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TITLE: COATING STEEL SUBSTRATES INSIDE REACTOR BUILDING & RADIATION AREAS	ORIGINATOR	<u>Mark Wells</u>	<u>3/4/84</u>	Date
	REVIEWED BY:	<u>n/a TPC iii</u>	<u>3-4-84</u>	Date
		<u>B&R QA</u>		
		<u>W. K. Kishner</u>	<u>3/4/84</u>	Date
		<u>TUGCO QA</u>		
	APPROVED BY:	<u>[Signature]</u>	<u>3-4-84</u>	Date
		CONSTRUCTION PROJECT MGR		

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FOR OFFICE AND
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DUE TO EXTENSIVE REVISIONS CHANGE BARS WERE OMITTED



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1.0	<u>INTRODUCTION</u>				
1.1	PURPOSE				
1.1.1	The purpose of this procedure is to establish the methods by which the prime and finish coats are to be applied to the containment liners and radiation areas in accordance with specification, drawing, and manufacturer's requirements. This procedure may also be used for coatings to any steel substrate inside the reactor buildings scheduled to receive primer of Dimetecote 6 and Phenoline 305 finish coat manufactured by Ameron and Carboline respectively.				
1.2	SCOPE				
1.2.1	The scope of this procedure covers the surface preparation and coating of Unit 1 and 2 steel substrates inside the reactor buildings and radiation areas scheduled to receive protective coatings.				
1.3	GENERAL DISCUSSION				
1.3.1	<p>All coating materials covered by this procedure shall be as manufactured by Carboline Corporation of St. Louis, Missouri and Ameron Protective Coatings Division of Brea, California. The coating system shall consist of a prime coat of Dimetecote 6 by Ameron with a finish coat of Phenoline 305 by Carboline. To protect the prime coat from prolonged exposure, a "seal coat" consisting of approximately one mil DFT of Phenoline 305, thinned at 50% may be applied over the prime coat. Finish coating shall be applied when convenient.</p> <p>In order to maintain traceability on protective coatings applied to shop coated steel cited for installation in the Reactor Building, these items shall be steel stamped with a unique coating code number. The code numbers shall be assigned by QC Paint and applied by craft personnel. Upon division of materials, this unique number will be transferred along with all other unique identifying numbers.</p>				
1.3.2	Vendor coated items shall have coating system verified for compliance to site specification prior to any additional coating or coating repair.				
1.3.3	When there is a conflict between this procedure and Reference 5, the requirement of Reference 5 shall prevail.				



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2.0 SPECIAL ITEMS AND OPERATIONS

2.1 QUALIFICATION OF PERSONNEL

2.1.1 Coating application personnel shall be qualified per previous experience and practical application. In addition, each painter shall have been instructed by the Paint Superintendent or his representative in the use of the products as consistent with Carboline's training procedures, which includes both classroom instruction and a field application demonstration. This shall be verified by completing a form similar to Attachment 1. This form shall be executed by the Brown & Root Paint Superintendent or his representative. A coating manufacturer's representative will be available for technical supervision upon initial painting effort. Applicators performing work to a special coating procedure shall be qualified for that procedure.

2.2 SAFETY REQUIREMENTS

2.2.1 All appropriate health, safety, and fire protection requirements, pertaining to surface preparation and coating application shall be followed. It shall be the responsibility of the Site Safety Department to establish the frequency of monitoring the coating work.

2.3 INSTRUMENTS AND THEIR USE

2.3.1 The painting Foreman and General Foreman shall have access to and be familiar with the use of all instruments necessary to insure efficiency of coating applications. This shall include, such as but not limited to, surface profile comparators, holiday detectors, thermometers, and wet and dry film gauges. Viscosity measuring devices will not be used. Wet film gauges will be randomly used during coating application as an aid to field personnel on Phenoline 305 only. Readings will be limited to the minimum necessary to control coating thickness.

2.4 DOCUMENTATION

2.4.1 Records shall be maintained on Attachment 1 listed in Section 6.2. After completion, each form shall be forwarded to the Brown & Root Document Control Center for filing and distribution to the various parties as listed on the distribution sheet.



