Corrosion Engineering
A Division of ErgonArmor

TECHNICAL INFORMATION

CORROSION ENGINEERING SPECIFICATION FOR INSTALLATION

PENNTROWEL® VINYL ESTER (VE) MR LINING SYSTEM

NOTE: PENNTROWEL MR (Mat Reinforced) Systems are sophisticated lining systems and should only be installed by industrial contractors familiar with industrial lining practices.

1. SCOPE

1.1 PENNTROWEL Vinyl Ester MR Lining System is a multiple component vinyl ester mat reinforced monolithic system that is suitable for a wide range of chemical service. PENNTROWEL VE MR Lining System may also be referred to as Penntrowel “60" MR System, depending on the specific country where the system is marketed. “60" MR is usually used in countries using the imperial system of measure. Countries using the metric system of measurement may not necessarily include the designation “60".

1.2 PENNTROWEL Vinyl Ester MR Systems can be installed using a variety of layers, varying the total lining thickness and the placement of the reinforcing mat. This specification covers the general steps and adjustments should be made to consider specific project situations. See section 4.0 below for further detail on system variations.

2. SURFACE PREPARATION

2.1 Steel

2.1.1 Abrasive-blast steel surfaces in accordance with SSPC-SP#5 (SA 3) "White Metal Blast Cleaning" to a 3 mil minimum profile. Immediately after blasting, apply a single coat of Primer to hold blast. Steel surface must be free of moisture for the application of the Primer.

2.2 Concrete

2.2.1 All concrete surfaces to be lined shall meet the following criteria:

A minimum compressive strength of 3,000 psi (20 Mpa) (test with a concrete test hammer).

A minimum surface tensile bond strength of 300 psi (2.0 Mpa) (test with a Dillon Dynamometer, Elcometer Adhesion Tester, or equal).

2.2.2 Preparation shall be in accordance with the following ASTM Standards:

D4258 - Practice for Surface Cleaning Concrete for Coating
D4259 - Practice for Abrading Concrete
D4261 - Practice for Surface Cleaning Concrete Unit Masonry for Coating
D4262 - Test Method for pH of Chemically - Cleaned or Etched Concrete Surfaces
D4263 - Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
D4285 - Method for Indicating Oil or Water in Compressed Air

3. APPLICATION

3.1 Layer 1 - PENNTROWEL VE Primer

3.1.1 PENNTROWEL Vinyl Ester Primer Resin shall be mixed with CHP Hardener by adding CHP Hardener to Resin at a rate of 1.5-2.25% by weight of Hardener to Resin. Note: variation of catalyst addition is usually performed to adjust for installation in cooler temperatures. For job conditions 20-23^{O}C, use the 1.5% addition rate. Cure can be accelerated if temperatures are cooler (10^{O}C-20^{O}C) by adjusting CHP Hardener addition, but in no case should lining work proceed if temperatures are below 10^{O}C or if substrate is not 2^{O}C above moisture dew point. Do not add more than 2.25% of Hardener. It does not accelerate the cure further.

3.1.2 Apply to properly prepared surface of dry concrete or dry abrasive blasted steel with a brush, squeegee, or short nap roller. Apply at a rate of approx 0.3 kg per sm or 0.28 mm.

3.1.3 Primer must be hardened to a tack free cure before application of subsequent layers. (Minimum of 4 hours at 22^{O}C).

3.2 Layer 2 - PENNTROWEL VE MR Reinforcing Mat and Saturant

3.2.1 PENNTROWEL Vinyl Ester Resin shall be catalyzed using the same catalyst addition rates as outlined in section 3.1.1 above.

3.2.2 Apply catalyzed PENNTROWEL Vinyl Ester Resin over tack free primer at a rate of 0.5 kg per sm.

3.2.3 Mat reinforcements can vary in weight depending on the application. Typical applications use 300 gm or 450 gm cloth. Consult the specific project details for exact cloth specifications and locations within the system. See Section 4.0 below for more detail.

