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FIBERGLASS MAT REINFORCED VINYL ESTER LINING SYSTEMS

TECHNI-PLUS VE 125 MR is a corrosion resistant lining with outstanding chemical resistance based on advanced vinyl-ester technology, peroxide cured and filled with blended silica aggregate. TECHNI-PLUS VE 125 MR is fiberglass mat reinforced with a troweled basecoat and two different topcoat options. VE 125 MR is nominally a 1/8" thick system consisting of trowel applied VE 125 Basecoat reinforced with 1.5 oz. chopped strand glass mat saturated with TECHNI-PLUS VE 125 Basecoat Saturant and topped with TECHNI-PLUS VE 125 MR Topcoat. VE 125 MR with VE 40 Topcoat is also a nominal 100 or 125 mil system consisting of trowel applied VE 125 Basecoat reinforced with one or two layers of 1.0 oz. chopped strand glass mat saturated with TECHNI-PLUS VE 125 MR

Basecoat / Saturant and topcoated with 20 to 25 mils TECHNI-PLUS VE 40 Topcoat.

TECHNI-PLUS VE 125 MR / VE 40 systems function as linings designed to withstand a broad range of chemicals in immersion at elevated temperatures. They may also be used as flooring in severe chemical spill areas and will withstand moderate vehicle traffic. The short cure time of TECHNI-PLUS VE 125 MR results in minimum downtime and the reinforcement layer offers resistance to thermal cycling. Graphite "G" version (VE 125 MR/G) is also available for fluoride and low concentration caustic exposures. Abrasion resistant "AR" version (VE 125 MR/AR) is also available for abrasive environments.

CHEMICAL RESISTANCE¹

The chemical resistance of vinyl ester resins is generally superior to polyesters and Bis-A epoxies. Examples of chemical resistance for immersion service are listed. In flooring applications, the system will generally withstand higher concentrations. Contact KCC Corrosion Control with complete operating service conditions for specific product conditions.

ACIDS	ALKALINES	SOLVENTS, CHEMICALS
1%-Glacial Acetic	1-29% Ammonium Hydroxide	Acetone (24 hrs)
1-25% Acrylic	Black & White Pulp Liquor	Aniline
1-25% 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	0-100% Sodium Chlorate	Kerosene
Nickel Plating	0-50% Sodium Chlorite	Methylene Chloride (24 hrs)
1-40% Nitric	1-100% Sodium Sulfite	Methyl Ethyl Ketone
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 ²	1,1,1 Trichloroethane
1-75% Sulfuric		Trichloroethylene

MAXIMUM SERVICE TEMPERATURE¹ 300°F Spillage; Immersion: 180°F (VE 125MR); 150°F (VE125MR/VE 40). 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.

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

² GRAPHITE "G" VERSION IS RECOMMENDED FOR THESE EXPOSURES, SPECIAL CLEAR COAT REQUIRED FOR HYPOCHLORITES.

TYPICAL PROPERTIES

Solids Content:.....	100% Reactive Vinyl Ester
Volatile Organic Content:.....	0.45 lbs per gallon Basecoat & Topcoat mortar.
Liquids Mix Ratio by Volume:.....	2 oz. Hardener per gallon of resin.
Mortar Mix Ratio by Weight:.....	2.8 parts powder: 1 part mixed resin and hardener.
Flash Point: (Pensky-Martens Closed Cup).....	VE 125 MR Basecoat/Saturant Resin > 97°F VE 125 MR Topcoat Resin > 100°F VE 40 Topcoat Resin > 102°F Hardener 2 C (MEKP) > 135°F
Viscosity:.....	Liquid 200-300 cps @ 73°F; mortar consistency with Lining Powder # 4
Thinner:.....	DO NOT THIN!
Weights per Gallon:.....	13.2 lbs. Resin, Hardener, Powder Mix; 8.7 lbs. Resin & Hardener.
Color:.....	Gray is standard for VE 125MR. VE 40 Topcoat may be Gray or Beige Graphite "G" version is Black.

