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80 MIL VINYL ESTER MONOLITHIC HEAVY DUTY LINING SERIES

TECHNI-PLUS VE 81 is a premium novolac vinyl ester, heavy duty corrosion resistant lining system with excellent chemical and wear resistance based on the latest premium vinyl ester technology. VE 81 is formulated with KCC's latest high performance, permeation resistant, 1/8" thick laminar glass flake filled system. VE 81 is trowel applied in two coats in a thickness range of 60 to 80 dry mils. The system may be applied to thicknesses ranging to 125 mils. VE 81 is an ambient cure, and requires no special application equipment. TECHNI-PLUS P 3 Primer is used with VE 81, applied to sandblasted steel at a total of 3 wet mils, for excellent adhesion and resistance to undercutting.

TECHNI-PLUS VE 81 functions as a monolithic tank lining or FGD lining and is designed to withstand a broad range of chemicals including immersion and splash/spillage of acids, alkalis and solvents. TECHNI-PLUS VE 81 functions as an immersion lining designed to withstand a broad range of chemicals in at elevated temperatures to 200°F. (250°F for dry conditions). VE 81 also provides good abrasion resistance to wet particle slurry or dry particle abrasion. The system has short cure time, with only hours between coats. VE 81 is available for full corrosion immersion service after 36 hours @ 75°F cure temperature.

CHEMICAL RESISTANCE¹

Examples of chemical resistance for immersion service are listed. VE 81 is not recommended for high concentrations of Chromic or Nitric acids. Contact KCC Corrosion Control with complete operating service conditions for specific product recommendations.

ACIDS	ALKALINES	SOLVENTS, CHEMICALS
1%-Glacial Acetic	1-29% Ammonium Hydroxide	Acetone (24 hrs)
1-25% Acrylic	Black & White Pulp Liquor	Aniline
1-23% Adipic	1-100% Calcium Hydroxide ²	Benzene
saturated Benzoic	Copper Plating Cyanide	Butyl Acrylate
saturated Boric	Diethanolamine	Carbon Tetrachloride
1-50% Chloroacetic	Dimethylamine	Chlorotoluene
1-10% Chromic	Gold Plating Cyanide	Cyclohexane
1-100% Citric	30% Hydrogen Peroxide	Cyclohexanone
1-50% Hydrobromic	Isopropylamine	Ethanol
1-30% Hydrochloric		Isopropanol
1-20% Hydrofluoric ^{1, 2}	Sodium Bisulfite (saturated)	Jet Fuel
Maleic	1-100% Sodium Chlorate	Kerosene
Nickel Plating	1-50% Sodium Chlorite	Methylene Chloride
1-40% Nitric	1-100% Sodium Sulfite	Methyl Ethyl Ketone (24 hrs)
Oleic	Sodium Peroxide	Naphtha, Aromatic
1-30% Perchloric	1-50% Potassium Hydroxide	ortho- & para-Xylene
100% Propionic	1-15% Sodium Cyanide	5-85% Phenol
1-100% Phosphoric	1-10% Sodium Hydroxide ²	Salt Brine
Stearic	10-50% Sodium Hydroxide	Toluene
1-25% Sulfamic	1-18% Sodium Hypochlorite ³	1,1,1 Trichloroethane
1-75% Sulfuric		Trichloroethylene

MAXIMUM SERVICE TEMPERATURE 250°F Dry, 200°F Immersion. Solvents listed are for Secondary Containment @ ambient temperature up to 72 hours, unless fewer hours are stated above. Mixed solvents or repeated spills must be reviewed by KCC. Contact KCC for specific recommendations to meet your requirements.

¹ FOR SPECIFIC RECOMMENDATIONS CONTACT KCC CORROSION CONTROL CO., LTD.

² FOR LOW CONCENTRATIONS SPECIAL CLEAR COAT REQUIRED.

³ CLEAR COAT REQUIRED GREATER THAN 15%.

TYPICAL PROPERTIES

Solids Content:.....	100% Reactive Vinyl Ester
Volatile Organic Content:.....	0.46 lbs. per gallon
Flash Point: (Pensky-Martens Closed Cup).....	VE 81 Resin> 89°F
	Hardener 2 C (MEKP)> 137°F
Thinner:.....	DO NOT THIN!
Weight per Gallon:.....	10.3 lbs. ± 0.2 Resin and Hardener Mixed
Color:.....	Off White and Gray available to differentiate basecoat and topcoat.