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2.5 RECEIVING, STORAGE AND DISPENSING OF COATING MATERIALS

2.5.1 Receiving and Storage - Upon receipt of a shipment of coating materials, the QC Representative accepting shipment shall be responsible for completing all necessary receiving inspection documentation. General receiving procedures shall be in accordance with Brown & Root Construction Procedure CP-CPM 8.1. It shall then be segregated from Non-"Q" materials and stored in the paint storage building where temperatures will be maintained between 45° - 110°F. Infrequent dips in air temperature in storage areas as low as 32°F for up to 24 hours are acceptable. Temporary storage may be required at the receiving warehouse due to receiving or other problems.

2.5.2 Dispensing Material to the Field - Coating materials shall be transferred from the controlled area to a designated temporary storage area or area of intended use. Due to limited shelf-life of coating materials, this shall be done on a "first-in", "first-out" basis. After materials have been partially used from an individual container, the said container cannot be resealed and returned to "Q" storage area for later use. Containers opened and partially distributed from the "Q" paint storage area may be resealed and the remaining contents used for "Q" painting.

2.6 SPECIAL COATING PROCEDURE

2.6.1 When items require special coating not covered under the content of this document, the appropriate Project Engineer (Mechanical, Civil, Electrical) shall complete Attachment 2. A log of all procedures of Attachment 2 shall be maintained. The following information shall be completed on each procedure.

2.6.1.1 Each procedure shall be given a unique number. The scope will describe the working limits of the procedure with detailed work requirements being listed under the requirements section. The approvals section shall have signatures of the following: Project discipline Engineer (Mechanical, Civil, etc.), QA Manager if coating of item is safety related, TUSI representative when required, Engineer who prepared document, and a revision number and date. Upon completion of the document, distribution shall be made to all holders of this procedure.



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3.0 PROCEDURE FOR SURFACE PREPARATION AND COATING

3.1 PREPARATION OF SUBSTRATES FOR PRIME COAT

3.1.1 Surface Preparation - If needed the surface to be primed shall be cleaned of any heavy oil or grease deposits in accordance with SSPC-SP-1-63 "Solvent Cleaning". Small amounts of grease or oil deposits may be removed by blast operations. Final blasting shall not begin unless the temperature of the surface to be blasted is 5°F or more above the dew point. The surface shall be cleaned by blasting to SSPC-SP-10, "Near White Blast" cleaning. Blasting operations shall be performed with blast abrasive which will achieve a minimum profile of 1 mil. After the above surface preparation, the surface to be primed shall be air blasted and/or solvent wiped to remove dust, sand or foreign contaminants from the surface. Air blasting shall not be performed where air-borne contaminants could adhere to tacky paint. Sufficient time shall be provided to allow suspended particles to settle before beginning primer application. If rust forms after surface preparation, the rusted area shall be recleaned before primer application. Generally a blast cleaned surface shall not be exposed for more than 8 hours prior to priming without additional cleaning of the surface. When applying coatings that will be joined together by a later coating operation, the interface shall be constructed as follows:

- a. Blasting using no border tape - Overblast the steel to near white metal approximately 12" - 18" beyond the point which will receive primer. Hold back approximately 12" - 18" from edge of blasted area when applying primer.
- b. Blasting using border tape - Clean the steel to near white metal approximately 3" - 6" beyond the point which will receive primer. Place border tape approximately 1" in from the edge of cleaned area and prime. When applying seal or finish coat on either of the above methods hold back approximately 12" - 18" from edge of primer.

3.1.2 Removal of weld spatter and other minor surface imperfections (not to exceed .031" for containment liners) - if needed, weld spatter omitted by others will be removed by Painting Personnel in accordance with SSPC-SP-2 and SSPC-SP-3. If it is determined that surface defects are sever enough to require later repair, the area to be repaired will be blocked out and spot painted at a later date. All protrusions and peaks shall be ground to a rounded contour.



