SERIES 434
PERMA-SHIELD® H_2S

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 434 Perma-Shield H_2S epoxy mortar 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.

Please review all pertinent product data sheets as well as the Perma-Shield Standard Details Guide which can be found online at www.tnemec.com. 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 434 PERMA-SHIELD H_2S

Series 434 Perma-Shield H_2S is an aggregate-reinforced, 100% solids hybrid epoxy mortar. This product is designed for severe wastewater immersion and fume environments. Specifically formulated to withstand high levels of hydrogen sulfide gas (H_2S), sulfuric acid (H_2SO_4), as well as other gases common to sewer exposures. The aggregate reinforcement provides additional resistance to abrasion and impacts.

2.2 SERIES 434 PACKAGING

KIT SIZE	PART A (PARTIALLY FILLED)	PART B (PARTIALLY FILLED)	PART C (AGGREGATE)	YIELD (MIXED)
Small Kit	1 gallon can	1 gallon can	One bag with premeasured aggregate	2.5 gal. (9.5 L)
Large Kit	6 gallon pail	3 gallon pail	One bag with premeasured aggregate	5.0 gal. (18.9 L)

2.3 SERIES 434 COVERAGE RATES

	Small Kit (2.5 gal.) (Approximately)	Large Kit (5.035 gal.) (Approximately)
At 1/8" (3.2mm)	32 sq. ft. (3.0 m^2)	64 sq. ft. (6.0 m^2)

Note: Application of coating below minimum recommended dry film thickness may adversely affect coating performance.

2.4 SERIES 434 STORAGE AND MATERIAL TEMPERATURE

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

Temperature will affect the workability. Cool temperatures will increase viscosity and decrease workability. Warm temperatures will decrease viscosity and shorten spray and 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 4.0 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.

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 sawcuts must be installed. Apply Series 218 up to sawcuts then install the Perma-Shield lining system into the sawcut. Please refer to the Perma-Shield Details Guide 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 entire contents of Part A and Part B separately. Add the contents of the can marked Part B to Part A and blend both components using a minimum of 10 amp, 3/4" heavy duty drill with an "H" paddle drywall mixing blade (i.e., M713 mixing paddle) for one minute. Gradually add all the Part C aggregate to the liquid mix while under agitation and blend for another one to two minutes or until a uniform consistency is achieved. During the mixing process, scrape the sides and bottom of the container to ensure all of the Parts A, B, and C are blended together. **Caution: Do not split kit, mix the entire kit as supplied. Do not reseal mixed material. An explosion hazard may be created.**

5.1 SURFACE TEMPERATURE - SERIES 434

Minimum of 50˚F (10˚C) Maximum of 130˚F (54˚C)
The surface should be dry and at least 5˚F (3˚C) above the dew point.

6.0 CURING SCHEDULE

Temperature	75°F (24°C)	55°F (13°C)
To Topcoat	8 hours	12 hours
To Place	2 days	3 days
Maximum Recoat	7 days	7 days

Curing time will vary with surface temperature, air movement, humidity and film thickness. **Note:** If more than 7 days have elapsed between coats, the Series 434 coated surface must be mechanically abraded before topcoating.

7.0 APPLICATION & EQUIPMENT

The following contains information on the recommended application methods and equipment.

7.1 WORKING TIME

The recommended working time for Series 434 is 30 minutes at 77°F (25°C).

7.2 TROWEL APPLICATION

Once the surface has been properly prepared, Series 434 Perma-Shield H_2S may then be applied using hand trowels and mortar hawks. Material is applied by trowel and worked to cover the surface in an even, minimum 1/8" (125 mils) thickness. Skilled technicians are required for the application of Series 434.

Care should be taken to not overwork the material. After mixing and during initial set times, the material can be very sticky. Overworking will tear the material apart (increasing shear forces), resulting in voids and crevices in the cured coating. It is recommended that the material be pulled either up, down or sideways, but not swirled as in concrete or masonry applications.

Once the material is placed and roughly smoothed out, it should be allowed to set for 20 minutes at 75°F (24°C). This will vary with ambient and substrate temperatures, so attention must be paid to the cure process. Once the material assumes a dough-like consistency, the Series 434 Perma-Shield H_2S epoxy mortar is to be closed using a 1/4" roller cover lightly dampened with Tnemec No. 2 or No. 42 Thinner. Lightly roll the trowelled surface to remove trowel marks and surface irregularities.

Note: Hand trowel application can present difficulties when applying material to ceilings and other overhead structures, and two lifts may be required.

7.3 SPRAY APPLICATION

Application of Series 434 Perma-Shield H_2S can proceed more rapidly when applying material by spray. However spray applying should only be considered a means of transfer, trowelling and backrolling is required to close the surface in order to attain the maximum performance characteristics.

The pump used for this application is an 12:1 ratio WIWA 600 or 9:1 WIWA 410 pump. Material is transferred to the gun via a 25', 1" hose. The pump should be configured with a 10', 3/4" 1200 psi rated whip, along with a pole gun assembly and a 1/4" - 3/8" tip.

The primary purpose of the pump is to transfer material, as complete atomization is not required. Once the material leaves the gun, air pressure is used to spatter the material onto the surface.

The system uses a pole gun for delivery of material. The gun is similar to those used in applying gypsum-based fireproofing. At the gun there are two valves, one for material and one for air. Minor adjustments will need to be made to find the correct amount of material and air for the particular application crew. Spraying should only be considered as a means to transfer material to the surface. Material must then be hand troweled followed by back rolling. Consult Tnemec Technical Services for detailed equipment recommendations.

7.4 PUMP MAINTENANCE

After every three to five kits, the equipment should be flushed with MEK. This is accomplished in two stages. First, MEK (either new or filtered) is run through the pump for five minutes. 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 three to five kits.

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. Once cleaned, the pump is reassembled and can be placed back into operation.

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 H_2S System. It is applied with a 3/8" - 1/2" high quality, synthetic, woven nap roller or airless spray equipment. 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 434 Perma-Shield H_2S 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 434 Perma-Shield H_2S 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 paper 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

Total Dry Film Thickness (mils)	Voltages (V)
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 the 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.