TNEMEC

PRODUCT DATA SHEET

PERMA-SHIELD® PL SERIES 431

PRODUCT PROFILE

GENERIC DESCRIPTION Modified Polyamine Ceramic Epoxy

COMMON USAGE A 100% solids, abrasion-resistant lining specifically designed for wastewater immersion and fume environments and exposure to corrosive soils. Provides low permeation to H_2S gas, protects against MIC and provides chemical resistance to steel, ductile iron pipe and fittings for severe wastewater or buried exposures. A coal-tar free, resin-rich formulation with low pigment volume concentration (PVC) for maximum performance.

COLORS 5024 Sewer Pipe Green. **Note:** Epoxies chalk with extended exposure to sunlight.

FINISH Gloss

SPECIAL QUALIFICATIONS Contains 20% ceramic microspheres for increased abrasion resistance. Compatible with high-velocity jet sewer cleaning (hydrocleaning) with 0-degree tips (Reference Technical Bulletin No. 11-86).
Meets the performance requirements of AWWA C 210 (not for potable water contact).

COATING SYSTEM

PRIMERS Self-priming, Series N69 or Series N140. **Note:** Series 431 must be applied to Series N69 or N140 within 7 days. Scarify the surface with fine abrasive before topcoating if exceeding this maximum recoat window.

SURFACE PREPARATION

Prepare surfaces by method suitable for exposure and service.

STEEL **Wastewater Service:** SSPC-SP5/NACE 1 White Metal Blast Cleaning or ISO Sa 3 Blast Cleaning to Visually Clean Steel with a minimum angular anchor profile of 3.0 mil (76.2 microns).
Raw water or Buried Service: SSPC-SP10/NACE 2 Near-White Blast Cleaning or ISO Sa 2 1/2 Very Thorough Blast Cleaning with a minimum angular anchor profile of 3.0 mils (76.2 microns).

DUCTILE IRON All surfaces of ductile iron pipe and fittings shall be delivered to the application facility free of asphalt or any other protective lining on the interior surface. All oils, small deposits of asphalt paint, grease, and soluble deposits shall be removed in accordance with NAPF 500-03-01 Solvent Cleaning prior to abrasive blasting.
Pipe Interior: Uniformly rotary-abrasive blast using angular abrasive to a NAPF 500-03-04: Internal Pipe Surface condition, full removal of annealing oxide layer. When viewed without magnification, the interior surfaces shall be free of all visible dirt, dust, annealing oxide, rust, mold coating and other foreign matter. Random staining shall be limited to no more than 5 percent and may consist of light shadows, rust stains, oxide stains, or stains of previously applied coating. Any area where rust reappears before application shall be reblasted. The surface shall contain a minimum angular anchor profile of 3.0 mils (76.2 microns) (Reference NACE RP0287 or ASTM D 4417, Method C).
Pipe Exterior: Uniformly abrasive blast the entire surface using angular abrasive to an NAPF 500-03-04: External Pipe Surface Condition. When viewed without magnification, the exterior surfaces shall be free of all visible dirt, dust, loose annealing oxide, mold coating, rust and other foreign matter. Tightly adherent annealing oxide and rust staining may remain on the surface provided they cannot be removed by lifting with a dully putty knife. Any area where rust reappears before application shall be reblasted. The surface shall contain a minimum angular anchor profile of 3.0 mils (76.2 microns). The exterior surfaces shall be primed with recommended epoxy primer at 3-5 mils (76.2 to 127 microns) dry film thickness.
Fittings: Uniformly abrasive blast using angular abrasive to a NAPF 500-03-05: Fitting Blast Clean #1 condition, no staining. When viewed without magnification, the interior surfaces shall be free of all visible dirt, dust, annealing oxide, rust, mold coating and other foreign matter. Any area where rust reappears before application shall be reblasted. The surface shall contain a minimum angular anchor profile of 3.0 mils (76.2 microns) (Reference NACE RP0287 or ASTM D 4417, Method C).

ALL SURFACES Must be clean, dry and free of oil, grease and other contaminants.

TECHNICAL DATA

VOLUME SOLIDS 100% (mixed)

RECOMMENDED DFT **Carbon Steel:** 30.0 to 50.0 mils (762 to 1270 microns) in one or more coats.
Ductile Iron: 40 mils (1015 microns) (nominal) in one or more coats.
Note: Number of coats and thickness requirements will vary with substrate, application method and exposure. Use Series 44-721 to increase film build. Amounts vary by kit size, refer to the Series 44-721 product data sheet. Contact your Tnemec representative for more information.

CURING TIME

Temperature	Set to Touch	Max. Recoat	To Place in Service
90°F (32°C)	1-2 hours	7 days	24 hours
75°F (24°C)	2-3 hours	7 days	2 days
55°F (13°C)	8-9 hours	7 days	3 days

Note: If more than 7 days have elapsed between coats, the Series 431 coated surface must be mechanically abraded (scarified) before topcoating. Curing time will vary with surface temperature, air movement, humidity and film thickness.

VOLATILE ORGANIC COMPOUNDS EPA Method 24: 0.19 lbs/gallon (23 grams/litre)

HAPS 0.00 lbs/gal solids

THEORETICAL COVERAGE 1,604 mil sq ft/gal (39.4 m²/L at 25 microns). See APPLICATION section for coverage rates.

NUMBER OF COMPONENTS Two: Part A (amine) and Part B (epoxy)

MIXING RATIO By volume: One (Part A) to one (Part B)

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PACKAGING

	PART A (partially filled)	PART B (partially filled)	When Mixed
Drum Sets †	55 gallon drum	55 gallon drum	100 gallons
Large Kit †	5 gallon pail	5 gallon pail	8 gallons (30.28 L)
Small Kit	1 gallon pail	1 gallon pail	1 gallon (3.78L)
Touch-Up Kit †† (1 tube)	4 ounces	4 ounces	8 ounces (236 mL)

† Plural Component application only.
†† Touch-Up Kit consists of one (1) tube along with two (2) disposable static mixers.

