



PROJECT SPECIFICATION & INSTALLATION PROCEDURE SPECIFICATION

FOR SURFACE PREPARATION AND ARMALINE 1730 LINING

Project:
Location:

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1. SCOPE OF WORK

- 1.1 This specification covers the surface preparation and application of **ARMALINE 1730** for the protection of concrete substrates.
- 1.2 Work includes furnishing lining materials and application advisory services for the performance of concrete surface preparation and application of linings as required in this specification.

2.0 APPLICATOR PRE-QUALIFICATION

The application of the lining material shall be approved by ARMATEC Environmental and have at least five (5) years experience in the application of this or similar products. Previous experience must be verified by three (3) references of similar applications and project size.

3.0 SIGNIFICANCE

- 3.1 This specification defines the necessary practices for surface preparation and application of **ARMALINE 1730** along with tolerances where applicable.
- 3.2 This specification reflects the most current information available on proper and acceptable procedures and tolerance. Where other documents and this specification differ, this specification shall govern.
- 3.3 Lining and preparation works may be staggered or proceed progressively in order to meet cleanliness requirements or overcoating times indicated in this specification. Tank walls may be prepared and lined prior to tank floors.
- 3.4 Linings shall be installed prior to the installation of pumps and other equipment.

4.0 FACILITIES AND EQUIPMENT

- 4.1 Surface preparation, priming and lining system installation as covered by this specification shall be carried out "on-site". The area shall be free from contaminants which may affect adhesion between the substrate and lining materials (e.g. airborne dust, water, oil and dirt, etc.).
- 4.2 Welding or other work shall not be carried out in the same area during lining material installation unless such operations are isolated to prevent possible safety hazards and/or contamination of the surfaces to be treated.
- 4.3 When lining materials have been applied and cured for 24 hours minimum, the lined areas shall be protected by others from damage in the event other contract operations are required or resume in the same area.



- 4.4 Compressed air for gritblasting equipment shall be oil and moisture free. It shall be checked for the presence of moisture and oil prior to commencement of work and at least once every four hours, or more frequently if deemed necessary by the **ARMATEC Lining Application or QC Advisor**. The test shall be done by operating the equipment with air only. The air stream shall be directed toward a piece of clean white absorbent paper or cloth for one minute to detect any oil or moisture. In the event oil or moisture is produced on the test paper or cloth, the equipment shall be modified to eliminate such carry over of oil or moisture.
- 4.5 It is necessary that suitable oil and moisture separators shall be used and serviced at a frequency required to adequately ensure no oil or water carry over.

5.0 CONCRETE SPECIFICATION

5.1 General Design

All concrete to receive protective surfacing shall be adequately designed for the intended use and poured to provide a uniform surface free of honey combing and sharp protrusions. The concrete must be dry, free of oil and dirt and cured sufficiently to receive the protective surfacing prior to commencement of surface preparation.

As a minimum all edges shall be cast or ground 12 mm x 45° minimum and radiused. Fins and edges caused by formwork misalignment shall be ground smooth. All nails, timber and other surface embedments shall be removed. All feathered and loose cement mortar or repair materials shall be hacked out. Bagged surfaces or render shall be stripped back to a firm substrate.

5.2 Compressive Strength

The compressive strength of the concrete should be minimum 25 MPa. This is only one measure of quality for consideration. It is a measure of integrity but not of surface strength.

5.3 Surface Strength

This is a most important property required for the best performance of chemical resistant monolithic floor surfacing. Minimum surface tensile should be 1.4 MPa. Surface strength has a direct relationship with proper high humidity curing and placement. This aspect of the civil work requires proper monitoring.



5.4 **Finishing Methods**

The preferred finish for horizontal concrete surfaces is "once over" with a steel trowel. This method provides the strongest most uniform surface. Screed, broom and wood float finishing are less desirable since an irregular surface can result.

5.5 **Surface Curing and Hardening Treatments**

Do not use curing agents or hardening treatments unless they are compatible with the proposed chemical resistant lining material. They may reduce adhesion of the protective surfacing and may require mechanical removal. Consult ARMATEC for advice.

5.6 **Concrete Cure Time**

It is best to cure new concrete 28 days prior to the application of the protective surfacing. If concrete temperatures are constantly maintained above 15°C then 14 days may be sufficient cure time. If the concrete is an adhesive bonded overlay or if a vapour barrier is used under the slab then 28 days cure is required.

5.7 **Determining Dryness**

Prior to commencement of the lining application the concrete shall be checked for dryness using the plastic sheet method (ASTM D4263-83).

