



**Corrosion
Engineering™**

AN ERGONARMOR COMPANY

TECHNICAL INFORMATION

CES-232

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CORROSION ENGINEERING SPECIFICATION FOR INSTALLATION

PENNTROWEL® EPOXY UNDERLAYMENTS

1.0 SCOPE

- 1.1 The following specification sets forth the proper environmental, mixing, application, and curing criteria for PENNTROWEL Epoxy Underlayment and PENNTROWEL 250 Epoxy Underlayment. These underlayments are trowel applied over primed concrete to a normal thickness of 1/4" (6mm) up to thicknesses required for repair, smoothing or sloping of concrete substrates. They are used as epoxy underlayments in conjunction with tile/brick systems. After compacting and troweling, a smoother surface may be imparted by using a dry short nap roller.
- 1.2 PENNTROWEL Epoxy Underlayment is a high performance resinous epoxy underlayment formulated for protecting concrete floors in corrosive conditions where temperature cycling and thermal shock are present. Its strength supercedes that of traditional Portland cement underlayments, and is an excellent substitute in situations where this higher strength is demanded.
- 1.3 PENNTROWEL 250 Epoxy Underlayment is a high performance silica-filled epoxy based underlayment. It has been formulated with the most up-to-date resin technology to withstand high temperatures and thermal cycling. It exhibits excellent chemical, abrasion, and impact resistance. PENNTROWEL 250 Epoxy Underlayment is specifically designed for use in wet areas that are difficult to keep dry during installation. It may be applied over damp concrete or placed into areas with standing water. The installed, cured underlayment exhibits excellent physical properties and adhesion.

2.0 MATERIALS

- 2.1 Primer

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PENNTROWEL Epoxy Primer may be used to prime concrete surfaces before Underlayment is applied. Read product data sheet CE-139 for more details. The primer is a 2-component chemically curing epoxy compound formulated to improve adhesion of epoxy monolithics to either dry or damp concrete.

2.1.2 For temperatures below 60°F, PENNTROWEL Epoxy Primer must be cured with THINSET Cold Room Hardener. NOTE: The use of Cold Room Primer means the PENNTROWEL Epoxy Primer will NOT have moisture tolerance for damp surfaces. Areas with damp or wet concrete must be dried before application.

2.2 PENNTROWEL Epoxy and Epoxy 250 Underlayment

2.2.1 PENNTROWEL Epoxy Underlayment is a 3-component epoxy concrete consisting of a resin, hardener, and filler formulated for acid, alkali, solvent, detergent, and grease protection for concrete floors. The underlayment is chemically resistant over a broad temperature range from 0°F (-18°C) to 220°F (121°C) intermittent.

2.2.2 PENNTROWEL Epoxy 250 Underlayment is a 3-component epoxy concrete consisting of a resin, hardener, and filler formulated for acid, alkali, solvent, detergent, and grease protection for concrete floors. The underlayment is chemically resistant over a broad temperature range from 0°F (-18°C) to 220°F (121°C) intermittent. It is suitable for application on damp concrete.

2.2.3 PENNTROWEL Epoxy Underlayment/250 Epoxy Underlayment is cured with THINSET Cold Room Hardener at temperatures below 55°F. NOTE: The use of Cold Room Primer means the PENNTROWEL 250 Epoxy Underlayment will NOT have moisture tolerance for damp surfaces. Areas with damp or wet concrete must be dried before application.

3.0 CONCRETE PREPARATION

3.1 New Concrete

3.1.1 See "Standard Practice for Curing Concrete" ACI-308.

3.1.2 Primer must be applied to a clean uncontaminated concrete surface.

3.1.3 The concrete should have a minimum compressive strength of 3,000 psi (21 MPa) and a minimum surface tensile strength of 300 psi (2.1

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Mpa).

