

**CORROSION ENGINEERING SPECIFICATION FOR  
INSTALLATION**

**PENNCOAT<sup>®</sup> 401 LINING**

**1. SCOPE**

- 1.1 This specification governs the installation of PENNCOAT 401 and 401MR Lining Systems. PENNCOAT 401 is an ambient cured or low temperature forced cured protective lining for steel and stainless steel surfaces, e.g., tanks and vessels. The application procedures described herein provide the best available information regarding the application of this product for the purpose of ensuring the best possible results when using PENNCOAT 401.
- 1.2 The coating contractor/applicator shall be pre-approved by Corrosion Engineering.
- 1.3 The coating contractor/applicator shall not deviate from these application procedures. The contractor/applicator shall sign a form acknowledging that the Application Procedures have been read and understood. In addition, the contractor/applicator shall have a copy of the Application Procedures on the job site at all times.
- 1.4 Contractor shall ensure proper ventilation of the workplaces and furnish proper safety equipment and clothing for each worker using PENNCOAT 401 products. The contractor is also responsible for providing all necessary equipment and scaffolding for surface preparation, application of coating material and removal of dirt, debris and spent abrasives. The contractor or subcontractor is also responsible for supplying all necessary heating equipment.
- 1.5 This application note is specific to steel and stainless steel substrates; however, PENNCOAT 401 can be applied to other substrates. Contact Corrosion Engineering for details on preparing and coating other substrates.
- 1.6 The theoretical coverage of PENNCOAT 401 is 1,604 ft<sup>2</sup>/gal/mil (36 m<sup>2</sup>/liter). PENNCOAT 401 has a recommended DFT of 14 -16 mils; therefore, at this

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thickness the theoretical coverage would be 90-103 ft<sup>2</sup>/gal (2.2 - 2.5m<sup>2</sup>/liter). However, some coating loss would be expected depending on the type of substrate, surface profile, substrate configuration, environmental conditions, operator technique and method of application. For example, using a 20% loss factor, the practical coverage would be 72-82 ft<sup>2</sup>/gal (1.8 - 2.0 m<sup>2</sup>/liter).

**2. APPLICABLE DOCUMENTS**

- 2.1 ASTM D4417 "Standard Test Method for Field Measurements of Surface Profile of Blast Cleaned Steel"
- 2.2 ASTM E376 "Measuring Coating Thickness by Magnetic-Field or Eddy Current (Electromagnetic) Test Methods"
- 2.3 ASTM D1186 "Method for Nondestructive Measurement of Dry Film Thickness of Non-Magnetic Coatings Applied to a Ferrous Base"
- 2.4 ASTM D1400 "Method for Nondestructive Measurement of Dry Film Thickness of Non-Magnetic Coatings Applied to a Nonferrous Metal Base"
- 2.5 ASTM G62 "Holiday Detection in Pipeline Coatings"
- 2.6 ASTM D512 "Test Methods for Chloride Ions in Water"
- 2.7 CES-342 Installation Specification for PENNCOAT Linings sections 4.4 and 4.5 (for PENNCOAT 401MR Lining System).

**3. SURFACE PREPARATION FOR STEEL AND STAINLESS STEEL SURFACES**

- 3.1 Prior to blasting, remove all weld splatter. Grind sharp edges to a minimum 1/8 inch (0.3 cm) radius and grind welds flat. "Skip" welds should be seal welded. All weld undercuts shall be filled with weld metal.
- 3.2 All surfaces to be coated shall be cleaned prior to abrasive blasting:
  - 3.2.1 For surfaces contaminated with grease and oils, degrease surface prior to abrasive blasting with a commercial degreaser, alkaline solution or with a hydro-blast at 5,000 psi (34.5 MPa) containing a degreasing solution which will remove dirt, oil and grease.
  - 3.2.2 For surfaces contaminated with soluble salts, the surface shall be steam cleaned or washed with warm, clean water (distilled or

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demineralized water is preferred)

**NOTE: Check surface for soluble salt contamination before blasting. A commercial blast (SSPC SP6) followed by surface decontamination may also be appropriate.**

- 3.3 The surface shall be abrasively blasted to SSPC-SP5 (NACE #1, SA3) white metal finish using clean, sharp angular abrasives, e.g., 8 - 20 silica sand, 1240 Black Beauty 1240 or G-14 steel grit.

