



# SURFACE PREPARATION AND APPLICATION GUIDE

SERIES 141 EPOXOLINE®

## TNEMEC COMPANY INC.

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*INNOVATION IN EVERY COAT.™*

## 1.0 INTRODUCTION

The purpose of this guide is to acquaint contractors and applicators with the basic information necessary for properly ordering and installing Tnemec's Epoxoline coating and lining materials. Series 141 Epoxoline is a high solids coating which offers high-build edge protection and excellent corrosion resistance. For use on the interior and exterior of steel or concrete tanks, reservoirs, pipes, valves, pumps, and equipment, as well as other steel and concrete substrates.

Prior to starting work, please read this entire guide carefully. If you have questions, contact your Tnemec representative or call 1-800-TNEMEC1. It is important that you obtain answers to any questions before work begins.

Please review all pertinent Product Data Sheets prior to starting. Also, reference the project specifications and compare them with this guide and the Product Data Sheets. Resolve any inconsistencies prior to starting work.

This application guide cannot cover every issue that may be encountered in the field. If issues arise that are not addressed in this guide or the Product Data Sheets, please contact your Tnemec representative or call 1-800-TNEMEC1 for assistance.

## 2.0 PRODUCTS AND PACKAGING

### 2.1 SERIES 217 MORTARCRETE

Series 217 MortarCrete is a single-component, rapid setting, non-shrinking hydraulic cementitious resurfacer used to restore deteriorated concrete, patching, and filling voids and bugholes from 1/4" to 2" deep in concrete substrates.

#### 2.1.1 SERIES 217 CURING TIME

TEMPERATURE	INITIAL SET	FINAL SET	TO TOPCOAT
70°F (21°C)	3-4 hours	90 minutes	12 hours

**Note:** Use Series 211-217 Slow Set additive to extend set times. Refer to Series 211-217 Slow Set product data sheet for information.

#### 2.1.2 SERIES 217 PACKAGING

Series 217 is packaged in a plastic bag inside a 5 gallon plastic bucket containing 55 lbs (25 kg) of blended specialty cements, aggregates and admixtures. **Note:** A trial batch is recommended to adjust the setting time to match jobsite conditions.

#### 2.1.3 SERIES 217 SPREADING RATES (THEORETICAL)

THICKNESS	SQUARE FEET	THICKNESS	SQUARE METERS
1/4"	21.6	0.635 cm	2
1/2"	10.8	1.27 cm	1
3/4"	7.2	1.91 cm	0.7
1"	5.4	2.54 cm	0.5
1 1/4"	4.3	3.18 cm	0.4
1 1/2"	3.6	3.81 cm	0.3
2"	2.7	5.08 cm	0.25

### 2.2 SERIES 211-217 SLOW SET

Series 211-217 Slow Set is a retarding additive used to slow the setting of Series 217. Series 211-217 is packaged in 0.9 oz (25 g) packets. Up to 3 packets may be used for each unit of Series 217.

### 2.3 SERIES 218-1000 MORTARCLAD

Series 218-1000 MortarClad is a high performance, aggregate-reinforced material for surfacing, patching and filling voids and bugholes in concrete substrates. In addition, it also serves as a means to diminish out-gassing problems typically associated with coating concrete when used as a resurfacer at 1/16" thickness. If environmental conditions dictate, such as high air or substrate temperatures or dry winds, the surface should be "pre-wet" or dampened with potable water. This can be done using a pump-up sprayer or heavy nap roller cover dampened with potable water.

**Note:** Do not over-saturate the surface. Material can be transferred to the surface by utilizing hydraulic spray equipment followed by trowelling to close the material. For a smoother finished appearance, trowel licks may be reduced by using water to lightly dampen a 1/4" nap roller cover over the sealed Series 218-1000 material. Refer to the Series 218-1000 MortarClad Product Data Sheet for further information.

#### 2.3.1 SERIES 218-1000 CURING TIME

TEMPERATURE	TO TOUCH	TO RECOAT WITH ITSELF	TO TOPCOAT
75°F (24°C) & 50% R.H.	3-4 hours	unlimited	15 hours minimum

#### 2.3.2 SERIES 218-1000 PACKAGING

KIT SIZE	PART A (LIQUID)	PART B (LIQUID)	PART C (CEMENT SAND)	YIELD (MIXED)
Large Kit	1 - 1 gallon plastic jug	1 - 1 gallon can	42.77 lb bag	3.0 gallons (11.4 L)
Small Kit	1 - 1 quart plastic jug	1 - 1 pint can	10.7 lb bag	0.80 gallons (3.0 L)

#### 2.3.3 SERIES 218-1000 COVERAGE RATES (THEORETICAL)

THICKNESS	LARGE KIT	SMALL KIT
1/16" (1.6 mm)	77 sq ft (7.2 m <sup>2</sup> )	21 sq ft (2.0 m <sup>2</sup> )
1/8" (3.1 mm)	38 sq ft (3.5 m <sup>2</sup> )	10 sq ft (0.9 m <sup>2</sup> )
1/4" (6.4 mm)	19 sq ft (1.8 m <sup>2</sup> )	5 sq ft (0.5 m <sup>2</sup> )

Allow for application losses due to surface irregularities and substrate porosity.