- 3.1.4 Concrete admixtures, curing compounds and air entrainment agents should not be used without consulting with Corrosion Engineering as they may interfere with the adhesion of the primer.
- 3.1.5 The concrete slab should be finished with a wood float. Steel trowel finishing is not recommended. To ensure removal of laitance and loosely adhered particles, the slab should be either mechanically abraded (see ASTM D4259 "Abrading Concrete") or chemically etched with a single application of 10% muriatic acid, thoroughly rinsed with water, and dried. (see ASTM 4260 "Acid Etching Concrete"). Due to environmental, safety and quality issues, acid etching is recommended only as a last resort. Read all safety warnings and manufacturers recommendations when handling muriatic acid.
- 3.1.6 Concrete floor should be continuously sloped to drains and/or trenches a minimum of 1/4" per foot (21mm/m). The slab should have sufficient flatness to avoid birdbaths or puddling.
- 3.1.7 Concrete should be free of all moisture that will inhibit adhesion or cure of topping compound (see ASTM D 4263 "Indicating moisture in concrete by the plastic sheet method").
- 3.2 Existing Concrete
 - 3.2.1 The integrity and performance of the underlayment is directly related to the quality of the existing concrete slab. The slab should have a strong, sound surface with a minimum compressive strength of 3,000 psi (21 MPa) with a minimum surface tensile strength of 300 psi (2.1 MPa).
 - 3.2.2 If concrete has leached badly or is chemically attacked it should be tested for integrity.
 - 3.2.3 Existing concrete surfaces must be clean and dry. The surface may be cleaned by scarifying or mechanically abrading (see ASTM D4259 "Abrading Concrete"). Chemically etch by using 10% muriatic acid (see ASTM D4260 "Acid etching concrete") followed by thorough rinsing with water and drying. (See ASTM 4258 "Surface Cleaning Concrete for Coating"). See notes in section 3.1.5.
 - 3.2.4 Grease, fats, and oils should be removed by washing with an alkaline

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detergent. Difficult to remove greases may require chipping or sand blasting. Detergents must be thoroughly rinsed with water. Do not use solvents to remove greases, fats, or oils. Consult ASTM D-4258 and D-4261.

3.2.5 Existing concrete surface should be reasonably sloped to continuously drain.

4.0 ENVIRONMENTAL CONDITIONS

4.1 Outdoor Installation

4.1.1 The air temperature and concrete slab temperature should be between 35°F (10°C) to 85°F (30°C). The concrete slab temperature must be 5°F (3°C) above the moisture dew point.

4.1.2 For optimum application results primer and surfacer should be applied out of direct sunlight or shaded if possible, and not under windy conditions.

4.1.3 For optimum application results primer and underlayment should be applied onto concrete when the temperature of the slab is decreasing, or cooling, rather than when the slab temperature is rising.

4.1.4 Primer must be applied over concrete surfaces whether new or existing, damp or dry. Primer will not adhere to wet concrete.

4.2 Indoor Installation

4.2.1 If installation is indoors follow sections 4.1.1 and 4.1.4.

5.0 PRIMER APPLICATION

5.1 PENNTROWEL Epoxy Primer components should be stored in a cool, dry, location and brought to as close to 70°F (21°C) as possible prior to use. See 5.2.4 for cold room/weather applications.

5.2 Mixing Instructions

5.2.1 Remove lids from primer resin and hardener cans.

5.2.2 Slowly pour primer hardener into primer resin container.

5.2.3 Stir with a mechanical mixer for a minimum of five minutes, insuring

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components are of a uniform color and texture.

5.2.4 At temperatures below 60°F, PENNTROWEL Epoxy Primer Resin is mixed with THINSET Cold Room Hardener at a rate of 3 gal. Resin to 1 case (4 x 0.15 gal.) of Hardener **OR** 3/4 gal. Resin to 1 can (0.15 gal.) Hardener. Approximate Ratio is 5 parts Resin to 1 part Cold Room Hardener, by volume.

5.3 Application Instructions

5.3.1 After mixing, apply primer by stiff brush onto prepared concrete using a strong scrubbing action.

5.3.2 Excess primer should be removed with a squeegee to maintain coverage and avoid puddling.

5.3.3 Surfacer may be applied while primer is wet, but is should be applied before primer is dry to touch.

6.0 UNDERLAYMENT APPLICATION

6.1. Store components in a cool, dry location and bring to as close as 70°F (21°C) as possible prior to use.

6.2 Remove lid of underlayment resin container and pour resin into a container suitable for mechanical mixing.

6.3 The mixer should be a KOL-Type rotary mixer or equivalent. It should consist of a slowly rotating container around a fixed blade which folds the components into a homogeneous mix. Do not use an electric drill mixer as it whips air into the viscous mix. A paddle type mortar mixer is recommended when mixing large mixes.

6.4 Add hardener to resin in mixing container as per ratios specified in product data sheet. Note: At temperatures below 55°F, use THINSET Cold Room Hardener instead of PENNTROWEL Epoxy Hardener.

6.5 Mix resin and hardener slowly and thoroughly for at least one minute or until mix is homogeneous.

6.6 Slowly add all underlayment filler over a period of one (1) minute or until mix is homogeneous. When material is used as an underlayment, a standard 20-40 mesh quartz sand may be used.