**NOTE: Always use oil-free air supply for blasting.**

- 3.4 Surfaces of heavily corroded steel with grooving and pitting should be opened up and sharp edges removed by using a mixture of medium and coarse angular abrasive grit (e.g., 12 - 40) mesh steel grit. This will allow for easier coverage and penetration when spraying or rolling.

**NOTE: An aluminum oxide abrasive (24 grit or larger) is recommended for stainless steels. Steel grit may embed or contaminate stainless steel surfaces. Other abrasives do not possess adequate hardness and tend to round-off peaks in the surface profile.**

**CAUTION: Stainless steel will work harden during abrasive blasting. Producing desired profiles can be difficult when reblasting is required.**

- 3.5 The abrasively blasted surface shall result in an anchor pattern of 3 - 4 mils (75 - 100 microns) minimum for steel and 2.5 - 3.0 mils (63 - 75 microns) for stainless steel as determined by one of the following methods:  
A) Testex Press-O-Film Replica Tape (X-Coarse)  
B) SSPC Keane-Tator Surface Profile Comparator  
Details for making surface roughness measurements are provided in ASTM D4417.
- 3.6 After abrasive blasting, the surface shall be vacuumed with a bristle nozzle to remove all dust, grit and embedded abrasive. In addition, the surface shall be tested again for soluble salt contamination (see Section 11.2)
- 3.7 Relative humidity must be less than 70% and the substrate surface temperature must be at least 5°F (3°C) above the dewpoint.

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- 3.8 Always wear clean gloves when touching blast clean surfaces . Salts and oils can be deposited onto the surface when touched with bare hands. These contaminants may adversely affect coating adhesion. In addition, always wear protective footwear when walking on blast cleaned surfaces.

**4. MATERIAL STAGING AND CURING TIME**

- 4.1 **“A” Stage.** Minimum time between coats with free flowing air across the substrate surface is dependent on the temperature as provided in Table 1. In order to advance the “B” Stage, warm air can be blown across the surface. The warm air temperature should not exceed 120 - 150°F (49-66°C) and substrate temperatures should not exceed 125°F (52°C).

**Table 1**

Ambient Air Temperature (1)	Minimum Time (Hrs) Between Coats (2)
68°F (20°C)	20
77°F (25°C)	16
86°F (30°C)	14
95°F (35°C)	12
104°F (40°C)	10

**NOTE: 1. Air temperature, not substrate temperature; 2. Time may differ due to exact conditions. It is extremely important not to over-cure coating at this stage.**

**Sufficient air flow across the coating and/or through enclosed spaces is necessary in order to assist in removing solvent from the coating before applying the next coat or performing the final heat cure.**

- 4.2 **Recoat Time:** The maximum time between coats is 48 hours at temperatures between 60 - 85°F (15 - 30°C) and 24 hours above 85°F (30°C). Times are after “B” stage has been reached.
- 4.3 **“B” Stage:** The “B” stage has been reached when the coating is firm to the touch and has lost its tackiness (but still solvent soluble); at this stage, the solvent has evaporated from the coating and is ready for the second coat or final cure.

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**NOTE: Do not over-cure coating between coats. This will adversely affect adhesion of subsequent coats.**

- 4.4 CURE SCHEDULE: The size of heating equipment and number of heaters is dependent on the size and configuration of the coated item to be cured (consult a heating contractor for more information). Direct or indirect forced air heating or inductive heating is acceptable. Use only propane or methane (natural gas) for direct heating.

**NOTE: Do not use kerosene, diesel fuel or heating oils for this purpose.**

The final cure shall be performed after completing the high voltage (5,000 volt) holiday test and repairs/touch-ups have been performed. For elevated temperature cure, increase the substrate temperature by 50°F (28°C) per hour until the final cure (soak) temperature is reached. The most common soak temperature is 180°F (82°C); at this temperature, the soak time is a minimum of four (4) hours.

