SERIES 436
PERMA-SHIELD® FR

SURFACE PREPARATION & APPLICATION GUIDE

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1.0 INTRODUCTION

The purpose of this guide is to acquaint applicators with the basic information necessary for properly ordering, storing and installing Tnemec's Series 436 Perma-Shield FR epoxy wastewater system. 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.

Also, reference the project specifications and compare them with this guide and the product data sheet. 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 sheet, please contact your Tnemec representative or call 1-800-TNEMEC1 for assistance.

2.0 PRODUCT AND PACKAGING

The following contains information on the core components of this product.

2.1 SERIES 436 PERMA-SHIELD FR

Series 436 Perma-Shield FR is a fiber-reinforced, modified polyamine epoxy. A thick film, 100% solids, spray-applied, abrasion-resistant coating designed for wastewater immersion and fume environments. It provides excellent resistance to H_2S gas permeation, protects against MIC and provides chemical resistance to severe wastewater environments. Fiber-reinforcement provides superior physical strength and higher film build.

2.2 SERIES 436 PACKAGING

KIT SIZE	PART A (PARTIALLY FILLED)	PART B (PARTIALLY FILLED)	YIELD (MIXED)
Small Kit	1 gal. can	1 gal. can	1.0 gal. (3.78 L)
Medium Kit	6 gal. pail	3 gal. pail	5.0 gal. (18.9 L)

2.3 SERIES 436 COVERAGE RATES

	Dry Mils (Microns)	Wet Mils (Microns)	Sq. Ft./Gal. (m^2/gal.)
Minimum	50.0 (1270)	50.0 (1270)	32 (3.0)
Maximum	125.0 (3175)	125.0 (3175)	13 (1.2)

Note: Recommended DFT will depend on substrate condition and system design. Refer to Recommended DFT section on page 1 of the product data sheet. Allow for overspray and surface irregularities. Film thickness is rounded to the nearest 0.5 mil or 5 microns and can be achieved in one or two coats. Application of coating below minimum or above maximum recommended dry film thickness may adversely affect coating performance.

2.4 SERIES 436 STORAGE AND MATERIAL TEMPERATURE

Minimum storage temperature is 40°F (4°C) and maximum is 110°F (43°C). For optimal handling and application characteristics, both material components should be stored or conditioned between 70°F (21°C) to 80°F (27°C) 48 hours prior to use.

Temperature will affect the workability. Cool temperatures increase viscosity and decrease workability. Warm temperatures will decrease viscosity and shorten pot life.

3.0 SURFACE PREPARATION

3.1 PREPARATION OF EMBEDDED MISCELLANEOUS METALS

When encountering miscellaneous metals embedded into concrete, the surface must be prepared in accordance with SSPC-SP5/NACE 1 White Metal Blast Cleaning with a 3.0 mil minimum angular anchor profile.

3.2 PREPARATION OF CONCRETE

Allow new cast-in-place concrete to cure a minimum of 28 days at 75°F (24°C). Verify concrete dryness and prepare concrete surfaces in accordance with NACE No. 6/SSPC-SP13 Joint Surface Preparation Standards and ICRI Technical Guidelines. Moisture vapor transmission should not exceed three lbs per 1,000 sq ft in a 24 hour period. (Reference ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.") Relative humidity should not exceed 80%. (Reference ASTM F 2170 "Standard Test Method for Determining Relative Humidity in Concrete using in situ Probes.") Abrasive blast, shot-blast or mechanically abrade concrete surfaces to remove laitance, curing compounds, hardeners, sealers and other contaminants and to provide a minimum ICRI-CSP 5 or greater surface profile. Large cracks, voids and other surface imperfections should be filled with a recommended filler or surfacer.

3.3 REINFORCING STEEL REPAIR

Where corrosion of the reinforcement steel (rebar) exists, continue concrete removal along the corroded steel and any adjacent areas which show evidence of corrosion-induced damage that would inhibit bonding of repair material. When the exposed reinforcing steel has loose rust, corrosion products, or is not well bonded to the surrounding concrete, removal should include undercutting the corroded reinforcing steel by approximately ¾ in (19 mm) in accordance with ICRI Guideline No. 310.1R. Every precaution should be made to avoid cutting underlying reinforcement. All

exposed reinforcement surfaces shall be thoroughly cleaned of all loose concrete, rust, and other contaminants. A protective coating such as Series 1 or N69 can be applied to the reinforcement after surface preparation. Avoid spillage or application onto the parent concrete. The area around the rebar may then be rebuilt using Series 218 MortarClad, or in more extreme cases, Series 217 MortarCrete.

