

Revised: December, 2006

100% SOLIDS EPOXY NOVOLAC COATING/LINING SYSTEM

TECHNI-PLUS EN 25.5 is an ambient or postcured epoxy novolac coating/lining system offering superior inorganic acid resistance. TECHNI-PLUS EN 25.5 is a flake filled polymer system which is spray or roller applied from 25 to 50 mils per coat depending upon service conditions. EN 25.5 is very versatile with low temperature cures below freezing in demanding winter applications. (consult KCC). TECHNI-PLUS EN 25.5 may be post cured at temperatures of 160°F-180°F to achieve higher immersion temperature resistance in acid exposures.

TECHNI-PLUS EN 25.5 exhibits superior chemical resistance to aggressive, concentrated inorganic acids, dilute organic acids, alkalines, splash and spillage of organic solvents. In immersion service, TECHNI-PLUS EN 25.5 is applied in multiple coats either over TECHNI-PLUS E 3 Primer or direct to white metal surfaces and performs as a corrosion resistant immersion lining up to 140°F in severe environments such as chemical tank and process vessel linings. Dry temperature limit is 350°F when ambient cured, 400°F when postcured.

System is also available glass flake filled, EN 25.5 GL; graphite filled, EN 26 G and in a Clear Coat version.

CHEMICAL RESISTANCE¹

Examples of chemical resistance for immersion and/or spill containment service are listed. Contact KCC Corrosion Control with complete operating service conditions for specific product recommendations.

ACIDS	ALKALINES	SOLVENTS, CHEMICALS
1-50% Acetic	1-29% Ammonium Hydroxide ²	Acetaldehyde
Acid Plating Solutions	1%-saturated Barium Hydroxide	Acetone
1-50% Adipic	Black & Green Pulp Liquors	Acetonitrile, Acrylonitrile
1-30% Chromic	Cadmium Cyanide Plating	Cyclohexane
1-37% Hydrochloric	Copper Cyanide Plating	Ethyl & Butyl Acetate
1-47% Hydrofluoric	1-50% Potassium Hydroxide ²	Formaldehyde
1-50% Nitric	1-15% Sodium Cyanide	Kerosene, Jet Fuel
Oleum	1-12.5% Sodium Hypochlorite	Methylene Chloride
1-85% Phosphoric	1-50% Sodium Hydroxide ²	MEK, Styrene ²
1-99.5% Sulfuric	1-30% Hydrogen Peroxide	1, 1, 1 Trichloroethane

MAXIMUM SERVICE TEMPERATURE¹ 350°F dry, 400°F dry postcured, 180°F splash and spillage, 140°F immersion, 140°-160°F immersion when postcured.

² Styrene containment 72 hrs, no affect.

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

² CLEAR COAT USED FOR HYDROFLUORIC ACID AND LOW CONCENTRATIONS OF HYDROXIDES.

³ IF PROTECTED FROM DIRECT SUNLIGHT.

TYPICAL PROPERTIES

Solids Content:.....	100% Reactive
Volatile Organic Content:	Zero
Volume Mix Ratio:	4 parts Resin to 1 part Hardener
Flash Point: (Pensky Martens Closed Cup)	Resin..... > 250°F
	Hardener..... > 200°F
Viscosity:	5000 cps @ 77° (mixed).
Thinner:.....	DO NOT THIN!
Weight per Gallon:.....	9.4 lbs. + 0.2 (EN 25.5 & EN 25.5R)
Coverage for Steel:	(Theoretical)... 64 sq. ft. per gallon per coat when spray applied at 25 wet mils.
	(Practical)..... 58 sq. ft. per gallon per coat when spray applied at 25 wet mils.
Coverage for Concrete.(Primed)	(Theoretical)... 100 sq. ft. per gallon @ 15 wet mils, 80 sq. ft./gal. @ 20 wet mils.
	(Practical)..... 85 sq. ft. per gallon @ 15 wet mils, 65 sq. ft./gal @ 20 wet mils.
Color:	Tile Red, Beige (off white) and Medium Gray. Minimum quantities apply for special colors.