**Table 2. Time to Reach Full Chemical Resistance**

Substrate Temp. (°C)	Substrate Temp. (°F)	Cure Time
20	68	13 days
30	86	9 days
40	104	6 days
50	122	12 hrs
65	149	8 hrs
82	180	4 hrs

**NOTE: For ambient temperature curing, allow coating to dry for a minimum of 24 hours before opening to foot traffic. Do not place coating into chemical service before full cure is achieved.**

**5. SPRAYING INFORMATION AND MIXING DATA**

5.1 Airless Spray

5.1.1 Equipment

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- 30:1 to 45:1 airless pump, 3 gal./min minimum, air-operated; Teflon packing is highly recommended.
- 3/8 inch (0.95 cm) I.D. airless spray hose.
- 0.017 - 0.023 inch (0.4 - 0.6 mm) airless tips with a reversible cleaning valve.
- #50 - #60 mesh in-line filter.
- Filter on siphon line is strongly recommended.
- Compressor specification - minimum 54 CFM at 90 psi (0.6 MPa) output.
- Air input line - 3/4 inch (1.9 cm).

#### 5.1.2 Mixing Process

- Mechanically agitate (e.g. with Jiffy Blade) component "A" (resin) until color and consistency is uniform (usually 1-2 minutes)
- If thinning, slowly add MEK and continue mixing until the thinner is thoroughly mixed (approximately 2-3 minutes). Do not use more than 1 quart (946 ml) of MEK per 5 gallons (19 liters) of resin. Thinning beyond what is specified herein must be approved by Corrosion Engineering.
- Slowly add component "B" (catalyst) and mix thoroughly for approximately 3-5 minutes. Do not overwork, especially when the resin, catalyst and ambient temperatures are greater than 85°F (29°C).
- After mixing, pour PENNCOAT 401 through a 60 mesh screen into a clean container to remove any large particles.

## 5.2 Conventional Spray

### 5.2.1 Equipment

- Recommended spray guns (all stainless steel parts):
  - A) Binks Model 18 with 66 SK nozzle
  - B) Devilbiss P-MBC or JGA with FX fluid tip and 704 air cap, approximately 0.043 inch (0.1 cm) I.D. fluid tip.
- ½ inch (1.3 cm) I.D. fluid hose and 5/16 inch (0.8 cm) I.D. air hose.
- Binks agitation and dial pressure 2 or 5 gallon (7.5 or 19 liter) pot.
- Dual water and oil extractors are required for conventional air spraying systems:
  - A) Extractor - Binks 86-944
  - B) Extractor Regulator - Binks 86-949

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**NOTE:** It is extremely important to remove water and oil from the air supply. Oil and water spots on the substrate surface can cause permanent failure of the coating or lining. Therefore, the compressed air must be checked regularly for oil and water contaminants.

5.2.2 Mixing Procedure

- Mechanically agitate component “A” (resin) until the color and consistency is uniform (usually 1-2 minutes) before adding component “B” (catalyst) or MEK
- Slowly add MEK and continue mixing until the thinner is thoroughly mixed (approximately 2-3 minutes). Do not use more than 1 quart (946 ml) of MEK per 5 gallons (19 liters) of resin. Adding more thinner than specified herein must be approved by Corrosion Engineering.
- Slowly add component “B” (catalyst) and mix thoroughly for approximately 3-5 minutes. Do not overwork, especially when the resins, catalyst and ambient temperatures are greater than 85°F (29°C).
- After mixing, pour PENNCOAT 401 through a 60 mesh screen into a clean container to remove any large particles.

**6. COATING PROCEDURES**

- 6.1 Substrate temperature shall not be less than 60°F (16°C) or greater than 110°F (43°C) and the substrate surface temperature at least 5°F (3°C) above the dew point. Relative humidity shall not exceed 70%. The resin and catalyst temperature should be between 70°F (21°C) and 90°F (32°C).

**NOTE: High temperatures will reduce pot life.**

- 6.2 After the resin and catalyst are mixed and screened, place material under pump or insert siphon hose into the container.
- 6.3 Before spraying or rolling, stripe coat all welds, edges, angle bars, corroded areas and other irregular shapes and difficult to spray areas using a natural bristle brush. Work coating into discontinuities by moving brush in a back-and-forth or twisting/dabbing motion.

**NOTE: Do not apply at wet film thickness of greater than 5 - 6 mils. Always mix the complete kit and at no time split or break down the kit into smaller portions.**

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6.4 Drying Between Coats

6.4.1 In general, allow stripe to cure dry until it is firm to the touch.

6.4.2 On vertical and overhead surfaces, subsequent coats can be applied when the coating has lost its tackiness. On floors that require foot traffic in order to apply subsequent coats, the coating must be hard, i.e., one cannot damage the coating when walking on it.