3.4 OUTGASSING

Outgassing must always be considered a possibility with any concrete substrate. A number of means exist to either eliminate or reduce outgassing. First, application should be accomplished in indirect sunlight and during times when the surface temperature of the concrete is stable or in a descending pattern. In addition, use of primers and resurfacing agents can help reduce outgassing. Series 218 MortarClad was specifically designed, and is the preferred method, to minimize this problem. Outgassing may also be minimized when using Series 436 Perma-Shield FR direct to concrete by spray applying a "mist coat" and allowing the concrete to outgas for several minutes. This should be followed by another light tack coat.

3.5 TERMINATIONS

When the coating system is not scheduled to provide a monolithic surface, terminations must be built into the system. For example, when the system is scheduled to terminate, saw cuts must be installed. Apply Series 218 up to sawcuts, then install the Perma-Shield lining system into the saw cut. Please refer to the Perma-Shield Detail Guides which can be found online at www.tnemec.com.

4.0 RESURFACING/PATCHING

For information regarding the resurfacing or patching of deteriorated concrete surfaces please refer to the Series 215, 217, or 218 product data sheets or application guides.

5.0 MIXING

Mix the entire contents of Part A and Part B separately. Scrape all of the Part B into the Part A by using a flexible spatula. **Note:** The small kit will require the use of a separate container large enough to hold both components. Use a variable speed drill with a PS Jiffy blade and mix the blended components for a minimum of two minutes. During the mixing process, scrape the sides and bottom of the container to ensure all of Parts A and B are blended together. Apply the mixed material within pot life limits after agitation. Mixing ratio is one to one by volume. **Note:** A large volume of material will set up quickly if not applied or reduced in volume.

Caution: Do not reseal mixed material. An explosion hazard may be created. Do not attempt to split kits.

5.1 SURFACE TEMPERATURE - SERIES 436

Minimum of 50°F (10°C), optimum 65°F (18°C) to 80°F (27°C), maximum of 130°F (54°C). The substrate temperature should be at least 5°F (3°C) above dew point.

5.2 POT LIFE/SPRAY LIFE - SERIES 436

POT LIFE - SERIES 436

15-20 minutes	80°F (27°C)
25-30 minutes	70°F (21°C)

Material, equipment and ambient temperatures above 80°F (27°C) will significantly reduce the spray and pot life.

SPRAY LIFE - SERIES 436

5-10 minutes	80°F (27°C)
15-20 minutes	70°F (21°C)

6.0 CURING SCHEDULE

Temperature	75°F (24°C)	55°F (13°C)
To Touch	3 hours	7 hours
Dry Through	14 hours	30 hours
To Place in Service	2 days	3 days
Maximum Recoat	7 days	7 days

Note: If more than 7 days have elapsed between coats, the Series 436 coated surface must be mechanically abraded before topcoating. Curing time will vary with surface temperature, air movement, humidity and film thickness.

7.0 APPLICATION & EQUIPMENT

Application of Series 436 Perma-Shield FR is as follows:

AIRLESS SPRAY

Pump Size	45:1, 56:1, X50 or X60
Gun	Graco XHF, XTR-7 or WIWA 500F
Tip Orifice	0.045" - 0.051" H.D. (1143 - 1295 microns)
Atomizing Pressure	4000 - 4500 psi (276 - 310 bar)
Mat'l Hose ID	Attach (1) 25' x 3/4" hose to the pump Attach (1) 25' x 1/2" hose to the 3/4" line
Whip Line ID	Attach (1) 6-10' x 3/8" hose to the 1/2" line & gun
Manifold Filter	N/R

Note: Graco H.D. RAC Housing/Guard assembly and H.D. tip sizes ranging from 0.045" to 0.051" should be used. Material needs to be gravity fed through an attached material hopper. Material will not feed through a suction tube. Contact Tnemec Technical Service for more information.