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3.2 MIXING PRIMER

3.2.1 Primer - The primer, Dimetcote 6 is packaged in a two component kit consisting of a base and zinc filler. First the base shall be thoroughly mixed. Zinc filler shall then be added under constant agitation and mixed until free of lumps. Partial mixes shall be mixed by weight in a proportion of 6.4 parts base to 15 parts zinc filler using a suitable scale to achieve a plus or minus 2 percent accuracy. The mixture shall then be strained through a 30-mesh screen.

NOTE: Inorganic zinc primer shall be power mixed or "boxed" prior to use.

3.3 APPLICATION OF PRIME COAT

3.3.1 Prime Coat Application

Coating material shall be applied using conventional spray equipment with agitated pressure pots having a maximum hose length of 75 feet. The primer shall be allowed to become tack free before start of other construction operations which could create contamination problems. Any runs or sags having a detrimental effect on the coating system shall be removed and repaired. The following application parameters shall be followed:

- a. Normal conditions of ambient and surface temperature shall be 40° to 120°F and 40° to 130°F respectively. Primer may be applied within an ambient range of 0° to 130°F and a surface temperature of 0°F to 200°F. Normal thinning of Dimetcote 6 is 1 1/4 pints per gallon. Application during other than normal conditions; Carbo Zinc 11 may be thinned up to 2 quarts per gallon .
- b. Humidity values vary from 0 to 95%. Coating shall not be applied to a wet or damp surface.
- c. Thickness of prime coat shall be a minimum dry film of 2 mils and a maximum of 5 mils.
- d. A double regulated pot having an adequate air volume supply shall be used.
- e. As a guide, coating material may be applied using a 50% overlap with each pass while holding a gun 8 - 10 inches from the surface. Cross hatch application is permissible.

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- f. Curing time shall be as follows, depending upon approximate surface temperature and relative humidity conditions:

<u>TEMPERATURE WITH OVER 50% R.H.</u>	<u>CURING TIME BEFORE TOPCOATING</u>
40 - 99°	24 hrs
100° and above	12 hrs

NOTE: When water curing, below 40°F. and/or below 50% R.H., rely on "coin test" method for determining cure. "Coin Test" is defined as: the coating is sufficiently cured for topcoat when the coating may be burnished rather than removed when rubbed with the flat portion of a coin such as a nickel.

If required, the cure of Dimetecote 6 may be accelerated by use of water spray after allowing at least one hour cure after application. This shall be done as required using clean water having a pH range of 6 to 8. If used, a filter system will be installed in order to assure proper cleanliness of the curing water.

- g. Primer application shall not begin unless the surface temperature is a minimum of 5°F above the Dew Point.

3.4 PREPARATION FOR FINISH COAT

3.4.1 Verify primer surface ready for finish coat.

- 3.4.1.1 If no primer defect exist, solvent wipe surface and allow solvent to flash off surface. Apply finish coat. Prime showing defects shall be repaired per 3.4.2 using conventional spray equipment or brush application per Note 2.

3.4.2 Primer Defects and Repair Methods

- a. Sags or runs in excess of 5.5 mils shall be abraded as required to 2.0 to 5.5 mils. Sags or runs 5.5 mils or less which show no evidence of mudcracking need not be repaired. If coating surface is satisfactory after abrading, then Carbolines finish coat may be applied.