6.0 **SURFACE PREPARATION (Concrete and Steel Preparation)**

6.1 **Common Requirements (Concrete and Steel Preparation)**

6.1.1 Prior to commencement of the lining work all subject surfaces shall be inspected for the presence of any conditions that may adversely affect the satisfactory performance of surface preparation and subsequent lining work. If any unsatisfactory conditions exist, work shall not proceed until conditions have been corrected.

6.1.2 All surfaces to receive protection shall be free from oil, grease, soil, moisture or other contaminants that may impair the adhesion of the protective lining materials.

6.1.3 All dust and grit shall be removed from the blast cleaned surface by brushing or air blowing followed by vacuum cleaning prior to priming.

6.1.4 Care shall be taken at all times, throughout all stages prior to completion that surfaces shall not be contaminated with finger prints (oil), perspiration (salts) or detrimental contamination from workers clothes and footwear.

6.1.5 The blasting media shall be clean and dry with sufficient coarseness/sharpness to produce the minimum profile specified. Clean, washed and graded sand or copper slag are recommended as suitable blast media. The grit shall be checked/tested to confirm that it is free of chloride salts.



6.1.6 The compressed air supply for gritblasting, spray coating, etc shall be free of oil, dirt and entrained water.

6.2 Concrete Preparation

6.2.1 Concrete shall be cured for the minimum period described in Section 5.6 prior to commencement of surface preparation operations.

6.2.2 Concrete surfaces to receive **ARMALINE 1730** lining shall be prepared by gritblasting to remove all surface laitance, loose, weak and unbonded concrete and to open up air voids in vertical surfaces. All weak secondary surface screeds shall be removed. A properly prepared concrete surface shall have the texture of 60-80 grit.

6.2.3 Prior to commencement of application, the concrete shall be checked for dryness using the plastic sheet method (ASTM D4263-83).

6.2.4 After the confirmation of dryness, priming work will be carried out using the specified priming materials.

7.0 LINING SPECIFICATION

7.1 The lining material shall be **ARMALINE 1730**, a modified epoxy resin based lining system. The system comprises of; a prime coat of EP7 Primer, a resin basecoat and a resin topcoat. ARMALINE 1730 is installed by brush or roller to yield a thickness of 1.0 to 2.0 mm.

7.2 ARMATEC ARMALINE 1730 System Design

Item	Description	No. of Coats	Colour	Thickness (microns)
1st Primer	EP7 Primer	1	clear amber	50 – 125
Basecoat	ARMALINE 1730	1	Green	500 - 750
Topcoat	ARMALINE 1731	1	Green	500 - 750

Thickness range including fibreglass reinforcement : 1.0 to 2.0 mm
 Target dry film thickness : 1.5 mm
 Minimum dry film thickness : 1.0 mm



8.0 LINING APPLICATION

8.1 Blast Cleaning

All surfaces to receive lining shall be prepared by blast cleaning in accordance with Section 6.0. Delays between surface preparation and priming shall be avoided to prevent surfaces from being contaminated.

8.2 Patching

8.2.1 All large holes, irregularities, etc. in the concrete shall be filled prior to application of the basecoat to achieve a uniform working surface. Patching compound consists of a mixture of catalyzed ARMATEC EPOXY FILLER Resin and Powder to form a thixotropic putty like consistency. Typical batch includes 1 kg catalyzed liquid to 3 kg powder. More or less powder may be used to achieve desired consistency. The powder type is dependant on hole size and quantities.

8.2.2 All wall to floor and wall to wall joints shall be evenly covered at a minimum of 10 mm radius. The coving material shall be similar to that used for patching (see 8.2.1 above).

Patching and coving application shall be carried out after application of the ARMATEC EP7 Primer detailed in section 9.3.

8.3 Priming

8.3.1 Prior to application of prime coat, all subject concrete surfaces must be completely dry and confirmed by testing.

8.3.2 The blast cleaned concrete surfaces shall be primed by rolling or brushing one uniform coat of ARMATEC EP7 Primer. Minor areas of steel surface shall also be primed with ARMATEC EP7 Primer.

8.3.3 The time interval between application of the primer and the lining basecoat shall not exceed 7 days when exposed to direct sunlight. Otherwise, the interval shall be within 14 days or as directed by the ARMATEC Lining Application Advisor / QC Advisor.

8.3.4 Random wet film thickness shall be taken during application.

8.3.5 Application of the primer shall not proceed when environmental conditions described in Section 7.10 (a), (b), (c) or (d) exist.

8.4 Application of ARMATEC ARMALINE 1730 Basecoat

CAUTION: BLISTERS MAY FORM IF ARMALINE IS APPLIED IN DIRECT SUNLIGHT.