PHYSICAL PROPERTIES OF CURED SYSTEM

	<u>VE 125 MR</u>	<u>VE 125 MR / VE 40 Topcoat</u>
Compressive Strength (ASTM C579A-82):.....	13,500 psi	13,000 psi
Flexural Properties (ASTM C580-85):		
Strength:.....	3,500 psi	3,000 psi
Modulus of Elasticity:.....	2.5 X 10 ⁶ psi	2.0 X 10 ⁶ psi
Tensile Strength (ASTM C307-83):.....	2,500 psi	2,300 psi
Tensile Bond Strength:.....	Concrete - exceeds 500 psi tensile.	
Taber Abrasion (ASTM D 4060):.....	15 mg. loss/(1000 cycles CS – 17)	25 mg loss
Water Absorption (ASTM C413-83):.....	+ 0.05 %	+ 0.05 %
Moisture Permeability (ASTM E96-85):.....	+ 0.0015 perm-inch	+ 0.0022 perm-inch

ESTIMATING AND ORDERING

Priming with TECHNI-PLUS P 3
COVERAGE

<u>Concrete</u>	<u>Steel</u>
150 sq. ft. / 1 gal. unit	300 sq. ft. / 1 gal. unit
750 sq. ft. / 5 gal. unit	1500 sq. ft. / 5 gal. unit

VE 125 MR Basecoat / Saturant Resin & Hardener Unit

When Used as Basecoat with Lining Powder #4
45 sq. ft. / 1 gal. unit
225 sq. ft. / 5 gal. unit

When used as Mat Saturant with 1.5 oz. mat: 30 sq. ft. / gal.

With 1.0 oz. mat: 45 sq. ft. / gal. / layer

VE 125 MR Topcoat Resin & Hardener Unit

45 sq. ft. / 1 gal. unit
225 sq. ft. / 5 gal. unit

Lining Powder # 4 for Basecoat and Topcoat

35 sq. ft. / 35 lb. bag @ 0.125 inches thick

Lining Powder G - For Graphite (G) Version only.

40 sq. ft. / 35 lb. bag @ 0.125 inches thick

VE 125 MR Mat Reinforcement: 1.1 x sq..ft.

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 10.0 fl. oz.

TECHNI-PLUS VE 125 MR Basecoat/Saturant Resin & Hardener

1 Gal. Unit	5 Gal. Unit
Resin 8.7 lbs.	Resin 43.5 lbs.
Hardener 2 C 2.0 fl. oz.	Hardener 2 C 10.0 fl. oz.

For Graphite "G" version: Substitute following hardener.

Hardener 2 C - 3.2 fl. oz. for a 1 gallon unit

Hardener 2 C - 16.0 fl. oz. for a 5 gallon unit

TECHNI-PLUS VE 125 CR Topcoat Resin and Hardener

1 Gal. Unit	5 Gal. Unit
Resin 8.9 lbs.	Resin 44.5 lbs.
Hardener 2 C 2.0 fl. oz.	Hardener 2 C 10.0 fl. oz

PACKAGING (continued)**TECHNI-PLUS VE 40 MR Topcoat Resin and Hardener**

1 Gal. Unit	5 Gal. Unit
Resin 9.8 lbs.	Resin 49.0 lbs.
Hardener 2 C 2.0 fl. oz.	Hardener 2 C 10.0 fl. oz.

Basecoat and Topcoat Powder

Lining Powder # 4 - 35 lb. bag

For "AR" version: (used in Topcoat Only)

Lining Powder AR - 50 lb. bag

For "G" version: (used in Basecoat & Topcoat)

Lining Powder G - 35 lb. bag

STORAGE AND SHELF LIFE

The shelf life of the powder is indefinite provided it is stored in a cool dry place. The Hardeners are **PEROXIDES** (*KCC Yellow Label*) and **SHOULD NOT BE STORED NEAR AMINES** (*KCC Red Label*). The shelf life of the resins and hardeners are shown below. **DO NOT STORE RESINS! USE IMMEDIATELY!**

TYPICAL SHELF LIFE

P 3 VE 125 MR BC/S VE 125MR/VE 40

Temperature	Months	Months	Months
@ 50°F	4-6	3-4	3-4
@ 75°F	2-4	1-3	1-3
@ 80°-90°F	1	2-4 weeks	2-4 weeks

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 LINING APPLICATION IF SUBSTRATE TEMP IS WITHIN 5°F OF DEW POINT OR IF RELATIVE HUMIDITY IS GREATER THAN 95%.