NET WEIGHT PER GALLON
9.48 ± 0.25 lbs (4.3 ± .11 kg) (mixed)

STORAGE TEMPERATURE
Minimum 25°F (-4°C) Maximum 110°F (43°C)
For optimal handling and application characteristics both material components should be conditioned to a minimum of 80°F (27°C) or higher 48 hours prior to use.

TEMPERATURE RESISTANCE
(Dry) Continuous 275°F (135°C) Intermittent 300°F (149°C) (Wet) Intermittent 150°F (65°C)

SHELF LIFE
24 months at recommended storage temperature.

FLASH POINT - SETA
Part A: N/A Part B: 200°F (93°C)

HEALTH & SAFETY
This product contains 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.

APPLICATION

COVERAGE RATES
Before commencing, obtain and thoroughly read the Series 431 Surface Preparation and Application Guide.

Dry Mils (Microns)	Wet Mils (Microns)	Sq Ft/Gal (m²/Gal)
30.0 (762)	30.0 (762)	53 (4.9)
40.0 (1016)	40.0 (1016)	40 (3.7)
50.0 (1270)	50.0 (1270)	32 (3.0)

Note: Recommended DFT will depend on substrate condition and system design. Allow for overspray and surface irregularities. Film thickness is rounded to the nearest 0.5 mil or 5 microns. Add Series 44-721 to increase film build. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance.

MIXING
Drum Set: For Plural Component Application. Place band heaters on drums. Remove the lid and insert the mixing blade shaft through the center two-inch bung; reinstall the lid. Mixing blade should be adequately sized to fully agitate material. The material should be 80°F-90°F (27°C-32°C) before the mixing blade is turned on. Insert 5:1 feed pumps into the outside two-inch bung. Place the recirculation line in the 3/4 inch outside bung. Recirculate the material through the primary heaters and heated hose bundle back into the containers. Continue recirculation under agitation until Component A reaches 110°F-120°F (43°C-49°C) and Component B reaches 100°F-110°F (38°C-43°C). Do not exceed 120°F (49°C) for either component. Consult Technical Services for specific details.

Large Kit: For Plural Component Application. Agitate Parts A & B separately making sure no pigment or solids remain on the bottom of the can. **DO NOT MIX PART A WITH PART B.** Use a 1 (Part A amine) to 1 (Part B epoxy) mix ratio heated plural component airless spray unit. **Note:** Product component A (amine) must be heated to 110°F to 120°F (43°C to 49°C) and component B (epoxy) must be heated to 100°F to 110°F (38°C to 43°C) prior to and during plural component application. Do not exceed 120°F (49°C) for either component. Keep containers tightly sealed prior to use. Consult Technical Services for specific details.

Small Kit: Agitate Parts A & B separately ensuring no pigment or solids remain on the bottom of the can. Scrape all of the Part B into Part A can using a flexible spatula. Use a variable speed drill with a PS Jiffy blade ad mix the blended components for a minimum of two minutes. During the mixing process, scrape the sides and bottom of the container to ensure complete blending of materials. Apply the mixed material within 15 to 20 minutes, or before the material reaches 100°F following agitation. **Note:** A large volume of material will gel quickly if not applied or reduced in volume.

Touch-Up Kit: Equipment: A dispensing gun with a thrust ratio of 26:1 is required (F100-TKAP). Material tube must be used in conjunction with provided disposable static mixer in order to ensure proper mixing. **Usage:** Unscrew retaining ring and remove plug. Save plug in case entire tube is not used. Install static mixing element, replace retaining screw ring, and install tube in gun. Point assembly up and slowly pull the trigger to de-air the mixer. Dispense approximately 1 fluid ounce (29.8 mL) of material to waste and continue to pump until material is of uniform color with the Part A completely blended with the Part B. Use a putty knife, brush or spatula to ensure adequate coverage and repair.

THINNING
DO NOT THIN

APPLICATION EQUIPMENT
PLURAL COMPONENT AIRLESS EQUIPMENT. The preferred application method for Series 431 Perma-Shield PL is using plural component equipment. Plural component equipment reduces material waste, solvent consumption and reduces material viscosity. Contact Tnemec Technical Service for complete Series 431 Plural Component Recommendations.

Airless:

Pump Size	Rotary Gun †	Mat'l Hose ID	Manifold Filter
45:1 or 56:1	Model 712-216	3/8" (9.5mm)	30 Mesh

† **Rotary Spray Gun:** Series 431 shall be applied to the interior surfaces of pipe or fittings using a rotary coater pistol spray gun. Spray-Quip (Houston, TX), Model 712-216, or similar rotary lance, to produce a monolithic and level film. Contact Tnemec Technical Services for additional information.

Note: Pump assembly should include a moisture trap and oiler, air regulator with gauge and fluid outlet drain valve and outfitted with a gravity fed material hopper (material will not feed through a suction tube).

Brush: Recommended for bell sockets, spigot ends, and small repairs.

SURFACE TEMPERATURE
Minimum of 50°F (10°C) Maximum of 130°F (54°C).
The surface temperature should be dry and at least 5°F (3°C) above the dew point. The coating will not cure properly below minimum surface temperature.

HOLIDAY TESTING High Voltage Discontinuity (spark) testing shall be performed in accordance with ASTM D 5162 or NACE SP0274 with a minimum voltage setting of 100 to 125 V/mil.

CLEANUP Flush and clean all equipment immediately after use with Tnemec's No. 4 Thinner or MEK.