### 2.4 STORAGE AND CONDITIONING

Protect Series 218-1000 and Series 217 from moisture; store in dry environment off the ground in unopened containers. Condition product to 65-75°F (18-24°C) 24 hours before use. Material temperatures above or below this range could result in undesirable material working properties.

## 2.5 SERIES 141 EPOXOLINE

Series 141 is a high solids coating which offers high-build edge protection and excellent corrosion resistance. For use on the interior and exterior of steel or concrete tanks, reservoirs, pipes, valves, pumps and equipment in potable water service as well as other steel and concrete substrates.

### 2.5.1 SERIES 141 CURING

TEMPERATURE	TO HANDLE	TO TOPCOAT	IMMERSION
90°F (32°C)	3 hours	4 hours ‡	7 days
75°F (24°C)	4 hours	5 hours ‡	7 days
65°F (18°C)	7 hours	9 hours ‡	7 days
55°F (13°C)	13 hours	18 hours ‡	9 days
45°F (7°C)	20 hours	24 hours ‡	13 days
40°F (4°C)	22 hours	28 hours ‡	18 days
35°F (0°C)	64 hours	72 hours ‡	30 days

Curing time varies with surface temperature, air movement, humidity and film thickness. ‡**Note:** When recoating Series 141, stable environmental conditions are critical. Both temperature and humidity must remain relatively constant during application and cure as to not exceed ±10 degrees or percent fluctuation respectively. If either environmental condition falls outside of these ranges, the surface must be thoroughly scarified by aggressive sweep blasting or mechanical abrasion and cleaned before the application of subsequent coats. **Note:** Maximum recoat time with itself is seven days. **Note:** For one-coat pipe and valve applications, allow 30 days cure at 75°F (24°C) prior to immersion. Refer to product listing on www.NSF.org for specific potable water return to service information.

### 2.5.2 SERIES 141 PACKAGING

KIT SIZE	PART A (PARTIALLY FILLED)	PART B (PARTIALLY FILLED)	YIELD (MIXED)
Large Kit	1 - 6 gallon pail	1 - 3 gallon pail	5 gallons (18.9 L)
Small Kit	1 - 1 gallon can	1 - 1 gallon can	1 gallon (3.79 L)

### 2.5.3 SERIES 141 COVERAGE RATES (THEORETICAL)

	DRY MILS	WET MILS	SQ.FT./GAL (M <sup>2</sup> /GAL)
Minimum	4.0 (100)	5.0 (125)	329 (30.5)
Maximum	18.0 (455)	22.00 (560)	73 (6.8)

**Note:** Maximum DFT of 18.0 mils in one coat. **Maximum total dry film thickness for NSF exposure is 18.0 mils.** Allow for overspray and surface irregularities. Wet film thickness is rounded to the nearest 0.5 mil or 5 microns. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance.

## 3.0 STEEL SURFACE PREPARATION

### 3.1 NEW CONSTRUCTION

All surfaces should be completely free of oil, grease and other

surface contaminants prior to abrasive blasting. Oil and grease should be removed by scraping off heavy deposits and cleaning with suitable solvents, emulsion cleaners, steam or a hot biodegradable alkaline detergent solution followed by a water rinse.

It should be noted that organic solvents may not remove water soluble contaminants such as acid and alkali salts. Such contaminants should be removed using water and/or water-based cleansing agents Reference SSPC-SP COM, Surface Preparation Commentary for Steel and Concrete Substrates.

### 3.2 WELDS

All welds should be clean and free of spatter, slag or sharp projections. Grind all welds to a smooth, rounded surface free of sharp edges, pinholes, undercuts, recesses and other irregularities.

All welds should be continuous. Skip or intermittent welds will be made continuous by welding. All lap joints and inside corners should receive a continuous fillet weld. All internal bracing, reinforcement and miscellaneous steel with open ends should be capped and seal-welded.