6.5 For conventional spray, set pot pressure between 45 - 60 psi (0.3 - 0.4 MPa) and air pressure between 50-70 psi (0.3-0.5 MPa). For airless spray, open air supply valve slightly to fill hose with material.

6.6 In a safe area away from the structure or object to be coated, test spray gun and adjust according to the desired pattern.

**Conventional Spray:** Open fluid hose to release the air, then adjust fluid and air ratio for desired spray pattern.

**Airless Spray:** Increase air supply to pump until desired spray pattern is reached.

6.7 Coat scrap piece of steel, or similar, until desired spray pattern and wet film thickness is reached.

6.8 Recommend that equipment be exclusively used for PENNCOAT 401 to avoid contamination with other materials. It is imperative that a clean environment be maintained at all times.

6.9 The following techniques shall be followed for the application of the first coat (basecoat):

6.9.1 Tack Coat: On previously corroded steel containing discontinuities (pits, grooves or crevices), the first coat should be thinned (contact a Corrosion Engineering technical representative for more information) in order to allow the coating to flow into the discontinuities; this coat should be applied at a wet film thickness of about 5 mils (125 microns). Allow the tack coat to reach "B" stage before applying subsequent coats. Follow procedures outlined in 6.9.2 - 6.13 for the second and third coats.

6.9.2 First Coat: On steel or old steel free of discontinuities, the first coat shall be applied in a cross-hatched pattern with 50% overlap. The recommended wet film thickness is 7-9 mils (175-225 microns).



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- 6.10 Follow curing procedures for basecoat as outlined in Sections 4.0 and 6.4.
- 6.11 Applicator shall wear protective footwear before stepping onto the first coat, e.g., cover shoes with protective plastic booties or similar.
- 6.12 Apply **second coat** (topcoat) at 7-9 mils (175-225 microns) as outlined in Section 6.9.2.
- 6.13 Cure total coating system (basecoat + topcoat) according to schedule given in Section 4.0.
- 6.14 For roller applications, the remaining surface can be (rolled) coated after the stripe coat has cured (see Section 6.4). Roll coating onto surface using forward and backward motion. A single forward and backward is normally sufficient for the application of PENNCOAT 401. Use additional forward and backward motions in order to cover all areas of the substrate; however, take caution not to overwork the coating.

**7. THINNERS**

- 7.1 PENNCOAT 401 coatings may require thinning for spray applications. Thin PENNCOAT 401 with MEK only, no other solvents are acceptable.

**NOTE:** Do not add more than 1 quart (946 ml) of solvent to 5 gallons (19 liters) of coating.  
In general, no thinning is required for roll or brush applications; however, some thinning may be required for stripe coating of previously corroded areas or irregular surfaces.

**NOTE:** MEK is a moderately toxic, flammable liquid (flash point 23°F [-5°C]). It is important to remember when using any solvent or thinner that adequate ventilation is required, no one should smoke and all individuals using these materials should use a respirator, face shield and wear proper protective clothing.

**8. VISCOSITY**

- 8.1 On common spray equipment there are several types of adjustments which affect the application properties. Viscosity is very important because if a coating is too thick, it will not go through the equipment and if it is too thin it

will run off the substrate. If the material seems to “spit” or comes out agglomerated, add some thinner and mix well.

**9. FLUID PRESSURE (i.e., Pressure Forcing Material to Spray Gun)**

9.1 The same type of spitting from a nozzle which is common when heavy viscosity materials are sprayed will also show up if the fluid pressure is too high. Too high of a fluid pressure (i.e., too high pump pressure or pot pressure) is indicated when an excessive amount of coating lands on the surface or there is a general lack of a smooth uniform wet film.

**10. AIR PRESSURE FOR POT SPRAYING**

The above recommendations on pressure and solvents should be followed. The following are additional points of information when using pressure pot spraying.

