TECHNICAL BULLETIN – TB189

FAÇADE RESTORATION

12 August 2013

INTRODUCTION & SCOPE

This technical bulletin details the necessary preparation procedures for the repair and reinstatement of damaged concrete and façade surfaces and the application of an anti-carbonation membrane.

Several aspects of the repair and coating schedule are covered in each of the following sections.

STRUCTURAL CONSIDERATIONS

This technical bulletin incorporates a fairing and patch repair mortar suitable for the repair of damaged or spalled concrete. Consultation with a structural engineer should be made on soundness of substrate prior to any repair or application of repair mortars.

CORROSION PROBLEMS WITH FACADES

CONCRETE SPALLING

Concrete is highly alkaline (pH 11–12) and creates a passive environment around steel reinforcement. While the passive environment exists, the reinforcing steel will not rust and concrete spalling will not occur. This passive environment can be destroyed by acid attack neutralising the alkalinity of the concrete or by insufficient concrete cover over the steel reinforcement. When steel reinforcement rusts it can expand to about 10 times its original volume, thereby creating tensile forces within the concrete, hence the onset of concrete spalling.

BRICKS

Brick structures can frequently exhibit fretting where the brick loses its integral strength and starts to powder causing erosion of the surface. Fretting mostly occurs in low temperature fired bricks as they are more porous than the high temperature fired types. These are usually exposed face brick. High fired bricks (construction grade) are also very susceptible because of cracks and fissures in the surface. A major cause of bricks fretting is acid attack caused by chloride ion forming acids in contact with water. Note that a second major cause of bricks fretting is ground soil acid attack.

ANTI-CARBONATION COATING REQUIREMENTS

Anti-carbonation coatings are surface treatments that have a high resistance to carbon dioxide and protect concrete from carbonation. These coatings should offer an exceptional level of protection from the elements and long term barrier against carbon dioxide, water and oxygen, while enhancing the exterior appearance of the building. They should also exhibit excellent weatherability, offer very good ageing properties and be water and alkali resistant, and should mask unavoidable surface irregularities after repair of concrete spalling.

Anti-carbonation coatings, while having a low permeability to carbon dioxide, should at the same time allow passage of water vapour through the membrane to avoid build up of vapour pressure behind the coating. This requirement is assisted by the fact that the molecular size of carbon dioxide is larger than that of water.

Note: Hydrophobic pore-lining and pore blocking materials, such as silanes, siloxanes and silicates, are not effective in controlling carbonation as they have no crack bridging properties and do not keep out carbon dioxide.

Ardex offers one general purpose façade membrane, ARDEX WPM 310 and one anti-carbonation membrane, ARDEX WPM 330 Façade.

ARDEX WPM 310 is a general purpose façade membrane which offers good water vapour transmission, but does not resist carbon dioxide, chloride and sulfide ion attack. This membrane is more suitable in areas where atmospheric salt levels are low such as distant from the coast and in areas of low atmospheric carbon dioxide or sulfide ion such as outer urban and country areas

ARDEX WPM 330 Façade membrane is the preferred membrane where high levels of sulfide ions normally exist in high traffic areas, such as: CBD's from vehicle emissions and some industrial areas, e.g., around petroleum refineries; high salt laden atmospheres, such as 5 – 7km from the coast. This distance may vary, such as in Perth where the risk distance is far greater because of the "Freemantle Doctor", driving spray inland.

FAÇADE SURFACE PREPARATION

PREPARATION

1. The obvious thing to do when confronted with corrosion damage is to cut out the damaged areas, replace any steel weakened by section loss and reinstate good quality concrete. However there are several problems with this approach:
   - cutting out the area of damage may leave many areas that are about to crack and spall. As a result of the electrochemical nature of the corrosion process, repairs can actually lead to an acceleration of corrosion in adjacent areas, especially with chloride-induced corrosion, as the removal of the corroding anode also causes the loss of the protective cathodes around it and new anodes form when the material is renewed;
   - the repairs may be visually intrusive as it is very difficult to match the concrete used for repair to the colour and texture of the original and it is almost impossible to get the new material to weather in the same way.
2. Signs of concrete spalling or mechanical damaged should be repaired with a suitable repair mortar prior to the application of any liquid applied membrane.
3. Reinforcing steel around spalled concrete areas should be exposed back to clean un-corroded steel with a wire brush to the extent that allows access to all surfaces of the steel. Suitably prepared reinforcing steel shall be primed with ARDEX B34 corrosion inhibiting primer.
4. Concrete substrate surfaces to be coated must be clean, sound, and free from oil, grease, form release agents, bond breakers and other contaminants. Loose or flaking paint must be removed or firmly bonded to the substrate. Concrete surface pores must be open to enable good adhesion.

5. Brick surfaces should be bagged or rendered or have the mortar joints flush with the surface, prior to the application of any façade membrane. This is required as mortar joints may shrink and crack over time.