PHYSICAL PROPERTIES OF CURED SYSTEM

Compressive Strength (ASTM D-695):	22,500 psi
Tensile Strength (ASTM D-638):	8240 psi
Tensile Elongation (ASTM D-638):	11%
Bond Strength to Steel (ASTM D-1002):	2250 psi
Bond Strength to Concrete (ASTM C-882):	> Tensile strength of concrete; breaks 5000 psi concrete.
Tensile Modulus (ASTM D-638):	385,000 psi
Impact Resistance (ASTM D-256, Method A):	0.15 ft-lb./in
Shore "D" Hardness (ASTM D-2240):	75
Abrasion Resistance (ASTM C C501-80):	48 mg. loss/1000 cycles with 1000 grams and CS-17 wheel (Taber test).
Moisture Permeability (ASTM E 96-85):	0.0015 perm-inch

POT LIFE/RECOAT TIME

Temp.	Pot Life	Recoat Time	
		Minimum	Maximum
@ 50°F	90 min	12 hrs.	48 hrs. ⁴
@ 75°F	30 min.	6 hrs.	36 hrs. ⁴
@ 90°F	15 min.	3 hrs.	24 hrs. ⁴

Pot life test on 200 gram sample; working time in larger quantities will be shorter! (See installation procedure sections.) For application of EN 25 at temperatures below 50°F contact KCC Corrosion Control for recommendations.

PACKAGING

TECHNI-PLUS EN 25.5 is packaged in pre-measured units as follows:

1 Gal. Unit	5 Gal. Unit	30 Gal. Unit
Resin 7.68 lbs.	Resin 38.4 lbs.	Resin 230.4 lbs.
Hardener 1.74 lbs.	Hardener 8.7 lbs.	Hardener 52.2 lbs.

LTC – Low temperature cure version has different packaging. Consult KCC for a wide range of versions to meet your needs.

(30 gallon units include multiple containers for hardener.)

BID SPECIFICATION

Steel or concrete may be primed (optional) with a nominal 3 wet mils of TECHNI-PLUS E 3 Primer (required for surfaces to be scratch coated). Epoxy Scratch Coat shall be applied as needed to fill pits or voids. TECHNI-PLUS EN 25.5 shall be applied at a nominal 25 to 50 mil thickness. EN 25.5 is to be applied to the substrate prepared in accordance with the manufacturer's specifications.

STORAGE AND SHELF LIFE

TECHNI-PLUS EN 25.5 components should be stored in cool dry area and out of direct sunlight. The hardener is an **AMINE** (KCC Red Label) and **SHOULD NOT BE STORED NEAR PEROXIDES** (KCC Yellow Label).

⁴ IF PROTECTED FROM DIRECT SUNLIGHT.

TYPICAL SHELF LIFE

Temperature	Months
@ 50°F	12
@ 75°F	12
@ 80°-90°F	12

INSTALLATION PROCEDURES

The installation procedures in this bulletin will be as specific as possible.¹

- **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 coating 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 and similar items must have continuous welds, (no skip welding) with weld rippling, undercutting and weld spatter ground smooth. Edges must be ground to a 1/8" radius. To facilitate the coating application, nozzles should have a larger 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 made of alloy suitable to resist the corrosive contents.

All surfaces to be coated require a "White Metal" blast to SSPC-SP-5 or NACE 1, with an abrasive blast media that removes all visible mill scale, existing coating 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 steel substrate should be clean, dry and have a minimum surface anchor profile of 3 mils.¹

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, blastracking or scarifying are the preferred methods. Chemical methods such as acid etching and detergents should be utilized to remove laitance, oil and grease 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 coating 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 "Preparation of Concrete for Thermoset Polymer Systems."

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 Application**

DO NOT ATTEMPT COATING APPLICATION IF SUBSTRATE TEMPERATURE IS WITHIN 5°F OF DEW POINT OR IF RELATIVE HUMIDITY IS GREATER THAN 95%.

If coating concrete surfaces, concrete expels air during the day and intakes air during the night. The best time to apply coating 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. Use of primer is optional, although it may minimize air expulsion from concrete.