10.1 Air Atomization Pressure: Because the air breaks up the coating into fine particles as it leaves the orifice of the spray gun, its variation can have gross effects on the appearance of the applied coating. Too low of an atomization pressure will allow the coating to land as agglomerates. In a finer state this can appear as small craters or generally a rough or pitted appearance of the applied coating. On the other hand, too high of an air pressure can cause a blowing of the coating which will appear as ripples on the surface or even bare spots. High atomization pressure will also cause excessive overspray. A finer appearing, smooth surface will be obtained if air pressure is carefully adjusted prior to application.

10.2 Pattern and Trigger Adjustments: Most spray guns have adjustments to widen, narrow and rotate the spray pattern by simply turning a knob. They also have a trigger adjustment to vary the fluid-to-air ratio. These adjustments are useful for varying shapes and configurations, and most applicators will vary them to arrive at their most convenient settings. Each of these factors, pressure, thinner and adjustments are independent of one another and any change in one factor can affect all other settings, but usually there is little trouble in arriving at a suitable combination of parameters.

**11. INSPECTION, TESTING AND DOCUMENTATION**

11.1 The surface profile must be verified after abrasive blasting on a small area of the structure, e.g., 2 ft. x 2 ft. (61 cm x 61 cm), prior to continued blasting. The anchor pattern should provide a minimum profile of 3-4 mils (75-100 microns) (see Section 3.5). Recycled abrasives must be checked regularly

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to ensure that a uniform profile is maintained and that the abrasive material remains free of soluble salt and oil contaminants. A final check of the anchor pattern shall be performed immediately after the blasting operation is complete. Make a sufficient number of surface profile measurements on evenly spaced areas around the tank or structure so that a representative record is obtained.

- 11.2 Surface cleanliness shall be checked before and after abrasive blasting and prior to coating if more than four (4) hours elapse between the blasting and coating operations. This involves examining the surface for dust, debris, oil, grease, chemical contamination (particularly for chloride ions) and “flash” rusting. The latter is problematic in high relative humidity environments, especially those surfaces with high levels of chloride ion contamination, and when there is a delay between the abrasive blasting step and coating step.

11.2.1 The surface shall be tested for soluble salt contamination before and after abrasive blasting. This test is especially important when coatings are applied in close proximity to marine coastal environments. Perform a sufficient number of tests over the tank or structure so that a representative record of the surface contamination level is obtained. Make additional tests when several high readings are recorded.

11.2.2 Testing for contamination by soluble salts can be accomplished by using a “KTA Surface Contamination Analysis Test Kit” or by an extraction method followed by titration (ASTM 512). The acceptable level of chloride ion contamination is 5 µg/cm<sup>2</sup> or less. If after testing the chloride ion level exceeds this limit, all contaminated areas shall be steam cleaned or pressure washed with warm, clean water (distilled or demineralized water is preferred). If soluble salt contamination is detected after abrasively blasting, the surface shall be cleaned as outlined above. If flash rusting occurs, the surface shall be washed and reblasted. Check abrasive material for contamination before reblasting (the maximum acceptable conductivity level for a 1:1 abrasive/distilled water mixture is 150 µS/cm). In environments where flash rusting is problematic, the surface can be decontaminated by adding “Chlor\*Rid” to the wash water. When the chloride ion level is acceptable, the surface is ready to be coated.

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11.3 Thickness measurements are necessary to be sure weak spots are not present, which spark testing and visual inspection might miss.

11.3.1 Wet film thickness (WFT) measurements made during the coating application will aid in determining if the specified amount of material is being applied so that the expected film thickness (DFT) is attained. Make frequent readings during the initial coating application to ensure that the proper thickness is being applied, e.g., the WFT should be about 8 mils in order to achieve a DFT of about 7 mils (this difference between wet and DFT may vary when thinner is added). Make regular wet film thickness measurements when a new area of the structure is coated or lined. No formal documentation of WFT is required; however, good coating practice dictates that a sufficient number of WFT measurements be made in order to ensure that the required dry film thickness is achieved.

11.3.2 DFT measurements made after the coating or lining has been applied will ensure that the proper thickness has been applied. The recommended DFT is 14-16 mils (350-400 microns); the minimum and maximum DFTs are 12 mils (300 microns) and 20 mils (500 microns), respectively. Make five separate spot measurements at random locations for every 200 ft<sup>2</sup> (19 m<sup>2</sup>) of coated surface. Each spot measurement should consist of an average of three different gage readings made in a small area. The average of the five spot readings must be within 20% of the specified dry film thickness. If the average coating thickness differs by more than 20% of the specified value, notify the Owner's Representative. Readings should not be made closer than ½ inch (1.3 cm) from edges, holes, inside corners, etc. unless validity of calibration for such measurements can be demonstrated. Details on DFT measurements can be found in ASTM E376, D1186 and D1400.

