F or the maximum allowed by the Asset Owners Specification.

- Preheat can be applied with direct flame, induction coil or infrared heat.
- When a direct flame is used, the surface must be sweep blasted after heating and prior to coating application.

A minimum of 10°C/50°F surface temperature should be maintained on all preheated applications until applied coating reaches Shore D Hardness 80 or higher.

- Surface temperature shall be periodically measured with a contact thermometer or other approved means.

NOTE: Areas where coating is applied utilizing preheat shall not be handled or backfilled until a Shore D Hardness of 80 or higher is achieved.

10 POST CURING APPLIED COATING

To develop post curing procedures, if required in extreme conditions, please consult with your ICAT Representative.

11 COATING APPLICATION EQUIPMENT- BRUSH GRADE

- Rechargeable drill or variable speed electric drill
- ICAT approved mixing impeller
- Paint sticks
- Disposable brushes and/or short nap rollers
- Disposable gloves.
- Required Personal Protective Equipment
- Heavy duty trash bags are recommended to collect used disposable application equipment and coating containers.

12 COATING APPLICATION

The surface temperature range for application of ICAT CEL-375 is 10°C/50°F to 100°C/212°f, or the maximum temperature allowed by the Asset Owners specification. Area to be coated shall be prepared in accordance with Section 6, 7 and 8 above. Surfaces requiring preheat due to temperatures below the recommended surface temperature will be heated and dried in accordance with Section 8 above.

13 BRUSH GRADE COATING KIT- MIXING AND APPLICATION INSTRUCTION

Verify Part “A” (Base) and Part “B” (Hardener) are the same kit size to ensure proper 3:1 mixing ratio.

Brush Grade kits can be mixed when product temperature ranges from 10°C/50°F to 38°C/100°F.

- Pot Life will be extended at lower temperatures and shortened at higher temperatures.
- Coating material on the lower end of mixing temperature range will require longer mix time to thoroughly blend the components.

13.1 MIXING:

1. Scrape contents of Part “B” (Hardener) bucket into Part “A” (Base) bucket.
2. Begin mixing slowly with impeller to avoid air introduction into the coating mix.
3. Continue to mix slowly until the products are mostly blended.
4. Using the paint stick, scrape the walls of the Part “A” (Base) bucket by placing the stick edge on the vertical wall of the bucket and contacting on the bottom of the bucket. Scrape around the container once and then wipe the stick off on mixing impeller.
5. Continue blending until a uniform color is seen and no streaking of unmixed material is present.
   NOTE: Mixing generally requires 1.5 to 3.5 minutes to complete depending on material temperature.
6. Mixed material can be delivered to the prepared surface by pouring small amounts on top of pipe and working material down with brushes or rollers.
   a. Alternately, on small applications, mixed coating can be applied by dipping/scooping brush into bucket and then applying to the prepared surface.

13.2 APPLICATION:

- With brushes or rollers, as much as practical, do not remove the application instrument on the downstroke as this will create icicles.
- If conditions dictate the instrument must be removed on the downstroke, immediately follow with an upstroke starting on the bottom and removing the instrument on the top of the pipe.
- Apply coating to all blast prepared areas of steel and coating overlap.
- Verify applied coating thickness with occasional Wet Film Thickness Gauge checks and then brush over areas where Wet Fim Thickness coating where checks were made.
- Additional mixed coating material can be added to areas found with insufficient Wet Film Thickness while applied material is Thumbnail Soft.

14 BRUSH GRADE CARTRIDGE APPLICATION

Coating of welds and coating repairs can be accomplished with 1-liter cartridges using the automatic dispenser gun, or smaller manual repair cartridges can be used.

- Areas to be coated shall be prepared in accordance with Section 6,7 and 8 above.
- The product temperature for cartridge dispensing should be 10°C/50°F to 50°C/122°F.

- Preheating of the cartridges, if required to reach the recommended temperature, can be accomplished using a microwave. A microwave of 750 watts to 1000 watts should be used. The microwave should have a turntable.
- Unused portions of the 1-liter cartridge and the smaller manual cartridges can be recapped for future use.

14.1 REPAIR APPLICATION- GENERAL

1. Preheat material (if required as directed above).
2. Affix static mixer to cartridge that is in the specified temperature range. Dispense the mixed coating material through the static mixer across the area to be coated or repaired.
3. Spread with a brush or roller to the specified thickness.