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<p>b. Mudcracking is unacceptable and must be removed. Remove mudcracking by blast or power tooling, then reprime the area. If the repaired area falls within minor defect criteria or does not extend to metal substrate, topcoating may proceed. See Note 3.</p> <p>c. Oil or grease shall be removed from inorganic zinc primer by solvent wiping then blast or power tool cleaning to substrate.</p> <p>d. High film thickness shall be removed by abrading to acceptable thickness.</p> <p>e. Low film thickness shall be corrected by application of additional primer material to acceptable limit utilizing material thinned at two quarts per gallon.</p> <p>f. Contamination shall be removed by abrading. Recoat if necessary.</p> <p>g. Treatment of Stains - Remove residue, though not necessarily the stain with a bristle brush and water or Carboline Thinner #33 or Amercoat #12 cleaner. Allow the surface to dry thoroughly</p> <p>NOTE 1 Prior to recoating, the primed surface to be recoated shall be wiped with clean rags moistened with Carboline Thinner #33 or Amercoat #12 cleaner.</p> <p>NOTE 2 Brush touch-up painting shall be done on prime coat in accordance with the following:</p> <ol style="list-style-type: none"> 1. Dimetecote 6 Application Instruction R 11-78. Max. allowable touchup - 144 square inches. 2. Dimetecote 6 Product Bulletin R 6-79 <p>NOTE 3 If substrate exposed is a minor defect, hand tooling may be utilized to achieve the required surface cleanliness.</p>				
<p>3.5 MIXING OF FINISH COAT</p> <p>3.5.1 The finish coat, Phenoline 305, is packaged in a two component kit consisting of Phenoline 305 base, Part A, and a Phenoline catalyst, Part B. Mixes are made by combining and thoroughly mixing the base and catalyst. Partial mixes may be made by combining, in a ratio by volume, four parts base to one part catalyst. Viscosity shall be controlled by adding thinner as</p>				



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required, but shall not exceed two quarts of thinner per gallon of Phenoline 305. Pot life of Phenoline 305 is shown on Attachment 3. The finish color shall be as required by the governing specification.

3.6 FINISH COAT APPLICATION

3.6.1 Finish Coat: Carboline, Phenoline 305

Finish coating shall be applied using conventional, airless, brush or roller. Weld seams, edges and other sharp geometrical discontinuities may receive an initial coat of 1-2 mils finish coating thinned by using two quarts Phenoline Thinner per each gallon kit of Phenoline 305. To aid in continuity at edges, edges may be "striped" with Phenoline unthinned instead of the 50% mixture as stated above. In either "striping" or initial coating of edges, welds, etc., time should be allotted for the coating to harden sufficiently to maintain a "sealing" effect prior to continuing coating operations. The initial coating of edges, striping, etc., as stated above, shall be considered part of the total initial finish coating operation. The material shall be allowed to become tack free before any other construction operations proceed which could create contamination problems by dust or other foreign matter. A continuity check may be performed in accordance with NACE T-6F-3 Condition "C". No gross discontinuities are acceptable such as holidays, voids, skips, bubbles, and misses. Any runs or sags having a detrimental effect on the coating system shall be removed and repaired. The following application parameters shall govern:

- a. The permissible range of surface and ambient temperature for application shall be 50° - 120° F. Temperature may rise above 120° F after material has become "tack free". Phenoline 305 may be thinned up to 2 quarts of Phenoline Thinner per gallon mix. The ratio of thinner to Phenoline will be that which gives the best workable mix, i.e., usually advantageous to use more thinner at lower temperatures.
- b. Minimum and maximum values of relative humidity shall be 0% and 85% respectively.
- c. As a guide, coating material shall be applied using a 50% overlap with each pass while holding the gun 8 - 10 inches from the surface.



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d. The ambient temperature and relative humidity shall be measured to determine the dew point temperature. Phenoline 305 finish shall not be applied unless the substrate temperature is 5°F or more above the dew point.

e. Curing and time to recoat Phenoline 305 shall be as shown below:

<u>Between Coats</u>	<u>Temperature°F</u>	<u>Final Cure</u>
72 hours	50 - 59	12 days
36 hours	60 - 74	8 days
18 hours	75 - 89	4 days
12 hours	90 & above	2 days

f. Phenoline thinned at 50% and applied as a seal coat may be recoated after 4 hours of cure at or above 75°F.

g. Tack free shall be defined as the extent of cure at which contaminants will not adhere to the coating.

h. The total coating system shall have an average dry film thickness range from 7 - 11 mils.

