

TECHNICAL BULLETIN – TB133

APPLICATION OF ARDEX OPTIMA AND X56 TO METAL SURFACES FOR TILING

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INTRODUCTION & SCOPE

In some situations tiling may be done over metal surfaces. Examples of this are ship decks, metal fittings on wall cappings or stair treads and in this bulletin we will look at the issues involved in this application.

BACKGROUND CONSIDERATIONS

Metal is a completely different substrate to the 'usual' surfaces that are tiled such as masonry or fibre-cement. It is quite flexible, has very high thermal movement properties, is completely non-porous and can be subject to corrosion both from environmental conditions when in contact with the adhesives.

The most common metal surfaces to be tiled are galvanised or Zinalume[®] coated mild steel, stainless steel sheet or shower trays, copper shower trays, aluminium surfaces and ships decks which can be steel or an aluminium alloy.

Stainless steel and copper (though it does develop an oxide layer) are not subject to significant corrosion. Galvanised steel is also protected from corrosion by its coating and Zinalume[®] is also corrosion resistant, but is a thinner coating. Mild steel in contrast is subject to corrosion so must be protected, and aluminium or zinc are attacked by the alkalinity in the cement base of the adhesives.

Aluminium surfaces develop a coating of oxide which generally protects the surface, except where there is salt corrosion such as a seaside environment.

PROTECTION

A number of the metal surfaces require priming both to obtain a good bond, but also to protect the surface of the metal from corrosion. The best primers for these surfaces are an epoxy based primer which normally provides a good bonding surface for the adhesive and protection for the metal.

In the case of maritime applications a specific marine two part epoxy primer is recommended.

The use of galvanised metal primers which contain aluminium and zinc powder is not recommended as the alkalinity in the cement part of the adhesive can react with the metal component and create hydrogen gas with subsequent de-bonding and corrosion.

RESTRICTIONS

The following applications are not recommended -

- ✎ Tiling over metal in ponds, swimming pools, spa or near coastal environments as there are risks related to corrosion of the metal in contact with saltwater or chlorinated water, and also deformation of the metal, as opposed to problems with adhesive bond.
- ✘ Direct tile adhesion to aluminium or zinc.
- ✘ The application of tiles to metal areas that are subject to high thermal stress such as metal panels exposed to the sun. The stresses resulting from temperature changes and movements could result in adhesion problems.
- ✘ The application of tiles over highly deformable steel structure surfaces.

The following applications require careful consideration before proceeding –

- The use of alkyd based, or epoxy modified metal primers (on metal substrates appropriate for these primers) as these are not designed to carry the weight of tiles in vertical applications.
- The application of tiles to steel stair treads where there can be significant deflection and loading which may exceed the capabilities of the tiling system (e.g. size of tile and choice of adhesive).

SURFACE PREPARATION AND ADHESIVES - BUILDINGS

The following tables list the recommended preparation and adhesives for internal and external applications.

LOCATION	SUBSTRATE	SURFACE PREPARATION	PRIMING	ADHESIVE
Internal	Stainless steel sheet	De-oiled with Methylated Spirits Abrasive cleaned ³ , vacuumed and dried	*Optional ARDEX P9 ARDEX P82	Optima X56
	Stainless steel shower trays	De-oiled and surface roughened ²	Optional ARDEX P9	Optima
		Sand/cement screed is required for falls		X56
	Copper shower trays	Sanded ² and remove all oxidation	Optional ARDEX P9	Optima
		Sand/cement screed is required for falls		X56
	Mild Steel	Degrease with Methylated Spirit, Detergent wash and Abrasive clean ^{2 or 3} to remove scale or corrosion	Epoxy modified alkyd anticorrosive primer or epoxy two pack primer Optional ARDEX P9 ARDEX P82	Optima X56
	Galvanised steel	Clean with Detergent & Light scour ²	Epoxy two pack primer Optional ARDEX P9 ARDEX P82	Optima X56
Galvanised steel with spangled surface or Zinalume [®]	Properly sanded ²	Epoxy two pack primer Optional ARDEX P9 ARDEX P82	Optima X56	
	Aluminium	Abraded ^{2 or 3} to remove oxide coating	Epoxy two pack primer Optional ARDEX P9 ARDEX P82	Optima X56

*Optional – additional ARDEX primer is an extra process which can improve bond performance.

ARDEX P82 is for dry internal applications.

LOCATION	SUBSTRATE	SURFACE PREPARATION	PRIMING	ADHESIVE
External It is suggested that shaded areas are preferred as direct sun exposure can create differential movements	Stainless steel sheet	De-oiled with Methylated Spirits Abrasive cleaned ³ , vacuumed and dried	NA	Optima
	Mild Steel	Degrease with Methylated Spirit, Detergent wash and Abrasive clean ^{2 or 3} to remove scale or corrosion	Epoxy modified alkyd anticorrosive primer or epoxy two pack primer	Optima
	Galvanised steel	Clean with Detergent & Light scour ²	Epoxy two pack primer	Optima
	Galvanised steel with spangled surface or Zinalume [®]	Properly sanded ²	Epoxy two pack primer	Optima
	Aluminium	Abraded ^{2 or 3} to remove oxide coating	Epoxy two pack primer	Optima
	Colorbond [®] Steel	Degrease with Methylated Spirit, Detergent wash properly sand ²	NA	Optima

Colorbond[®] & Zinalume[®] are registered trademarks of BlueScope Steel
 Super script 2 refers to S.S.P.C-SP2 and superscript 3 to S.S.P.C-SP3.