- 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 should not be used or be of an alloy resistant to the vessel 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 mils.

Concrete

All oil, grease, chemicals, polymeric materials and/or weak laitance should be removed by either mechanical or chemical methods. Mechanical methods such as sandblasting, blasttracking or scarifying are the preferred methods. Chemical methods such as acid etching and detergents should be utilized to remove oil and grease or when mechanical methods cannot be utilized. The concrete should have sufficient tensile strength (250 psi), and be clean and dry. All pits, and surface imperfections, sharp corners, undercut areas from forms, honeycombing and bug holes opened up as a result of surface preparation must be filled with a scratch coat compatible with the lining system. It is the physical forcing, by troweling of a scratch coat onto and into the concrete surface that makes it possible to obtain an impervious finished coating.

For specific scratch coat material recommendations, contact KCC Corrosion Control. Specific recommendations and testing procedures for surface tensile strength and moisture content are contained in KCC Corrosion Control's Specification (SC-01).

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."

MIXING AND APPLICATIONS

• **Priming the Substrate**

If lining concrete surfaces, concrete expels air during the day and intakes air during the night. The best time to apply primer and basecoat is late afternoon or early evening at which time concrete is least likely to expel air. Other precautions such as shading the work area from sunlight to minimize the heating of the substrate and elimination of cyclic temperature changes will also reduce expulsion of air.

TECHNI-PLUS P 3 Primer should be used for the TECHNI-PLUS VE 125 MR System. The primer should be applied to the concrete at a thickness of 3 wet mils. The hardener should be added to the resin and mixed for approximately 2 minutes. The primer can be applied by brush, roller or spraying. Specific instructions are contained in the TECHNI-PLUS P 3 Primer bulletin.

When installing VE 125 MR the basecoat should not be installed over very rough or porous concrete unless either a fill material or scratch coat has been installed. The slurry coat should not exceed ¼ inch thickness. A fill material would be recommended for any thicknesses over ¼ inch. Contact KCC Corrosion Control for recommendations if there is any question about the roughness or texture of the concrete.

• **Mixing of Basecoat/Topcoat Materials**

BE CERTAIN TO USE VE 125 MR BASECOAT RESIN FOR THE FIRST TROWEL COAT OVER THE PRIMED SURFACE AND VE 125 MR TOPCOAT RESIN FOR THE NEXT TROWEL COAT OVER THE GLASS LAYER.

The units of VE 125 MR should be mixed in a mortar mixer. Resin should be stirred 2 minutes, then Hardener 2 C should be added to the resin in the pail and mixed approximately 3 - 5 minutes with a jiffy mixer on a slow speed drill. For each 5 gallon pail of the combined mix of resin and hardener, 3½ bags of powder (120 lbs.) are added while the mortar mixer is running. The mixing should continue until the powder is completely wet out and no dry spots remain. Smaller mixes can be made by using a one gallon unit of TECHNI-PLUS VE 125 MR (Resin and Hardener) with 24 lbs. of lining powder. Bucket mixers are efficient for such small mixes. Quantities of Lining Powder #4 used in mix may vary according to site conditions.

For Graphite "G" version, four (4) bags of Lining Powder G are used with a 5 gallon unit of resin. For "AR" version, topcoat mixture is modified by adding 9 lbs. of Lining Powder AR to each 24 lbs. of Lining Powder #4 used in the mix.