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- 6.7 Underlayment mix which has begun to set cannot be recovered by adding more resin.
- 6.8 Never add water, Portland cement, additives or adulterants to underlayment mix.
- 6.9 Thicknesses
- 6.9.1 The thickness of the underlayment epoxy must not be less than the following:
- A) 3/16" (4.8mm) for floors in areas subject to light traffic.
 - B) 1/4" (6.4mm) in areas subject to average traffic and wet/dry exposure.
 - C) 3/8" (9.5mm) in areas subject to extremely heavy traffic or to regular spillage of a corrosive liquid.
- 6.9.2 The thickness of the underlayment can be a nominal 1.5" (38mm) before consideration must be made to add additional layers, if thicker underlayment is required.

7.0 INSTALLATION TECHNIQUES

- 7.1 Underlayment must be tightly compacted by one of the following methods.
- 7.1.1 Steel Trowel
- A steel trowel is the preferred tool and method for finishing PENNTROWEL Epoxy Underlayments. This is best accomplished by applying moderate pressure with the trowel to impart a uniform finish. A uniform surface can be obtained with 2 or 3 trowel passes. Avoid excessive troweling as a dark discoloration (burnishing) may occur. The use of magnesium trowels is recommended as they will minimize any discolorations.
- 7.1.2 Wood Float
- An alternative finishing method for PENNTROWEL Epoxy Underlayments is by means of wood float, which may be passed over the surface with moderate pressure. Finishing with a dry short napped mohair roller is required to insure a non-porous surface. (See following alternative finishes).
- 7.1.3 Power Trowel

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PENNTROWEL Epoxy Underlayments may be power troweled. Contractors experienced with the specialty equipment and techniques required for this installation technique shall install PENNTROWEL Epoxy Underlayments in this manner.

7.1.4 Placement of Underlayment

Dump the mixed underlayment onto the primed substrate. Work quickly; to avoid surface skinning. Screed the mixture evenly over the area using a vibrating sawing motion. Finish as desired with a trowel or broom.

7.2 Alternative Finishes

7.2.1 Can be obtained with a dry short-napped mohair paint roller.

7.2.2 Lightly rolling the troweled surface will yield a medium skid resistant surface.

7.2.3 Extensive rolling or medium pressure exerted on the roller will yield a resinous somewhat slick smooth Underlayment. Periodic cleaning of the roller with solvent (xylol or xylene or toluene) may be required to remove build up. Shake off excess solvent thoroughly before re-rolling. Minimize solvent contact with installed Underlayment. Read and follow manufacturers recommendations when handling xylol, xylene, or toluene.

8.0 MISCELLANEOUS DETAILS

8.1 In all areas where the installed floor does not butt against a vertical surface, the PENNTROWEL Underlayments shall be keyed in. The key shall be saw cut into the concrete, and have a depth of 1/4" (6mm) and width of a minimum 1/4" (6mm).

9.0 CURING

9.1 Ambient Temperatures

9.1.1 Do not allow water or any other fluids on surface for a minimum of 24 hours @70°F (21°C). If floor must be put into service before this time, contact Corrosion Engineering for further details.

9.1.2 Allow installed PENNTROWEL Underlayments to cure a minimum of 24 hours at 70°F (21°C) before allowing heavy traffic. At lower

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temperatures PENNTROWEL Underlayments will take longer to cure.

9.1.3 Light foot traffic is allowed after a 4-5 hour cure @70°F (21°C)).

9.2 Cold Room Curing

9.2.1 Do not allow water or any other fluids on surface for a minimum of 24 hours @70°F (21°C). If floor must be put into service before this time, contact Corrosion Engineering for further details.

9.2.2 Allow installed PENNTROWEL Underlayment to cure a minimum of 24 hours at 55°F (12°C) or below before allowing traffic or proceeding with brick or tile layers.

10.0 CLEAN-UP

10.1 Clean mixing equipment, tools, and trowels with MEK, xylene, or toluene. Consult cleaning solvent suppliers Material Safety Data Sheet (MSDS) for proper precautions.

11.0 SAFETY PRECAUTIONS/DISCLAIMER

11.1 PENNTROWEL Epoxy Floor Underlayments, components and mixes of them present a number of hazards. Read before using and follow the hazard information, precautions, and first aid directions on the individual product labels and Material Safety Data Sheets.

11.2 The statements, technical information and recommendations contained herein are believed to be accurate as of the date hereof. Since the conditions and methods of use of the product and of the information referred to herein are beyond our control, Corrosion Engineering expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information; NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE CONCERNING THE GOODS DESCRIBED OR THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specific product designated and may not be applicable when such product is used in combination with other materials or in any process. The user should thoroughly test any application before installation. Nothing contained herein should be taken as an inducement to infringe any patent and the user is advised to take appropriate steps to be assured that any proposed use of

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the product will not result in patent infringement.

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

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