3.2.4 Apply the selected reinforcing mat immediately on to the wet surface of the PENNTROWEL Vinyl Ester Resin. Press the mat firmly into the PENNTROWEL Vinyl Ester Resin being careful to eliminate any wrinkling. Adjacent strips of mat should be overlapped 50 mm.

3.2.5 Flood a saturant layer of catalyzed Resin over the mat. Saturate the mat with an even coat of this Resin/Hardener Saturant is applied at a rate of 0.5 kg per sm. Work out wrinkles as work proceeds, using ribbed roller tools as utilized for FRP laminate work.

3.2.6 Allow installation to harden a minimum of 8 hours at 22^{O}C before proceeding.

3.3 Layer 3 - PENNTROWEL VE MR System Build Coat

3.3.1 PENNTROWEL Vinyl Ester Resin shall be mixed with CHP Hardener by adding CHP Hardener to Resin at a rate of 1.5-2.25% by weight of Hardener to Resin. Note: variation of catalyst addition is usually performed to adjust for installation in cooler temperatures. For job conditions 20-23^{O}C, use the 1.5% addition rate. Cure can be accelerated if temperatures are cooler (10^{O}C-20^{O}C) by adjusting CHP Hardener addition, but in no case should lining work proceed if temperatures are below 10^{O}C or if substrate is not 2^{O}C above moisture dew point. Do not add more than

2.25% of Hardener. It does not accelerate the cure further.

3.3.2 Add Penntrowel LF Filler to catalyzed Penntrowel VE Resin at a rate of 3.0-4.0 parts of Powder to 1.0 part of catalyzed Resin by weight. Adjustments in this ratio are permitted according to installer preference. Mixed Build Coat should have a creamy workable consistency similar to a paste-like material.

3.3.3 Apply PENNTROWEL VE MR System Build Coat over cured mat reinforcement at a rate of 3.0 kg per sm.

3.3.4 Allow to cure at least 72 hours at 23^{O}C before placing into service.

3.3.5 Clean tools and equipment periodically with MEK to prevent accumulation of cured coatings (do not use acetone for vinyl ester components cleanup). Read MSDS's and follow manufacturer's precautions while using and storing these chemicals.

4. SYSTEM THICKNESS AND NUMBER OF LAYERS - VARIATIONS

4.1 PENNTROWEL VE MR Lining System can be specified for use in a number of ways depending on the anticipated thermal and mechanical stresses. The basic system uses a single 300 gram mat reinforcement applied over the primer and followed by a single build coat, but variations to this system may include the addition of a second reinforcing layer, the use of heavier cloth, or placement of the reinforcement over top of the build coat instead of under it. (In the case of the reinforcement being applied over the basecoat, a second build coat, which is repeat of the base coat procedure, is suggested). Consult Henkel if there are any technical questions concerning variations to the basic system.

5. *STORAGE*

5.1 If PENNTROWEL L/F Filler is stored like Portland cement in a dry, cool covered premise on wooden pallets, it should be usable for one year or more from its date of manufacture.

5.2 If Vinyl Ester Resin is stored in a cool, dry location they should be usable within 4-6 months from date of manufacture. VE Resin past its shelf life will exhibit a gelled consistency in the pail and should be discarded. CHP Hardener, if properly stored should be usable for up to one year from its date

of manufacture. If there is any question with respect to quality of the components, the components shall be tested prior to being used.

6. *SAFETY PRECAUTIONS / DISCLAIMER*

6.1 Read and follow the hazard information, precautions and first aid directions on the individual product labels and material safety data sheets before using. While all statements, technical information, and recommendations contained herein are based on information our company believes to be reliable, nothing contained herein shall constitute any warranty, express or implied, with respect to the products and/or services described herein and any such warranties are expressly disclaimed. We recommend that the prospective purchaser or user independently determine the suitability of our product(s) for their intended use. No statement, information or recommendation with respect to our products, whether contained herein or otherwise communicated, shall be legally binding upon us unless expressly set forth in a written agreement between us and the purchaser/user.

6.2 Please contact Corrosion Engineering for specific recommendations at +1-610-833-4000 or fax +1-610-833-3040.

www.penntrowel.com