PHYSICAL PROPERTIES OF CURED SYSTEM

Compressive Strength (ASTM C579A-82):	12,000 psi
Flexural Properties (ASTM C580-85):	
Strength:.....	9,500 - 10,000 psi
Modulus of Elasticity:.....	2.0 X 10 ⁶ psi
Tensile Strength (ASTM C307-83):	4,000 psi
Tensile Bond Strength:	1,500 to steel
Taber Abrasion (ASTM D 4060):.....	17 mg. loss/1000 cycles with 1000 gms. CS - 17 Wheel
Water Absorption (ASTM C413-83):.....	+ 0.05 %
Moisture Permeability (ASTM E96-85)	0.0005 Perm Inch.

ESTIMATING, ORDERING AND PACKAGING

- **Estimating and Ordering**
 - Priming Steel with TECHNI-PLUS P 3**
 - 1 gal. unit / 300 sq.ft.
 - 5 gal. unit / 1500 sq.ft.
 - VE 81 Basecoat/ Topcoat Resin & Hardener Units**
 - 14.5 sq. ft/ gallon in range of 60 - 80 mils thick
 - 5 gal. unit / 72.5 sq. ft.
 - 30 gal. unit / 435 sq. ft.
 - Applied at target range of 60 - 80 mils thick

● **Packaging**

TECHNI-PLUS P 3 Primer

1 Gal. Unit	5 Gal. Unit
Resin 8.1 lbs.	Resin 40.5 lbs.
Hardener 2 C 2.0 fl. oz.	Hardener 2 C 10 fl. oz.

VE 81 Basecoat, & Topcoat Resin and Hardener

5 Gal. Unit	30 Gal. Unit
Resin 51.5 lbs.	Resin 309.0 lbs.
Hardener 2 C 12.5 fl. oz.	Hardener 2 C 75.0 fl. oz.

BID SPECIFICATION

Substrate shall be primed with a nominal 3 wet mils of KCC Corrosion Control's TECHNI-PLUS P 3 Primer. The substrate shall be protected with a nominal 60 - 80 mil thickness of KCC Corrosion Control's TECHNI-PLUS VE 81, consisting of two trowel applied coats each 30 - 40 mils thick, and finished with KCC's P/VE Finishing Liquid. The materials shall be applied to substrate prepared in accordance with the manufacturer's specifications.

STORAGE AND SHELF LIFE

TECHNI-PLUS VE 81 components should be stored in a cool dry area and out of direct sunlight. The hardeners are peroxides and should not be stored near amines. The shelf life of the resins and hardeners are:

TYPICAL SHELF LIFE

	P 3	VE 81
Temperature	Months	Months
@ 50°F	5-6 months	3-4 months
@ 75°F	3-5 months	2-3 months
@ 80-90°F	1 month	1 month

INSTALLATION PROCEDURES

The installation procedures in this bulletin will be as specific as possible. If any questions arise after reading this bulletin, please contact KCC Corrosion Control for more specific information.

DO NOT ATTEMPT MATERIAL APPLICATION IF SUBSTRATE TEMP IS WITHIN 5°F OF DEW POINT OR IF RELATIVE HUMIDITY IS GREATER THAN 90%, OR IF SUBSTRATE TEMPERATURE IS LESS THAN 50°F OR HIGHER THAN 120°F.

• **Equipment Design, Fabrication and Surface Preparation**

Whether the vessel is to be protected from the corrosive action of the contents or the contents are to be protected from contamination from the vessel surface, the lining must be continuous. The vessel design must consider the need to eliminate sharp corners, projections, crevices and acute angles and provide access to all surfaces. The design must also minimize movement when in operation.

Steel

External stiffeners and bracing should be used when acceptable. Internal bracing, dividers, nozzle projections, etc. must have continuous welding (no skip welding) with weld rippling, undercutting and weld spatter ground smooth. Edges must be ground to a 1/8" radius. To facilitate the lining application, nozzles should have a large diameter (4" minimum) and short pipe nipple length. Nozzles smaller in diameter or with long pipe nipple lengths should be made of an alloy or utilize a Fiberglass Plastic nozzle insert. Threaded fittings must be avoided or be of an alloy suitable to resist the corrosive contents.