4.0 SYSTEM REPAIR AFTER FINAL TOP COAT

4.1 SURFACE PREPARATION

4.1.1 Substrate not Exposed - The surface shall be repaired by solvent wiping per SSPC-SP-1 followed by hand or power tool cleaning per SSPC-SP 2 or 3 to roughen surface. The area shall be solvent wiped to remove dust prior to coating application.

4.1.2 Substrate Exposed - The surface shall be solvent wiped per SSPC-SP-1. After solvent wiping the surface shall be prepared by abrasive blast or power tool cleaning except when minor defects exist, hand tooling may be utilized. The cleanliness requirements shall be as defined in SSPC-SP-10 "Near White Blast" unless on a weld or within 1 inch of a weld where the cleanliness requirements of SSPC-SP6. In all cases a minimum profile of 1 mil shall be maintained.

NOTE: The 3-M Clean and Strip or the 60 grit or coarser flapper wheel properly used over previously blasted surfaces provide a 1 mil profile. Adjacent areas shall be roughened and tapered by hand or power tool a sufficient amount to ensure a smooth continuous final coating system.



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4.2	REPAIR PRIMER APPLICATION				
4.2.1	For touch-up and repair areas, including major defects, primer may be applied utilizing material thinned up to 2 quarts of thinner per gallon. Allow sufficient time for solvent to "Flash off" prior to coating application.				
	NOTE: Brush touch-up utilizing inorganic zinc primer shall not exceed one square foot in area.				
4.3	REPAIR FINISH APPLICATION				
4.3.1	Remove any loose particles and solvent wipe. The area shall be coated with Phenoline 305 Thinner or Xylol. Allow sufficient time for solvent to "Flash off" prior to coating application. Apply finish coat to the area, including minor defects, as required. Finish coat applied over minor defects should be applied at a thickness sufficient to ensure a smooth transition to existing surrounding coatings.				
4.4	DEFECTS AND REPAIRS				
4.4.1	Runs and Sags - Runs and sags which have a DFT higher than that allowed per Section 3.6.1 h shall be repaired by abrading to bring coating to acceptable thickness.				
4.4.2	Cracks or Mudcracking - Cracks shall be repaired by abrading to sound coating or substrate and recoat as necessary per 3.4.2 b.				
4.4.3	Contamination - Contamination shall be removed by abrasion. If low film thickness results recoat as necessary.				
4.4.4	Discontinuities, and Damaged Areas - Discontinuities and damaged areas shall be repaired by abrading and recoating as necessary.				
4.4.5	Stains - Stains shall be solvent cleaned prior to any additional coating application.				
4.4.6	Orange Peel - Moderate amount of orange peel is acceptable. If repair is necessary, abrade and recoat if required due to low film thickness.				
4.4.7	Dry spray - Moderate amount adhering dry spray is acceptable in the finish coat. On primer, intermediate coats, or if necessary to recoat, dry spray is to be removed prior to additional coating being applied.				



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4.4.8	Low Film Thickness * Areas with low dry film thickness shall be repaired by applying additional coating.			
	<p>NOTE: If coating removal is required from an area or item which has previously been coated in accordance with this procedure, shadows or tight residue of primer which may remain in the profile of the previously prepared substrate is acceptable. However, areas with residues of Carboline 191 Primer shall be recoated with Carboline 191 Primer. Areas with residues of inorganic zinc may be coated with either inorganic zinc or Carboline.</p>			
5.0	<u>FINAL ACCEPTANCE</u>			
5.1	FINAL ACCEPTANCE INSPECTION			
5.1.1	<p>Final acceptance inspection may be performed after a minimum topcoat cure of 24 hours cure for recoat time as stated in section 3.6.1 e is satisfied.</p> <p>Touch up of minor defects, as defined in section 6.1.1 of this procedure may be done at time of final inspection without later reinspection of the repair.</p> <p>After final inspection and resolution of all discrepancies are completed the QC inspector shall document the final acceptance by completing and signing the final acceptance record. A copy will then be transmitted to the B&R Paint Superintendent as soon as possible after final acceptance is made.</p>			
5.2	HOLD POINTS			
5.2.1	Onsite receipt of coating materials.			
5.2.2	Substrates before and following surface preparation.			
5.2.3	Mixing and preparation of coating material for application.			
5.2.4	Film characteristics after drying and curing.			
5.2.5	Control of ambient conditions and surface temperatures during all phases of the coating work.			
6.0	<u>SUPPORTING INFORMATION</u>			
6.1	DEFINITIONS			
6.1.1	Minor defect - Minor defects are defined as an area, either			



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circular or linear, in which a $\frac{1}{2}$ " diameter circle can not be completely inscribed at same point along the entire length and which may extend to substrate.