• **Mixing of VE 125 MR Saturant Liquid**

TECHNI-PLUS VE 125 MR Basecoat and Saturant Resin are the same. The saturating resin should be stirred thoroughly before the Hardener 2 C is added. The hardener should be added to the stirred resin and mixed for approximately 2 minutes.

• **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. 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 for optimum handling properties.

Working Time of Mixed Units (mortar)

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

NOTE: Working time of mixed resin and hardener without Lining Powder is reduced by half.

• **Application**

The mixed basecoat should be troweled onto the cured P 3 Primer or Scratch Coat at a thickness of 1/16 inch. The basecoat should be applied in sections wide enough to be covered with the cloth in one pass. Do not trowel more material than can be embedded with cloth and saturated prior to the basecoat hardening.

The 1.5 oz. or 1 oz. chopped strand glass mat should be rolled into the wet basecoat and saturated with VE 125 MR Saturant utilizing a short nap roller and a steel ribbed roller. The cloth should be saturated so no white or dry spots remain. The cloth should be overlapped a minimum of 1 inch. When ending for the day the cloth should be embedded and saturated in all the basecoat applied. The next day, a 1/2"-2" wide overlap section of basecoat over the cured saturated cloth is applied. When the basecoat and saturated cloth layer is cured, the surface should be checked for air pockets or other imperfections. These imperfections should be should be cut out and repaired; the seams should be ground down with a sander or grinder.

The VE 125 MR topcoat units are mixed in the same manner as the basecoat units. The topcoat is troweled at a nominal 1/16 inch thick. The surface of the topcoat can be smoothed with a brush dampened with P/VE Finishing Liquid . For AR topcoat, 9 lbs. of Lining Powder AR is

CURE TIME OF COMPLETED SYSTEM

The cure time is dependent on temperature of the substrate. The ambient air temperature may not be the temperature of the substrate, i.e. direct sunlight will heat substrate to higher temperature than ambient air. In winter, substrate may be colder than ambient air. The substrate temperature should be measured and dew point calculated prior to coating. Substrate temperatures below 50°F will retard curing.

added for each 24 lbs. of Lining Powder #4 in the topcoat mix. For VE 125 MR / VE 40 system, the VE 40 topcoat is spray or roller applied at 20 to 25 wet mils.

• **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!**

RECOAT AND TOPCOAT LIMITATIONS

It is important that basecoat be fully cured prior to topcoat application and equally important that basecoat is not exposed for a long period prior to topcoating. Minimum recoat time between basecoat and topcoat is 4 hours at 75°F. Maximum allowable time between basecoat and topcoat application is 2 days @ 75°F.

Time To Complete Cure

	<i>For minimum chemical service/foot traffic</i>	
If substrate is maintained:	@ 50°F.....	24 hrs.
	@ 75°F.....	16 hrs.
	@ 90°F.....	8 hrs.
	<i>For full chemical service/forklift traffic</i>	
If substrate is maintained:	@ 50°F.....	72 hrs.
	@ 75°F.....	48 hrs.
	@ 90°F.....	24 hrs.

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 coating, 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 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 temperature.

Product that has been sprayed using plural component equipment with red tracer dye in the catalyst can be visually inspected by looking for variations in color. 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 to be 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.

Linings on concrete surfaces may be checked for continuity by spark testing if so desired. If a lining is to be spark tested, a conductive primer must be used on the concrete in place of standard primer. Follow test procedure for completed lining outlined above.

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 Primer resin, VE 125 Basecoat/Saturant resin and VE 125 MR and VE 40 Topcoat resins are all flammable. They are polyester and vinyl ester resins containing styrene. The Hardeners are **PEROXIDES** (*KCC Yellow Label*) and **SHOULD NOT BE STORED NEAR AMINES** (*KCC Red Label*).

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:

P/VE Smoothing Liquid and 622 Clean-up Solvent are flammable solvent blends. All components should be stored in a cool dry place out of direct sunlight.

When working with any polymers, hardeners, solvents and dry aggregate fillers always wear appropriate safety glasses, breathing protection, clothing, and gloves. Any contaminated clothing should be washed prior to being reworn. 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.

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.**