PRIMING

After all damaged concrete and steel reinforcement has been removed and made good prime the repaired areas with ARDEX B34 Anti-corrosive primer. Ensure the full circumference of the steel reinforcing bar is fully primed. The ARDEX B34 should be mixed with approximately 230mL of water per kilogram of powder and blended to a smooth consistency.

a. Weigh the appropriate amount of water into a clean container and then add the powder to the water while mixing with a heavy duty mixing paddle on slow-medium speed (approx 400 – 600 rpm). Once all of the powder has been added, mix for approximately 2 – 3 minutes to fully homogenise.

b. Apply the ARDEX B34 Anti-corrosive primer with a paint brush to a thickness of approximately 2mm to the suitably prepared reinforcing steel and concrete.

PATCHING

While the ARDEX B34 is still wet apply ARDEX B36 Patching Mortar to the primed areas. ARDEX B36 should be mixed with approximately 175mL of water per kilogram of powder.

a. Measure the appropriate amount of water into a clean container and then add approximately half to two-thirds of the powder to the water while mixing with a heavy duty paddle mixer on slow-medium speed (approx. 400 – 600 rpm). Mix to fully wet out the powder. Add the remaining powder and mix until it is fully dispersed. Once all of the powder has been added, mix for approximately 2 – 3 minutes to fully homogenise.

b. Apply the ARDEX B36 using a trowel or by hand (wearing chemical resistant gloves) to the primed areas. Ensure that ARDEX B36 is sufficiently forced or compacted into cracks and holes and that all voids are filled.

FAIRING

The ARDEX B36 Patching Mortar should be allowed to dry for approximately 7 days prior to overcoating with a façade coating. However, if the surface of the ARDEX B36 Patching mortar is coarser than the surrounding concrete then ARDEX B34 can be used as a fairing coat that will provide a smoother finish. The ARDEX B34 should be mixed with approximately 200mL of water per kilogram of powder and mixed to a homogenous consistency.

a. Weigh the appropriate amount of water in a suitable container and then add the powder to the water while mixing with a heavy duty electric drill and mixing paddle on a slow-medium speed (approx 400 – 600 rpm). Once all of the powder has been added, mix for approximately 2 – 3 minutes to fully homogenise.

b. Apply the ARDEX B34 with a trowel over pre-dampened ARDEX B36.

APPLICATION OF FAÇADE MEMBRANES

Note:

- Where damaged areas of the façade substrate have only been treated with ARDEX B34 as a fairing coat then they should be allowed to dry for at least 16 hours prior to overcoating with a façade membrane.

- Where the ARDEX B36 patching repair mortar has been used in conjunction with the ARDEX B34 Fairing mortar, they shall be allowed to dry thoroughly for at least 7 days prior to overcoating with a façade membrane.

1. All façade substrates should be dry and have moisture content less than 5% prior to coating with a façade membrane. All façade surfaces to be coated shall be clean, sound and free from oil, grease, form release agents or bondbreakers and other contaminants.
2. Façade substrates having existing coats shall be high pressure water cleaned with a neutral detergent and allowed to dry thoroughly prior to over coating with a façade membrane. Areas having loose or flaking paint must be removed to a firmly bonded substrate. Irregular surfaces resulting from peeled paint should be smoothed using ARDEX B34 Fairing mortar.
3. Concrete surface pores must be open to enable good adhesion.
4. ARDEX WPM 310 or WPM 330 Façade membranes can be applied directly over hairline cracks that are less than 0.3mm in width. All other cracks should be treated with a neutral cure silicone, such as ARDEX ST silicone and preferably after priming. Other deep surface imperfections should be repaired using ARDEX B34 or B36 and allowed to cure for 7 days before applying the membrane.
5. Apply to all surfaces a primer coat of ARDEX WPM 270 solvent based primer at a rate of 6m^2 per litre. Allow the primer to dry for at least 30 minutes prior to proceeding with ARDEX WPM 310 or WPM 330 Facade. AAC (Hebel) or other highly porous surfaces may require two coats.
6. Apply ARDEX WPM 310 or WPM 330 Façade with a nap roller, textured roller or paint brush. Ensure that the coating is applied evenly at the recommended coverage rates.

SURFACE FINISH OF FAÇADE MEMBRANES

The surface finish achieved can be varied by selection of method of application. Prior to the commencement of any project it is recommended that a sample of the finish be prepared for approval and that finish shall act as the standard.

Surface Finish Profile	Roller Type	
	1st Coat	**2nd Coat**
High Texture	Medium Texture	Medium Texture
Medium Texture	Nap	Medium Texture
Low Texture	Medium Texture	Nap
Ripple Texture	Nap	Nap

The length of the roller nap will vary the profile of the texture although the nap length must suit the substrate.

A 12 – 15mm nap produces a low surface profile while a 15 – 24mm nap produces a higher surface profile.

IMPORTANT
This Technical Bulletin provides guideline information only and is not intended to be interpreted as a general specification for the application/installation of the products described. Since each project potentially differs in exposure/condition specific recommendations may vary from the information contained herein. For recommendations for specific applications/installations contact your nearest Ardex Australia Office.

DISCLAIMER
The information presented in this Technical Bulletin is to the best of our knowledge true and accurate. No warranty is implied or given as to its completeness or accuracy in describing the performance or suitability of a product for a particular application. Users are asked to check that the literature in their possession is the latest issue.

REASON FOR REVISION
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