TECHNI-PLUS EN 25.5 Resin and Hardener components must be stirred individually. The EN 25.5 Hardener component is then added to the EN 25.5 Resin container and mixed with mechanical agitator for 2 to 3 minutes, with care taken to minimize amount of air introduced by mixing process.

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

DO NOT THIN! If plural component spray equipment is used, both components must be thoroughly stirred before introducing into spray equipment. Hardener is not added to resin, but mixed in spray equipment at nozzle. Proper volume mix ratio is important to ultimate cure and film properties.

TECHNI-PLUS EN 25.5 is designed to be applied by spray, brush or roller. Glass flake filled **EN 25.5 GL must be sprayed only**. Roller or brush application is normally used for small areas and spot repair. When spraying, the pots and lines should be flushed with KCC's 622 Clean-up Solvent after every 3 to 4 batches when temperatures exceed 80°F. TECHNI-PLUS EN 25.5 is applied at a nominal 25 to 50 mil thickness in coats of 25 wet mils. On concrete horizontal traffic surfaces, 20 x 40 mesh dry round silica or 30 x 50 mesh flintshot may be broadcast into the wet first coat until the surface appears dry, swept after cured, and topcoated with 15 to 20 wet mils of TECHNI-PLUS EN 25.5, depending on non-slip finish desired.

APPLICATION METHODS

Brush-Roller: Natural bristle brush short nap wool or mohair roller.

Spray: Refer to KCC Recommended Practice Bulletin RP-01, Spray Application Methods and Equipment. Note limited pot life if spraying.

CURE TIME

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 time. EN 25.5 is available in low temperature cure systems for application below freezing temperatures. Consult KCC specific information. Post curing is accomplished by heating vessel within 6 to 8 hours of application when material has taken initial set with clean hot air source (no direct combustion gases) to 160-180°F for 6 to 8 hours. Product is post cured at final desired dry film thickness (e.g., 25 mils).

• **Pot Life** (See values on Page 2)

The pot life or 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. Above 90°F ambient temperature, best results are obtained when the catalyzed material is poured into smaller containers reducing the mass. When ambient temperature exceeds 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.

If plural component application equipment is used, materials are not premixed and pot life is not a factor. Mixing chamber and spray tip must be kept clean and flushed with KCC's 622 Clean-up solvent.

• **Clean-Up**

All mixing equipment, spray equipment and brushes should be cleaned immediately after use. Solvents recommended for clean-up are KCC's 622 Clean-up Solvent or methyl ethyl ketone.

RECOAT AND TOPCOAT LIMITATIONS

The maximum recoat time for all KCC products exposed to direct sunlight (ultraviolet light) is 2 days. This time period can be extended to 7 days by protecting the product from exposure to direct sunlight. In the event that either of above recoat times are expired, 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 topcoat application, within 4-6 hours.

Time to Complete Ambient Cure

If substrate is maintained:	@ 50°F.....	96 hrs.
	@ 75°F.....	48 hrs.
	@ 90°F.....	24 hrs.

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

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 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 uncured areas caused by insufficient hardener quantity, incomplete mixing or low temperature. If uncured areas are found, they must be repaired.

Film thickness on steel structures should be checked with a magnetic dry film thickness gauge. Coatings 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.

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

CAUTION: Exposure of this product to concentrated nitric acid, above 70% concentration, is not recommended, as a nitration reaction may result, with

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 in this bulletin 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 of data contained in this bulletin are made without guarantee or representation as to results. We suggest that the user evaluate these suggestions or recommendations in your facility, laboratory or in field testing prior to use. For specific KCC 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 other intellectual property owned by any KCC company or any KCC affiliate company.

potential hazard of fire or explosion. This does not mean the product is recommended for concentrations of nitric acid up to 70%.¹

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

TECHNI-PLUS EN 25.5 Resin contains epoxy resins. EN 25.5 Hardener contains **AMINES (KCC Red Label)** and **SHOULD NOT BE STORED NEAR PEROXIDES (KCC Yellow Label)**. 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 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 area. 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.**