Round all sharp edges to a 1/8" minimum radius or greater by grinding, filing or mechanical sanding. Care should be exercised during this task to ensure that new, sharp edges are not created. All surfaces should be clean and dry before proceeding with work. (Reference NACE SP0178, Surface Finishing of Welds Prior to Coating).

### 3.3 EXISTING SURFACES

Unlined tanks or previously-lined tanks require checking for contaminant presence and complete removal prior to abrasive blasting. Water soluble contaminants such as chlorides, sulfates, acids, alkalis, etc. are not readily visible when present in small quantities on the surface of the metal. These surface contaminants can be embedded into blast profile if not removed and cause extensive, persistent corrosion and blistering under the protective coating system. For proper identification procedures and removal methods, contact Tnemec Company, Inc.

### 3.4 PREPARATION OF STEEL - ABRASIVE CLEANING

All steel surfaces to receive Tnemec's Epoxoline in immersion service should be abrasive blasted to a near -white metal cleanliness in accordance with SSPC-SP10/NACE 2 Near-White Metal Blast Cleaning. A minimum 2.0 mil anchor pattern is required.

For non-immersion service, steel surfaces should be abrasive blasted to a SSPC-SP6/NACE 3 Commercial Blast Cleaning. A minimum 2.0 mil anchor pattern is required. Note: Abrasive blast cleaning generally produces the best coating performance. If conditions will not permit this, Series 141 may be applied to SSPC-SP2 or SP3 Hand or Power Tool Cleaned surfaces.

The abrasive used should be clean, dry, bagged material that has a hard, angular cutting surface, such as aluminum oxide. Abrasive materials should be selected to produce the required 2.0 mils minimum anchor pattern and no evidence of a polished or peened surface will be accepted. Depth of anchor pattern is suggested to be measured by using Testex-Replica profile tape prior to the application of the prime coat. Profile readings should be recorded on Testex-Replica tape and retained by the applicator for verification as part of the Quality Assurance file (reference NACE RP0287).

The compressed air used for blasting should be free of water and oil. Adequate traps and separators should be used to ensure elimination of all contaminants. Cleanliness of the air supply may be checked by operating the line without abrasive media through a clean white cloth for 20 seconds. If oil or water appear on the cloth, the traps and separators should be cleaned until subsequent 20 second tests prove satisfactory (reference ASTM D4285).

Blasting should not be performed when the surface temperature is less than 5°F above the dew point to prevent the formation of rust bloom. Dew point and surface temperature readings should be taken prior to blasting to ensure this condition. In addition, application of the prime coat should be scheduled so as to immediately follow blasting and cleaning operations. Painting over flash rust or other contaminants is not acceptable. Care should be exercised by all personnel to avoid hand or clothing contamination of the freshly-blasted surface.

Dust and blast products should be removed from the surface of abrasive blasted steel by high-pressure air, vacuum cleaning or brushing.

### 3.5 SURFACE IMPERFECTIONS

Abrasive blasting may expose surface imperfections in steel surfaces that may previously have gone unnoticed. If practical, these imperfections must be repaired immediately and blasted to duplicate the surrounding area. If immediate repair is not feasible (due to loss of blast), the affected area is to be masked off and repaired following application of the first coat. If welding is involved in the repair procedure, the masked area must measure 6" in any direction from the weld. The edges of all masked repair areas should be feathered using an abrasive cloth or wheel. Prepare the repaired area for coating using the surface preparation procedures for steel outlined previously in Sections 3 and 4. Any contamination resulting from the repair must be removed by solvent wiping prior to abrasive blasting.

A record should be kept of all repaired areas using a coordinate system. The repaired area must be spot-blasted and remain free of voids, undercutting and weld spatter and exhibit a minimum 2.0 mil anchor pattern.

## 4.0 CONCRETE SURFACE PREPARATION

### 4.1 NEW CONSTRUCTION

Allow new cast-in-place concrete to cure a minimum of 28 days at 75°F (24°C). Verify concrete dryness in accordance with ATSM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride" (moisture vapor transmission should not exceed three pounds per 1,000 square feet in a 24 hour period), F 2170 "Standard Test Method for Determining Relative Humidity in Concrete using situ Probes" (relative humidity should not exceed 80%), or D 4263 "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method" (no moisture present).

### 4.2 EXISTING SURFACES

The concrete should be inspected for porosity, exposed aggregate, cracks, laitance and surface contaminants. Removal of chemical contaminants must be accomplished before any other surface preparation takes place.