8.4.1 Prior to application of the lining basecoat, the primer shall be tack-free.



- 8.4.2 Primed surfaces that have been contaminated with dust shall be wiped with solvent and allowed to dry prior to lining to ensure removal of contamination.
- 8.4.3 Prior to application of the basecoat all components shall be mixed in strict accordance with ARMATEC recommendations observing material pot life and working time parameters.
- 8.4.4 Spread a uniform coat of ARMATEC ARMALINE 1730 basecoat onto the primed surface using a brush or roller to achieve a nominal thickness of 0.75 mm.
- 8.4.5 Random wet film thickness readings shall be taken and recorded during application of the basecoat.
- 8.5 Preparation of Basecoat**
- 8.5.1 Examine the hardened saturating coat before recoating. If it appears damp or has an oil film on it (amine blush) wash it with water and allow it to dry.
- 8.6 Application of ARMATEC ARMALINE 1731 Topcoat**
- 8.6.1 Prior to topcoat application, the basecoat shall be tack free and have set less than 7 days if exposed to direct sunlight or 14 days in areas shaded from direct sunlight. The basecoat shall show no evidence of an oily film (amine blush).
- 8.6.2 Surfaces not meeting the time intervals of 8.6.1 above shall be abraded by sanding or blasting. At least 75% of the original surface must be uniformly prepared prior to application of the topcoat.
- 8.6.3 All dust and contamination generated by preparation work shall be removed by air blowing or vacuuming and wiping with an approved solvent.
- 8.6.4 Application of the topcoat shall not proceed when any of the environmental conditions described in Section 6.3.4 (a), (b), (c), or (d) exist.
- 8.6.5 Prior to application of the topcoat all components shall be mixed in strict accordance with ARMATEC recommendations observing material pot life and working time parameters.
- 8.6.6 Spread a uniform coat of ARMATEC ARMALINE 1730 Resin topcoat mixture onto the basecoat layer using a brush or roller to achieve a nominal thickness of 0.75 mm.
- Random wet film thickness readings shall be taken and recorded during installation.
- 8.7 Finishing**
- 8.7.1 While topcoat is still wet lightly brush out trowel marks using a paint brush and XYLENE smoothing liquid. Optionally, topcoat may be rolled with a short nap roller and XYLENE. Liberal or excessive use of XYLENE must be avoided.
- 8.8 Terminations**



- 8.8.1 All temporary lining terminations as work progresses, or at the completion of each day's work, shall be progressively stepped back to expose no less than 25 mm each of primed surface, base coat.
 - 8.8.2 At stainless steel fittings the lining shall extend no less than 25 - 50 mm over the grit blasted and primed surface of the stainless steel. The balance of stainless steel surfaces shall be protected from grit blasting and lining.
 - 8.8.3 Masking tape shall be removed from terminations prior to curing of the lining.
 - 8.8.4 All permanent lining terminations shall be keyed into the surface in accordance with ARMATEC lining procedure details.
 - 8.8.5 The lining shall extend no less than 20 mm into all hacked or formed recesses for terminating lining at through wall pipes.
 - 8.8.6 The lining shall extend across the top of walls at all open top tanks.
- 8.9 Through Wall Pipes**
- 8.9.1 At all through wall pipes linings shall terminate according to ARMATEC lining procedures.
 - 8.9.2 Pipes above normal liquid levels shall have lining terminate into a formed groove in the concrete around the circumference of the pipe. The groove shall be filled with CEILCOTE EJ-4 flexible sealant.
 - 8.9.3 Pipes below normal liquid level shall have linings terminate as in clauses 8.9.2 and in addition the CEILCOTE EJ-4 sealant shall be overlaid with one layer of saturated 450 gsm CSM onto the pipe extension. If no pipe extension exists a larger recess will first be formed and then after lining the pipe, will be grouted with a grout mixed using ARMATEC EPOXY FILLER Resin.
- 8.10 Expansion Joints**
- 8.10.1 All expansion joints shall be formed in accordance with ARMATEC procedures.
 - 8.10.2 At expansion joints the lining will extend into the joint walls according to ARMATEC detail requirements.
- 8.11 Surface Mounted Supports and Machinery Footings**
- 8.11.1 Where possible surface mounted equipment and equipment supports shall be removed prior to the commencement of surface preparation.
 - 8.11.2 Where lining must be penetrated for hold down bolts, remove all drilling debris from hole and partially fill hole with catalyzed resin (ARMATEC EPOXY FILLER Resin) through support base plate. The expanding bolt shall then be inserted allowing excess resin to over flow and fill any void under the base plate. Tighten down the holding down bolt then remove excess resin from around the support base plate using T410 cleaning solvent.