**NOTE: Make additional spot measurements if low DFT areas are found.**

11.4 Large defects in the applied coating will be obvious, but such defects as small blisters, hairline cracks or pinholes will not be apparent without close examination. Edges and inside and outside corners will usually be most likely areas for defects. Spark testing is required over 100% of the coated or lined

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structure in order to locate holidays in the coating. The coating must be clean, dry and firm-to-the-touch (wait at least 24 hours after application of the final coat) before making holiday detection measurements. In addition, it is important to make sure that connections to ground and the detector are tight. Spark test all coated surfaces. More details on making holiday detection measurements can be found in ASTM G62. The location of all detected holidays shall be identified and subsequently repaired as outlined in Section 12.0. If more than three (3) holidays/m<sup>2</sup> (3 holidays/11 ft<sup>2</sup>) are found, the Owner's Representative and Corrosion Engineering shall be notified before repairs are made.

11.4.1 Initial spark testing should be conducted at 5,000 volts.

**NOTE: Spark test at 5,000 volts ONCE. Conduct subsequent spark tests at 1,400-2,000.**

11.5 The following test shall be performed to determine whether the coating is cured: coating hardness can be tested using a pencil hardness gage (e.g., Paul N. Gardner Co., Inc.) A properly cured PENNCOAT 401 should have a pencil hardness value greater than or equal to "9H". If a hardness value of less than 9H is determined, notify the Owner's Representative and Corrosion Engineering before recurring. In the absence of a pencil hardness tester, one may use a solvent wipe to determine whether the coating is cured. Soak a clean, white cloth with clean solvent. Rub the same area of the coating 40-50 times in a back and forth motion while applying pressure. If the coating becomes soft and tacky or coating material is transferred to the cloth, the coating is not properly cured.

## **12. REPAIRS AND TOUCH-UPS**

12.1 Prior to Heat Curing: The coating shall be sufficiently hard so one is able to walk on it before repairs are made. Make repairs and touch-ups with PENNCOAT 401. Use pint or half-pint kits for this purpose.

12.1.1 Obvious defects and pinholes identified by spark testing can be repaired prior to heat curing with minimum surface preparation. Open pinholes by hand using a small diameter drill bit (about 3/32" diameter). It is not necessary to enlarge pinholes such that bare substrate is exposed. If repairs are made in less than 24 hours, clean area to be touched-up with a clean cloth slightly dampened with clean solvent. Apply coating using a

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small, clean, stiff bristle brush. Work coating into the opened pinhole using the end of the brush in a twisting and dabbing motion. Lightly brush material over pinhole and a minimum of one inch around the repair site. Coating should be applied thickly but not so thick that sags or runs are produced.

**NOTE: Preheat “drilled out” hole with hot air gun before application of the coating.**

12.1.2 Repairs made after the recoat window had passed require the area around the opened pinhole to be roughened by hand using 50-80 grit abrasive paper before cleaning with solvent.

12.1.3 Spark test patched areas at 1,400-2,000 volts after heat curing. If pinholes are found, follow touch-up procedures outlined in Section 12.2.

12.2 After Heat Curing: The following procedures shall be followed when making repairs or touch-ups after the coating has been heat-cured:

12.2.1 Open pinholes by hand using a small diameter drill bit (about 3/32" diameter). It is not necessary to enlarge pinhole such that bare substrate is exposed. Clean area to be touched-up with a clean cloth slightly dampened with clean solvent. Roughen area at least 1-2" around pinhole by hand using 50-80 grit abrasive paper. Heat area to be repaired with a hot air gun for 2-3 minutes. Apply coating using a small, clean, stiff bristle brush. Work coating into the opened pinhole using the end of the brush in a twisting and dabbing motion. Lightly brush material over pinhole and a minimum of 1" around the repair site. Coating should be applied thickly but not so thick that sags or runs are produced. Heat patched area with hot air gun until coating is hard and has changed colors. Spark test at 1,400-2,000 volts to confirm pinhole has been properly repaired.