14.2 REPAIR APPLICATION-ALTERNATIVE FOR SMALL REPAIRS

1. Preheat material (if required as directed above).
2. Eject the required amount of coating from cartridge onto a clean, disposable surface.
3. Mix the two parts together using a clean mixing tool such as a paint mixing stick or spatula until no color streaks are evident, taking care to not introduce air into the coating during mixing.
4. Apply the mixed coating material to the repair area using a trowel type applicator or brush to the specified thickness.

15 SPRAYABLE CARTRIDGES

Surfaces to be coated using Sprayable Cartridges shall be prepared in accordance with Section 6,7 and 8 as applicable.

Sprayable cartridge application will always require preheating of the cartridges prior to use.

1. Preheat by separating the two cartridges, leaving the plugs in the cartridge. **NOTE:** Each cartridge must be preheated individually.
2. Using a microwave of 750 watts to 1,000 watts, preheat each cartridge to a range of 54°C/130F to 65°C/150°F, depending on the ambient conditions.
3. Using an infrared or contact thermometer, verify cartridge temperature. **NOTE:** The hardener cartridge will always heat faster than the base due to the volume of material.
4. Using the dispensing gun, set air atomization pressure at 2.8 bar/40 psi on the attached regulator.
5. Set the dispensing speed on the gun to the lowest setting.

6. Place gun in reverse, retract the pistons and insert the preheated cartridges. **NOTE:** If pistons do not move when trigger pressed, slightly increase the dispense speed of the gun, retract pistons, and install preheated cartridges.
7. Once cartridges are placed in the dispensing gun, put gun in forward or dispense mode, and move pistons forward to contact plungers in cartridge.
8. Install static mixer on end of cartridges, taking care not to cross-thread the plastic retainer nut that affixes the static mixer to the cartridge. Hand tighten securely.
9. Turn on diffusing air at regulator.
10. Press trigger to dispense material through the static mixer.
    NOTE: If the coating material does not move down inside the static mixer, slowly increase dispense speed until coating is moving through static mixer.
11. In a disposable container such as a box, begin spraying.
12. Adjust gun dispense speed and atomization pressure to achieve coating flow rate and atomization desired for each application.
13. Spray apply coating in a multiple pass application to achieve the specified thickness.
    1. During spraying, an approximate 50% overlap on each pass will create coating thickness uniformity.
    2. Multiple pass application is more desirable than several heavy passes to achieve the specified thickness.
    3. Verify applied coating thickness with Wet Film Thickness Gauge during application.
       Spray over areas tested for Wet Film Thickness lightly to prevent coating holidays.
    4. When the cartridge is empty, remove the cartridge and static mixer from the dispensing gun and properly dispose of it.
    5. If the cartridge is not empty, remove the retainer nut from the static mixer and discard.
    6. Once all coating work is complete, clean the dispensing gun and recharge batteries as required.

For each new cartridge, repeat the procedure above until coating application is complete.

PLURAL SPRAY APPLICATION

Surface preparation for Plural Spray shall be performed in accordance with Section 6, 7 and 8 above.

ICAT CEL 375 spray grade requires preheating of the coating material to atomize during spraying. Preheating coating material is accomplished with a combination of external product

heating in combination with inline fluid heaters within the spray application equipment. The recommended product temperatures for spray application are as follows:

Base- 55°C/130°F to 65°C/150°F
Hardener- 55°C/130°F to 65°C/150°F
Base and Hardener temperatures shall be relatively the same during spraying.

- The coating material shall be applied in a multi-pass application with an approximate 50% overlap to the specified coating thickness.
- Wet Film Thickness gauges shall be used to verify applied coating thickness.
- Lightly spray areas where wet film thickness measurements are taken.
- Areas that require additional coating thickness can be overcoated providing the applied coating is Thumbnail Soft.

ICAT CEL 375 shall be applied utilizing a monolithic 3:1 ratio pump such as Graco XP-70 or a dosing system such as a Graco XM. Generally, monolithic pumps are used for field application and dosing systems are used for shop application.

All spray systems used for the application of ICAT CEL 375 must be approved by ICAT. Consult your ICAT Representative for recommendations and approval of spray application systems to be used.

16 DISPOSAL

Disposal of all coating waste, used containers, and application tools shall be done in accordance with Local, State and Federal and Provencial Guidelines. Activated product is inert and non-leachable.
NOTE: Disposal of coating waste in a hardened, activated state is less regulated than wet material that has not been activated.

16.1 RESELLING

No amount of ICAT CEL 375 shall be sold or traded without the express written consent of ICAT Industries.

17 DOCUMENT HISTORY – SUMMARY OF REVISIONS

Release Number	Date	Revisions
Version 1	5/15/2017	Original Release
Rev. 2	12/20/23	Complete Document Change