Where surface mounted machinery or supports cannot be removed ARMATEC shall be consulted for alternative methods of sealing the floor around the machinery or support. Two typical methods are either encasing the base plate in epoxy resin grout to a height of 50 mm or using CEILCOTE EJ-3 or CEILCOTE EJ- 4 flexible joint compound. Both methods require metal base plate to be thoroughly cleaned prior to commencement of work.

9.0 INSPECTION AND TESTING

9.1 Instruments

The following or equivalent instruments are required for quality control inspection and testing.

- (a) Surface thermometer with a range between 0°C and 120°C.
- (b) Sling psychrometer and U.S. Weather Bureau Psychrometric Tables or Dew Point & Relative Humidity Calculator.
- (c) Holiday Detector with audible alarm suitable for use up to 10,000 volts.
- (d) Wet film thickness gauges suitable for measuring up to 2.0 mm.

9.2 Concrete Surface Inspection

- 9.2.1 Prior to commencement of lining operations concrete surfaces shall be inspected by the applicator for any conditions which do not conform to the Specification and rectification shall be carried out as required to meet the specified requirements.
- 9.2.2 The degree of roughness achieved by grit blasting shall as a minimum be comparable with the surface texture of 60 - 80 grit sand paper. Excess roughness should be avoided however all 'Bug-Holes' must be fully opened.
- 9.2.3 Prior to commencement of lining operations the concrete surfaces shall be tested by the applicator for dryness in accordance with Section 5.7.
- 9.2.4 Prior to application of the primer blast cleaned concrete surfaces shall be visually inspected by the applicator for compliance with specified requirements.

9.3 Wet Film Thickness Testing

Random wet film thickness tests shall be taken by the applicator during the installation of the designated lining system. Measurements shall taken on the basecoat and topcoat layers as a guideline.

9.4 Spark Testing



- 9.4.1 The finished lining system shall be spark tested to determine the presence of pinholes.
- 9.4.2 Spark testing and repairs, if any, shall be complete prior to the application of optional resin topcoats.
- 9.4.3 The voltage required shall generally be based on 4 volts per micron of coating thickness and shall be limited to 16,000 volts maximum.
- 9.4.4 After sparktesting equipment, earthing tags shall be removed. If these are sited within the lined area the surface shall then be patched and lining repaired as necessary.

10.0 LINING REPAIRS

10.1 Pinholes

- 10.1.1 Blast or grind back to the basecoat layer at the pinhole and feather the lining back for a distance of 50 mm to 75 mm.
- 10.1.2 Wipe the prepared area with solvent to remove dust and allow to dry.
- 10.1.3 Apply a layer of topcoat material, checking wet film thickness to achieve proper lining thickness.
- 10.1.4 After cure, re-spark test the repair area only.
- 10.1.5 Repeat steps 101.1 through 10.1.4 until no pinholes can be detected.

11.0 QUALITY CONTROL DOCUMENTATION

The following data shall be recorded each working day in the Field Daily Inspection Reports.

- (a) Wet-bulb temperature, dry-bulb temperature, surface temperature, relative humidity and dew point before the start of each work shift and at intervals of 4 hours thereafter.
- (b) Concrete surface cleanliness.
- (c) Concrete surface condition.
- (d) Concrete surface preparation.
- (e) Wet film thickness of basecoat and topcoat.
- (f) The number of pinholes and their location in accordance with Section 9.4.
- (g) Check of compressed air.



(h) Check of blasting grit.

12.0 OWNER REPRESENTATIVE AND 3RD PARTY INSPECTIONS

Owner and 3rd party inspection shall coincide with applicator testing described in Section 9.0 where applicable. This is particularly important for spark testing where additional repeated spark testing may damage lining and shall not be performed without the prior approval of ARMATEC.



APPENDIX A Metric Mixing Ratios For ARMATEC ARMALINE 1730 Lining

Primer Coat

ARMATEC EP7 Primer : Mix 2 parts EP7 Primer Part A (6.67 kg) to 1 Part EP7 Primer Part B (3.33 kg) or multiples thereof this proportion.

ARMALINE Epoxy Filler

ARMATEC Epoxy Filler : Mix 2 parts Epoxy Filler Part A to 1 Part Epoxy Filler Part B resin or multiples thereof this proportion.

Powder : Mix approx. 2.1 kg to 2.5 kg Powder to 1.0 kg of catalysed Epoxy Filler resin or multiples thereof this proportion.