6.1.2 Major defect - Major defects are defined as an area, either circular or linear, in which a $\frac{1}{2}$ " diameter circle could be completely inscribed at any point or along the entire length which may extend to substrate.

6.1.3 Coating interface - At coating interface for finish and/or primer coat, the existing coating shall be "feathered back" a sufficient distance to ensure a smooth final coating system. When performing coating interfacing the interface of the coatings or systems shall be a maximum of approximately $\frac{1}{4}$ inch in width. Within the interface area, overlapping of any materials or systems is acceptable.

NOTE: When inorganic zinc is applied at an interface, the cured inorganic zinc shall be screened or abraded prior to application of next coat.

6.2 ATTACHMENTS

1. Painter Qualification Record
2. Special Coating Procedure
3. Pot Life Phenoline 305

6.3 REFERENCES

1. Gibbs & Hill Specification 2323-SS-14, "Containment Steel Liner". Latest Revision
2. Steel Structures Paint Council, Volume 2, Second Edition
3. Carboline Corporation "Application Instruction". October 76-N Revision and Bulletin Number 775 - data sheets October 76-N Revision and 473, Latest Revision
4. ANSI N 101.2, "Protective Coatings (Paints) for Light Water Nuclear Reactor Containment Facilities"
5. Gibbs & Hill Specification 2323-AS-31, "Protective Coatings", Latest Revision
6. Gibbs & Hill Specification 2323-MS-101, "Equipment Erection", latest revision



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7. Gibbs & Hill Specification 2323-MS-43B,
"Nuclear Piping", latest revision
8. Gibbs & Hill Specification 2323-MS-44B,
"Non-Nuclear Piping"
9. Gibbs & Hill Specification 2323-MS-100,
"Piping Erection"
10. Gibbs & Hill Specification 2323-SS-17,
"Miscellaneous Steel", latest revision



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ATTACHMENT 1

BROWN & ROOT, INC.
COMANCHE PEAK STEAM ELECTRIC STATION

Painter Qualification Record

GENERAL DATA

Date _____ Report Number _____

TECHNICAL DATA

Name of Painter _____

Summary of Field Experience _____

Experience with Following Product Types _____

Application Test for Specified Substrate _____

Additional Qualifications (School) _____

Signature _____

Applicator's Field Supervisor

Distribution: Painting Supt.
Q.C. Department
Tugco QA Vault (Original)



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ATTACHMENT 2

"Q" Coating _____

Sheet _____ of _____

"Non Q" Coating _____

Procedure # _____

Rev. _____ Date _____

SPECIAL COATING PROCEDURE NO. _____

SCOPE _____

REQUIREMENTS:

REFERENCE DOCUMENTS



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ATTACHMENT 3

POT LIFE PHENOLINE 305

<u>TEMPERATURE (°F)</u>	<u>UNTHINNED</u>	<u>THINNED-50%</u>
50-54	10 hrs	24 hrs
55-59	7 hrs	24 hrs
60-64	4½ hrs	24 hrs
65-69	3½ hrs	24 hrs
70-74	2 hrs	24 hrs
75-79	1½ hrs	24 hrs
80-84	1½ hrs	24 hrs
85-89	1½ hrs	24 hrs
90-95	1 hrs	24 hrs

Pot life stated above for unthinned coatings are the recommended times and should be utilized as a guideline for coating usage time, however, actual pot life may be longer. For unthinned coatings or coatings thinned 50% or less, actual pot life is determined by the applicability of the coating.