TILING ON SHIPS AND BOATS

Where the substrate is a nautical vessel the following recommendations apply –

Steel decking

1. Remove oil and grease in accordance with S.S.P.C. – SP1 solvent cleaning.
2. Metal Surfaces to be prepared to minimum Standard of Sa 2.5, (ISO 8501-1 2007) or S.S.P.C.-SP6 abrasive blast with non-metallic abrasive (Garnet) in accordance with the manufactures requirements for the application of a steel epoxy primer. (See definitions for S.S.P.C. requirements).
3. Vacuum to remove all trace of loose particles, dust, all foreign matter, and ensure the surface is dry before proceeding.
4. Install a two part epoxy primer e.g. INTERGARD 269 as recommended by the steel/protective coatings manufacturers.
5. ARDEX recommends INTERGARD 269 (International Marine Coatings –Akzo Nobel) installed at min 40 microns D.F.T @ 25°C as per manufactures instructions.
6. Allow the two part epoxy primer to dry thoroughly, minimum 3 days until full cure, as per manufacturer's recommendations.
7. Ensure the epoxy primer surface is free from salts, foot traffic grime, dust, steel shavings, fillings, or particles, and any other foreign matter prior to application of ARDEX *Optima* adhesive.
8. Grouting (1-8mm width) shall be done using ARDEX FG8 Grout mixed with ARDEX Grout Booster in the ration of 80% Grout Booster to 20% clean cool water.
9. We suggest that the installation proceed at ambient and substrate temperatures between 15 and 25°C.



Aluminium decking

1. It is absolutely essential that the aluminium decking is solid, firm and well bonded. Aluminium deflects more easily than steel and therefore it is necessary that the aluminium be especially well attached and deflection is less than 1/360 the span of the hull ribs.
2. We suggest that the installation proceed at ambient and substrate temperatures of 15 - 25°C
3. Although not subject to the same type of "rusting" that steel is, it is necessary to protect the aluminium from oxidising and forming salts. We therefore suggest that the aluminium decking be coated with the same two part epoxy protective coating primer as steel, INTERGUARD 269.
4. Preparation of the aluminium surface to receive a two part primer shall be done in strict accordance with procedures as outlined by the coatings manufacturer.
5. Remove oil and grease in accordance with S.S.P.C.-SP1 solvent cleaning - brush blast to obtain a mechanical profile for coating adhesion, as per the coatings manufacturers written instructions.

Further preparation and installation is the same as for steel decking.

ARDEX Technical Bulletin TB100 covers the installation of floor smoothing cements on to metal decking and these make suitable underlayments for tiles.

Always install test areas to determine the suitability of the product for the intended purpose.

CONCLUSIONS

Tiling on metal surfaces can be achieved with the correct surface preparation and the use of a flexible adhesive. However, metal surfaces which are exposed to full sunshine and weathering should be considered as risky surfaces to tile onto.

DEFINITIONS FOR SURFACE PREPARATION

The following definitions are derived from the Steel Structures Painting Council guidelines.

SSPC-SP-1

Solvent Cleaning - Removal of all detrimental foreign matter such as oil, grease, dirt, soil, salts, drawing and cutting compounds, and other contaminants from steel surfaces by the use of solvents, emulsions, cleaning compounds, steam or other similar materials and methods which involve a solvent or cleaning action.

SSPC-SP-2/St 2

Hand Tool Cleaning - Removal of all rust scale, mill scale, loose rust and loose paint to the degree specified by hand wire brushing, hand sanding, hand scraping, hand chipping or other hand impact tools or by a combination of these methods. The substrate should have a faint metallic sheen and also be free of oil, grease, dust, soil, salts and other contaminants.

SSPC-SP-3/St 3

Power Tool Cleaning - Removal of all rust scale, mill scale, loose paint, and loose rust to the degree specified by power wire brushes, power impact tools, power grinders, power sanders or by a combination of these methods. The substrate should have a pronounced metallic sheen and also be free of oil, grease, dirt, soil, salts and other contaminants. Surface should not be buffed or polished smooth.

SSPC-SP6/Sa 2/NACE 3

Commercial Blast Cleaning - Removal of mill scale, rust, rust scale, paint or foreign matter by the use of abrasives propelled through nozzles or by centrifugal wheels, to the degree specified. A commercial blast cleaned surface finish is defined as one from which all oil, grease, dirt, rust scale and foreign matter have been completely removed from the surface and all rust, mill scale and old paint have been completely removed except for slight shadows, streaks, or discolorations caused by rust stain, mill scale oxides or slight, tight residues of paint or coating that may remain; if the surface is pitted, slight residues of rust or paint may be found in the bottom of pits; at least two thirds of each square inch of surface area shall be free of all visible residues and the remainder shall be limited to the light discoloration, slight staining or tight residues mentioned above.



SSPC-SP-10/Sa 2^{1/2}/NACE 2

Near-White Blast Cleaning - Removal of nearly all mill scale, rust, rust scale, paint, or foreign matter by the use of abrasives propelled through nozzles or by centrifugal wheels, to the degree hereafter specified. A Near-White Blast Cleaned Surface Finish is defined as one from which all oil, grease, dirt, mill scale, rust, corrosion products, oxides, paint or other foreign matter have been completely removed from the surface except for very light shadows, very slight streaks or slight discolorations caused by rust stain, mill scale oxides, or light, tight residues of paint or coating that may remain. At least 95 percent of each square inch of surface area shall be free of all visible residues, and the remainder shall be limited to the light discoloration mentioned above.

The Australian Standard AS1627 Parts 0-4 1997-2005 also gives details for the surface preparation of metals. Part 1 deals with degreasing, Part 2 power tool cleaning and Part 4 abrasive blasting.

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

24 month review. Addition of optional recommendations for ARDEX P9 and P82

REVIEW REQUIRED

24 months from issue. Updating of dates for AS1627.

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