**NOTE: Pre-heat “drilled out” hole with hot air gun before application of the coating.**

12.2.2 Large areas that need to be repaired shall be brush blasted using vacuum blasting equipment or adjacent coating must be fully protected to prevent damage from open abrasive blasting.

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Remove all blasting dust and grit using a vacuum. Wipe down area using a clean cloth slightly dampened with clean solvent. Apply coating by spray, roll or brush application as directed by Corrosion Engineering. Heat patched area with hot air gun, infrared heater or similar until coating is hard and has changed color (substrate temperature in patched area should exceed 200°F [93°C]). Spark test at 1,400-2,000 volts to confirm pinhole has been properly repaired.

**NOTE:** Be sure to remove shiny coating surface at least 1" (2.5 cm) around perimeter of pinhole to be patched by roughening with abrasive paper or carefully with disc sander. This step is necessary because the adhesion of the coating patch to a cured coating is poor.

**13. RECOATING**

13.1 PENNCOAT 401 may be recoated after hardening (full cure); however, the surface shall be brush blasted to remove the shiny resin rich surface. Surface preparation procedures outlined in Section 3.0 and coating/curing procedures in Sections 4.0 to 6.0 shall be followed thereafter.

**14. GENERAL NOTES**

14.1 Tanks shall be adequately illuminated using safety/explosion-proof lighting. It is recommended that areas to be blasted or sprayed are illuminated at 1000 LUX.

14.2 Install adequate ventilation system in order to maintain an optimum air supply level, to minimize blasting dust and to draw off solvent in order to promote faster "B" staging. It is recommended that the ventilation system is sufficient in order to ensure an air exchange of 4 times/hour in large tanks (e.g., >2,000 m<sup>2</sup>) and 10 times/hour for small tanks, respectively.

14.3 Staging (scaffolding) shall be installed in a secure manner and designed so that all piping and boarding are a minimum of 12 inches (30 cm) from the surfaces to be blasted or sprayed and a maximum of 24 inches (61 cm) from these same areas.

14.4 PENNCOAT 401 shall be stored in a "climate controlled" container, room or building that is weatherproof and maintained at temperatures between 68-

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77°F (20-25°C) for a minimum of 48 hours prior to use. The material should be kept warm (68-77°F [20-25°C]) during the mixing and application processes.

**WARNING: Keep resin and catalyst out of direct sunlight when the ambient air temperature is greater than about 75°F (24°C); in addition, keep material away from heat sources and open flames.**

- 14.5 The coating preparation area outside the tank or away from the structure shall be sheltered from adverse environmental conditions including rain, wind, dust and cold temperatures (<50°F [<10°C]).
- 14.6 Surfaces that are difficult or impossible to abrasively blast shall be prepared by using small blasting units or mechanical grinding tools.
- 14.7 Humidity and temperature control inside tanks are not as critical during the blasting operation, as it is before, during and after the coating operation.
- 14.8 It is important to maintain adequate ventilation to control dust and for safety reasons.

**15. SAFETY EQUIPMENT**

- 15.1
  - 1. Safety goggles or face shield
  - 2. Respirators: Wilson 1200 series (or equal) with organic vapor/dust mist cartridge (122110/122110S). For enclosed spaces, use full face external air-supplied mask (3M or equal)
  - 3. Rubber gloves (e.g., natural rubber, neoprene)
  - 4. Protective coveralls over long pants and long-sleeve shirts
  - 5. See Material Safety Data Sheet (MSDS) for handling instructions and health hazard data.

**16. SAFETY PRECAUTIONS / DISCLAIMER**

- 16.1 Read and follow the hazard information, precautions and first aid directions on the individual product labels and material safety data sheets before using. While all statements, technical information, and recommendations contained herein are based on information our company believes to be reliable, nothing contained herein shall constitute any warranty, express or implied, with respect to the products and/or services described herein and any such warranties are expressly disclaimed. We recommend that the prospective



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purchaser or user independently determine the suitability of our product(s) for their intended use. No statement, information or recommendation with respect to our products, whether contained herein or otherwise communicated, shall be legally binding upon us unless expressly set forth in a written agreement between us and the purchaser/user.

- 16.2 Please contact Corrosion Engineering for specific recommendations at +1-610-833-4000 or fax +1-610-833-3040.

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