All surfaces to be lined require a white metal blast to SSPC-SP-5 or NACE 1 specification with a blast media that removes all visible mill scale and rust. Performance is directly related to the anchor pattern profile and cleanliness of the steel. For immersion service conditions, highly corrosive environments and thermal shock, the substrate should be clean, dry and have a minimum anchor profile of 3 to 4 mils.

Concrete

TECHNI-PLUS VE 81 is not recommended for use on concrete.

Reference Documents: *National Association of Corrosion Engineers (NACE) Standard RP0178-89, "Fabrication Detail, Surface Finish Requirements, and Proper Design Considerations for Tanks and Vessels to be Lined for Immersion Service".*

Steel Structures Painting Council (SSPC) Volume 1, Chapter 14.2, "The Lining of Steel Tanks".

• **Priming the Substrate**

TECHNI-PLUS P 3 Primer should be used for VE 81. The primer should be applied to the steel substrate to a thickness of 3 wet mils. The primer resin should be mixed thoroughly before the Hardener 2 C is added.

The hardener should be added to the mixed resin and mixed for approximately 2 minutes. The primer can be applied by brush, roller or sprayed. Specific instructions are contained in the TECHNI-PLUS P 3 Primer bulletin.

• **Mixing of Basecoat/Topcoat Materials**

The units of VE 81 should be mixed in a bucket mixer. First the Hardener 2 C should be added to the resin in the pail and mixed approximately 3 - 5 minutes with a bucket type mixer.

It is recommended that a colored dye be added at the rate of 4 oz. gallon of VE 81 for the application of the first coat, so that the second coat is clearly discernable from the first.

• **Working Time**

The working time of the material is mass sensitive, the larger the volume the shorter the pot life. Do not catalyze more material than can be used within the pot life. At ambient temperature above 90°F, best results are obtained when the catalyzed material is poured into smaller containers reducing the mass. When ambient temperatures exceed 80°F the pot life can be extended by cooling the materials. The materials should be stored between 65°F and 75°F for 24 hours prior to use of optimum handling properties.

Working Time of Mixed 1 Gal. Units

@ 50°F	90 min.
@ 75°F	60 min.
@ 90°F	30 min.

• **Application**

The mixed basecoat should be troweled onto the cured P 3 Primer to a target thickness of 40 mils. Thickness should be frequently checked with a wet film thickness gauge.

After application of the first coat, the top surface must be rolled to orient the laminar flakes parallel to the substrate surface, and provide a dense and smooth surface. Rolling liquid is styrene monomer or KCC's P/VE Finishing Liquid.

The topcoat units are the same as the basecoat units and should be mixed in the same manner. The topcoat is also troweled to a target thickness of 40 mils. The surface of the topcoat must also be rolled the same as the basecoats to orient the laminar glass flake system. Styrene monomer or P/VE Finishing Liquid may be used for rolling liquid.

The second coat may be applied in as little as 4 hours when cured at 70°F. The second coat color difference assures complete and uniform thickness and measurement of the second coat versus the first coat.

RECOAT AND TOPCOAT LIMITATIONS

The maximum recoat time when exposed to direct sunlight (ultraviolet light) is 4 hours. This time period can be extended to 7 days by protecting the product from exposure to direct sunlight. The first coat should always be tested for suitability for topcoating by utilizing a styrene sensitivity test. The test is performed by wiping several small areas of the first coat with styrene, waiting until the styrene flashes off (just a minute or two) and then

checking to insure that the first coat surface contacted by styrene is now "tacky" to the touch. If the surface does not become "tacky", the surface must then be roughened or abraded by light abrasive blasting to remove all shiny surfaces of the product, and then, after wiping all dust from the surface, the product is ready for topcoated application. After light roughening of the surface the surface must be topcoated within 3 hours.

• **Clean-Up**

All mixing equipment, rollers and brushes should be cleaned immediately after use. Solvents recommended for clean-up are KCC Corrosion Control's 622 Clean-up Solvent or methyl ethyl ketone. **DO NOT USE ACETONE!**

TIME TO FULL CURE (Note: Substrate temperatures below 50°F will retard curing.)