Chemically-contaminated concrete must be neutralized before coating. If the surface is acidic, salt formation will take place;

these salts should be mechanically removed by abrasive blasting to sound concrete. If contaminated with alkalis, concrete must be cleaned with steam or with hot detergent wash. Solvents can be utilized to remove oil and grease from the surface. All surfaces should be clean and dry before proceeding with work (reference SSPC-SP13/NACE 6). For specific detection and additional information, contact Tnemec Company, Inc.

### 4.3 ABRASIVE CLEANING

Abrasive blast or mechanically abrade to remove laitance, form release agents, curing compounds, sealers and other contaminants and to provide a minimum surface profile, reference SSPC-SP13/NACE 6, ICRI-CSP 3. Blasting must be performed sufficiently close to the surface to open up surface voids, bugholes, air pockets and other subsurface irregularities. Dry, oil-free air must be used for the blasting operation (reference ASTM D4285).

Large voids, bugholes and other cavities should be filled with the recommended filler or surfercer.

After blast cleaning, residual abrasive, dust and other loose particles must be removed from the surface by vacuuming or blowing off with clean, dry compressed high-pressure air.

### 4.4 SURFACE IMPERFECTIONS

All concrete surfaces should be filled and sealed prior to application of the Series 141 Epoxoline system.

### 4.5 OUTGASSING

Outgassing must always be considered a possibility with any concrete substrate. A number of means exist to either eliminate or reduce out-gassing. First, application should be accomplished during times when the surface temperature of the concrete is stable or in a descending pattern. In addition, use of primers and surfacing agents can help reduce out-gassing. Series 218-1000 MortarClad was specifically designed to minimize this problem.

## 5.0 MIXING

### 5.1 SERIES 141 MIXING

Tnemec's Epoxoline materials are supplied in one-gallon and five-gallon kits. Mix the entire contents of Part A and Part B separately. Scrape all of the Part B into the Part A pail by using a flexible spatula. Use a variable speed drill with a PS Jiffy blade and mix the blended components for a minimum of two minutes. Apply the mixed material within pot life limits after agitation. Both components must be above 50°F (10°C) prior to mixing. For optimum application properties, the material temperature should be above 60°F (16°C). For applications to surfaces between 35°F to 50°F (2°C to 10°C) allow mixed material to stand 30 minutes and restir before use. Note: A large volume of material will set up quickly if not applied or lessened in mass. **Caution:** Do not reseal mixed material. An explosion hazard may be created.

### 5.2 SERIES 218-1000 MIXING

Mix entire kits as supplied. For smaller applications, smaller kits are available. **Note:** Mixing less than a full kit can result in miscatalization, improper film build and variant cure times. The aggregate for Series 218-1000 is supplied by weight, not by volume, so determining proper portions can be extremely difficult. **IMPORTANT:** Do not split kits.

Pour Part B liquid into a clean empty pail large enough to hold all components. Under agitation slowly add Part A liquid. When blended, slowly sift Part C powder while continuing agitation. Do not dump all of the Part C into the liquids at one time. Mix for two minutes or until the cement-sand is thoroughly wetted and a smooth consistency is obtained.

### 5.3 SERIES 217 MIXING

Refer to the Series 217 Surface Preparation and Application guide for complete mixing instructions.

## 6.0 APPLICATION

### 6.1 STEEL SURFACES

Welds, seams and repaired areas should be given an initial brush coat prior to a full spray application of the first coat to work the material into the surface. This should also apply to all areas inaccessible by spray gun and as necessary to achieve the specified dry film thickness and a surface free of imperfections.

Series 141 should be applied to all properly prepared surfaces with a total dry film thickness of 4.0 to 18.0 mils in one coat.

### 6.2 CONCRETE SURFACES

Series 141 is recommended for protection of concrete subject to splash, spillage and fume exposure of certain chemicals as well as water storage.

Recommendations are limited depending on the chemical nature of the immersion liquid. Concrete is highly reactive to acids and other strong chemicals, therefore a pinhole-free system is required to provide protection of the concrete substrate.

Series 218-1000 and Series 217 may be used to fill all voids and/or surface imperfections in the concrete substrate prior to the application of Series 141 Epoxoline.

### 6.3 APPLICATION OF SERIES 218-1000 MORTARCLAD

Stiff, steel, concrete finishing trowels, broad knives and rubber floats are recommended.

Maximum performance is obtained when Series 218-1000 MortarClad is applied to form a continuous, void-free film. When used as a surfacer, apply with a rubber float or trowel. Care should be taken to assure material is forced into and fills voids and surface irregularities. When used as a filler, remove excess Series 218-1000 before the material sets up by striking off with a metal straight edge or rubber float, leaving the material flush with the surface.