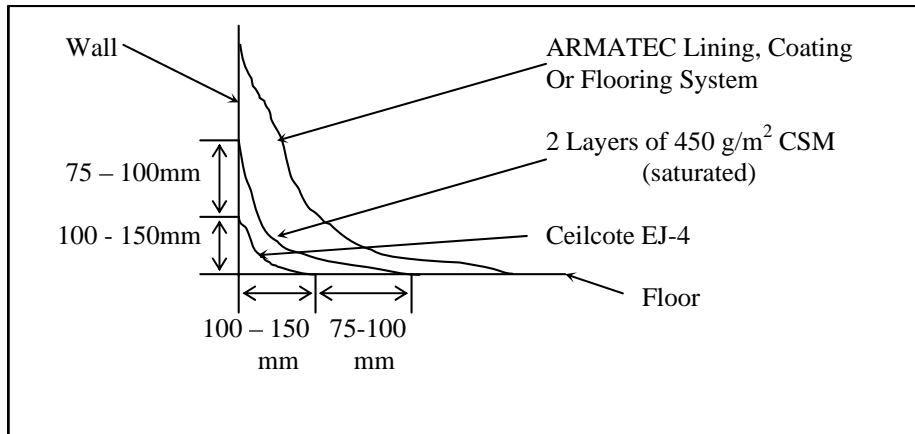
ARMALINE 1730 Basecoat

ARMATEC ARMALINE 1730 : Mix 2 parts ARMALINE 1730 Part A (6.67 kg) to 1 part ARMALINE 1730 Part B (3.33 kg) or multiples thereof this proportion.

ARMALINE 1731 Topcoat

ARMATEC ARMALINE 1731 : Mix 2 parts ARMALINE 1731 Part A (6.67 kg) to 1 part ARMALINE 1731 part B (3.33 kg) or multiples thereof this proportion.

APPENDIX C Joint Detail For Concrete Floor & Wall Junction



- 1 Abrasive blast concrete joint surface, approximately 6-10" on vertical and horizontal side where required.
- 2 Prime prepared concrete joint surface with ARMATEC EP7 Primer 50 – 100 microns thick, which will receive the CEILCOTE EJ-4 expansion joint material (100 – 150 mm on each side of the crack). Mix per data sheet instructions and allow to cure.
- 3 Repair rough concrete areas with primer and CEILCOTE S1 or S11 Powder, depending on size of repair.
- 4 Apply CEILCOTE EJ-4 with a trowel 1.0 – 3.0 mm thick, 100 – 500 mm on either side of wall junction and allow to cure.
- 5 Layout and saturate fiberglass mat (450 g/m² CSM). Use ARMATEC EP7 Primer. Be sure to overlap on both sides of the basecoat at 75 – 100 mm.
- 6 While the layer of mat is still wet, repeat with a second layer of 450 g/m² CSM. Remove entrapped air with a ribbed roller, no white spots should be obvious on fiberglass, and allow to cure.
- 7 After curing (generally the next day), grind off any imperfections or protrusions and feather edges.
- 8 Proceed with normal installation or repair procedures of product. For heavy splash and spill or immersion conditions with use of coating systems, two coats may be required. Contact ARMATEC.
- 9 This is designed to handle approximately 0.75 – 1.5 mm crack movement.



APPENDIX D Bridge Joint Details for Concrete Cracks

- 1 This procedure is recommended for use in conjunction with ARMATEC chemical resistant systems over joints or cracks where small amounts of movement (opening) will occur.
 - This joint detail provides limited crack bridging capability by dis-bonding a portion of the lining/coating over the crack to allow a finite “stretching length” of lining for the displacement to occur.
 - Maximum movement capability is 0.025mm per mm of un-bonded width.
 - There will be a greater thickness at the joint because of the added layers.
 - This type of joint may “bulge” outward if the joint closes narrower than at time of installation.

- 2 The concrete surface should first be prepared and primed for the lining, coating or floor system to be installed.

- 3 A bond breaker should be installed over the crack or joint. This is normally 100-150mm wide but will depend upon the movement expected. The bond breaker layer may consist of tape, polyethylene or other plastic film, or a flexible layer such as Ceilcote EJ-3 or EJ-4 expansion joint material.

- 4 A reinforcement layer should be applied over the dis-bonded area extending 150mm onto the primed concrete on each side of the dis-bonded area. The reinforcement layer should consist of two layers of 450gsm chopped strand fibreglass mat saturated with the catalysed primer resin (ARMATEC EP7 Primer).

- 5 After the reinforcement has cured (usually overnight) the lining or coating system should be applied over the reinforcement.