Brush or Trowel: Recommended for small areas only.

7.1 PUMP MAINTENANCE

After every 20 to 25 gallons or as needed, the pump should be flushed with MEK. This is accomplished in two stages. First, MEK (either new or filtered) is recirculated through the pump for five minutes through a filter bag. Then a second flush is done, again for five minutes, this time using only fresh MEK. (This MEK can be used for the first flush of the next flush cycle). This cycle is repeated every 20 to 25 gallons, or as needed. It should be noted that the amount of flushing needed is dependent on temperatures

and extended spray times.
After the end of a work shift, the pump is flushed as stated above. This time, after the second flush, the lower end of the pump is disassembled and thoroughly cleaned to remove all traces of coating material.

It should be noted that the amount of flushing needed is dependent on temperatures and extended spray times. Contact Tnemec Technical Services for detailed equipment recommendations.

8.0 SERIES 435 PERMA-GLAZE - (OPTIONAL TOPCOAT)

Series 435 Perma-Glaze is a 100% solids, modified polyamine epoxy designed for outstanding H_2S permeation resistance and is used as a glaze coat to prolong the service life of the Perma-Shield FR System. It is applied with a 3/8" - 1/2" high quality, synthetic, woven nap roller to a finished thickness of approximately 15 to 20 mils DFT. Refer to the Tnemec Series 435 Surface Preparation and Application Guide and Product Data Sheet for further instructions.

9.0 HIGH VOLTAGE DISCONTINUITY (SPARK) TESTING

High voltage discontinuity (spark) testing is recommended to determine the presence and number of discontinuities in the nonconductive Series 436 Perma-Shield FR or Series 435 Perma-Glaze applied to a conductive surface.

All high voltage discontinuity (spark) testing shall be performed in accordance with NACE SP0188 and the procedures outlined herein.

Series 436 Perma-Shield FR and Series 435 Perma-Glaze (if applicable) shall be applied and allowed to cure within the parameters of the corresponding Product Data Sheets. Sufficient curing time of the coating system shall be allowed prior to conducting a holiday test, as indicated by the "To Place in Service" duration on the Product Data Sheets. Curing time will vary with surface temperature, air movement, humidity, and film thickness.

If the substrate is incompatible or if thickness constraints are not applicable for a non-destructive dry film thickness gauge, measurements of the coating system thickness are to be performed during application of each system component using a wet film gauge, feeler gauge, or other measurement device that can accurately measure the coating wet film thickness. These coating measurements are to be tabulated to determine the total system thickness.

All high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor model AP/W Holiday Detector. Refer to the following chart for appropriate voltage based on coating system thickness.

To perform holiday testing, attach a ground wire from the instrument ground output terminal to the conductive substrate and ensure proper electrical contact. Test conductivity by attaching the instrument ground wire to rebar or other metallic ground permanently installed in the concrete and touch the electrode to the bare concrete. If metallic ground is not visible, the ground wire can be placed directly against a bare concrete surface and weighted with a damp cloth and sand-filled bag. Make contact with the exploring electrode on the conductive substrate to verify the instrument is properly grounded. If the test proves negative, determining discontinuities with a high voltage spark test will be ineffective. Under no circumstances shall the voltage be increased above the recommended voltage potential.

RECOMMENDED VOLTAGES FOR HIGH VOLTAGE SPARK TESTING WITH TINKER & RASOR MODEL AP/W

Total Dry Film Thickness (mils)	Voltages (V)
20-24	2,500
25-29	3,000
30-39	3,500
40-47	5,000
48-59	6,000
60-69	7,500
70-79	8,500
80-99	10,000
100-124	12,500
125-134	15,000
135-159	16,000
160-174	17,500
175-214	20,000
215-269	27,000
270-299	31,000
300-350	35,000

Holiday testing of repaired areas shall be performed using same testing procedures as outlined above. If utilizing alternative high voltage DC holiday detectors, never exceed the recommended 100-125 volts DC per mil or contact Tnemec Technical Services for recommended voltage settings. Excessive voltage may produce a holiday in the coating film.