### 6.4 APPLICATION OF SERIES 217 MORTARCRETE

Hand troweling can be accomplished using steel concrete finish trowels, broad knives, rubber & wooden floats. Reference the Series 217 Surface Preparation and Application Guide for more details.

## 7.0 APPLICATION EQUIPMENT

### 7.1 SERIES 141 SUGGESTED EQUIPMENT OR EQUAL

GUN	DeVilbiss JGA
FLUID TIP	E
AIR CAP	765 or 704

AIR HOSE ID	5/16" OR 3/8" (7.9 or 9.5 mm)
MAT'L HOSE ID	3/8" OR 1/2" (9.5 OR 12.7 mm)
ATOMIZING PRESSURE	75 - 100 psi (5.2 - 69 bar)
POT PRESSURE	10 - 20 psi (0.7 - 1.4 bar)

Low temperatures or longer hoses require higher pot pressure. Do not store at temperatures below 20°F or above 110°F.

**Airless Spray:** Use appropriate tip and atomizing pressure for equipment, applicator technique and weather conditions.

TIP ORIFICE	0.17" - 0.21" (430 - 535 microns)
ATOMIZING PRESSURE	3000 - 3800 psi (207 -262 bar)
MAT'L HOSE ID	1/4" OR 3/8" (6.4 mm or 9.5 mm)
MANIFOLD FILTER	60 mesh (250 microns)

**Spray Recommendations:** Material should be spray-applied in a (cross-hatch) multi-pass system with 50% overlap between passes.

**Roller:** Roller application optional when environmental restrictions do not allow spraying. Use 3/8" or 1/2" (9.5 mm to 12.7 mm) synthetic woven nap cover.

**Brush:** Recommended for small areas only. Use high quality natural or synthetic bristle brushes.

### 7.2 SERIES 141 POT LIFE

TEMPERATURE	POT LIFE
77°F (21°C)	2 Hours
90°F (32°C)	1 Hour

### 7.3 SERIES 141 SPRAY LIFE

TEMPERATURE	POT LIFE
77°F (21°C)	1 Hour
90°F (32°C)	30 Minutes

## 8.0 APPLICATION TEMPERATURES

Under strictly controlled environmental conditions, Series 141 may be used as an interior holding primer underneath Series 335 or certain Tank Armor products when temperatures drop below 55°F (13°C). **IMPORTANT:** During Series 141's period of cure, based on temperatures listed on the Product Data Sheet, the climate must be kept at a constant temperature and humidity, otherwise, adhesion of subsequent coats may be adversely affected.

Surface and ambient conditions should be a minimum of 35°F (2°C) and a maximum of 135°F (57°C). The surface should be dry and at least 5°F above the dew point.

## 9.0 INSPECTION

### 9.1 BLAST PROFILE

Degree of surface cleanliness and blast profile of steel surfaces should conform to specifications detailed in Section 3 - Surface Preparation of Steel. Reference SSPC or NACE visual standards and consult Testex tape records of anchor pattern for verification.

## 9.2 WET FILM THICKNESS MEASUREMENT

Wet film thickness readings for successive coats should be taken as soon as possible at a frequency of at least one per 100 sq. ft. and should be taken so as to avoid surface irregularities that could distort the readings. Readings on corners and in areas of intricate geometry should be taken every 10 sq. ft. to ensure proper wet coverage.

## 9.3 DRY FILM THICKNESS MEASUREMENT (STEEL)

Dry film thickness readings of steel surfaces should be taken prior to the application of successive coats with a nondestructive, magnetic-type gauge in accordance with SSPC-PA-2. Corners and areas of intricate geometry will require more frequent readings. All measurements should be recorded and retained in the job file for later verification.

## 10.0 REPAIR

Where imperfections, discontinuities or surface defects are present, or if a coating is damaged during inspection, the area in question should be masked and mechanically abraded to provide a consistent finish. Application of an additional brush coat may be necessary.

If film defects are suspected to involve a significant void or holiday, or if the film has been damaged to the substrate, contact your Tnemec representative or call Tnemec Technical Service at 1-800-TNEMEC1 for specific recommendations.

## 11.0 HEALTH & SAFETY

Series 141 is for Industrial use only and must be installed by qualified coating and lining application specialists only. Paint products contain chemical ingredients which are considered hazardous. Read container label warning and Material Safety Data Sheet for important health and safety information prior to the use of this product. Keep out of the reach of children.

More detailed health and safety requirements for Series 141 are available in the Safety Data Sheet. Contact your local Tnemec representative for more information.