		Time to Complete Cure
		<i>For minimum chemical service/foot traffic</i>
If substrate is maintained:	@ 50°F.....	24hrs.
	@ 75°F.....	16hrs.
	@ 90°F.....	8hrs.
		<i>For full chemical service/fork lift traffic</i>
If substrate is maintained:	@ 50°F.....	48hrs.
	@ 75°F.....	36hrs.
	@ 90°F.....	24hrs.

CAUTION: Styrene fumes are offensive to personnel and heavier than air, therefore, it is necessary to maintain sufficient ventilation in closed areas to meet OSHA regulations, and to continuously ventilate closed areas such as tanks, pits and trenches to keep the working environment safe, and prevent styrene fumes from being trapped and building up which will prevent the proper cure of the product.

INSPECTION OF FILM INTEGRITY

During installation of the lining, care should be taken to provide for the correct specified uniform thickness of material by carefully checking at regular, pre-specified intervals, with guide bars or by using a wet film thickness gauge.

After allowing adequate cure time based on the actual substrate temperature, the surface should be inspected for runs, sags, foreign matter and under cured areas caused by insufficient hardener quantity, incomplete mixing or low temperatures. If under cured areas are found, they must be repaired.

Film thickness on steel structures should be checked with a magnetic dry film thickness gauge. Linings subjected to immersion service should be tested for minute discontinuities (pin holes) using a high voltage DC holiday detector, set at no more than 100 volts per mil of the film thickness being tested.

Reference Documents: *Steel Structures Painting Council (SSPC) Volume 1, Chapter 14.2, "The Lining of Steel Tanks", Section VIII, Inspection.*

National Association of Corrosion Engineers (NACE) Standard RP0188-88, "Discontinuity (Holiday) Testing of Protective Coatings" and Standard RP0288-88, "Inspection of Linings on Steel and Concrete".

SAFETY

TECHNI-PLUS P 3 and VE 81 resins are flammable. They are polyester resins containing styrene. The hardeners are peroxides and should not be stored near amines. P/VE Finishing Liquid is a flammable solvent blend. All components should be stored in a cool dry place out of direct sunlight. When working with any polymers, hardeners and dry aggregate fillers always wear appropriate safety glasses, breathing protection, clothing, and gloves. Any contaminated clothing should be washed prior to being re worn. The vapors given off during application and cure should not be allowed to build up. The ventilation should be sufficient to turn over the air with special consideration for enclosed areas. When using these types of materials any sources of ignition should be eliminated within a 50 ft. range.

WARRANTY

For product warranty see KCC Corrosion Control Co., Ltd. ***STANDARD TERMS AND CONDITIONS (U. S. 3/2006 KCC-Sale)***, stated terms including limitation of liability constitute the total warranty.

The information contained herein is believed to be accurate and reliable but is not to be construed as implying any warranty or guarantee of performance. The suggestions or recommendations and data contained herein are based on laboratory tests and field data that are believed to be accurate and reliable. The suggestions or recommendations of data contained in this bulletin are made without guarantee or representations as to results. We suggest that the user evaluate these suggestions or recommendations in your facility or laboratory or in field testing prior to use. For specific Corrosion Control Co., Ltd. product Limited Warranty and Limitations of Liability see KCC Corrosion Control Co., Ltd. Terms and Conditions of Sale - U.S. 3/2006 KCC - Sale. No statement contained herein shall infer or be construed as granting the right or permission to use, in any manner whatsoever, any patent or intellectual property owned by KCC company or any KCC affiliate company.

NOTES:

Material Safety Data Sheets have been supplied with your shipment. KCC Corrosion Control recommends that the personnel applying the materials read and understand these, as well as product labels, prior to mixing any material. If the resin or hardener are splashed in the eyes flush with clean water for 15 minutes and ***CONTACT A PHYSICIAN. IF INGESTED DO NOT INDUCE VOMITING AND CONTACT A PHYSICIAN.***

All empty containers; bags, cans, bottles and excess material must be properly disposed of in accordance with applicable Federal, State and Local Codes. ***IN EMERGENCY SITUATIONS CONTACT CHEMTREC AT 800/424-9300.***