TECHNICAL BULLETIN – TB133

APPLICATION OF ARDEX OPTIMA AND X56 TO METAL SURFACES FOR TILING

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INTRODUCTION & SCOPE

Sometimes, tiling may be done over metal surfaces such as ship decks, metal fittings on wall capping, or stair treads. This bulletin will examine the issues involved in this application.

BACKGROUND CONSIDERATIONS

Metal is a completely different substrate from the 'usual' tiled surfaces, 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 from environmental conditions when in contact with the adhesives.

The most common metal surfaces to be tiled are galvanised or Zincalume®

coated mild steel, stainless steel sheet or shower trays, copper shower trays, aluminium surfaces, and ship decks, which can be steel or an aluminium alloy.

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

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

PROTECTION

Several metal surfaces require priming to obtain a good bond and protect the surface from corrosion. The best primers for these surfaces are epoxy-based primers, which normally provide 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, spas, or near coastal environments as there are risks related to metal corrosion in contact with saltwater or chlorinated water, and metal deformation, as opposed to problems with the adhesive bond.

- ✕ Direct tile adhesion to aluminium or zinc.
- ✕ Tiles can be applied 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 that 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] Sand/cement screed is required for falls.	Optional ARDEX P9	Optima X56
	Copper shower trays	Sanded[2] and remove all oxidation Sand/cement screed is required for falls.	Optional ARDEX P9	Optima 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	Optima X56

			ARDEX P9 ARDEX P82	
	Galvanised steel with spangled surface or Zincalume®	Properly sanded[2]	Epoxy two-pack primer Optional ARDEX P9 ARDEX P82	Optima X56
	Aluminium	Abraded[2 or 3] to remove the oxide coating	Epoxy two-pack primer Optional ARDEX P9 ARDEX P82	Optima X56

*Optional – additional ARDEX primer is an extra process that 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 Zincalume®	Properly sanded[2]	Epoxy two-pack primer	Optima
	Aluminium	Abraded[2 or 3] to remove the oxide coating	Epoxy two-pack primer	Optima
	Colorbond® Steel	Degrease with Methylated Spirit, Detergent wash properly sand[2]	NA	Optima

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Superscript 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 a 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 manufacturer's requirements for the application of a steel epoxy primer. (See definitions for S.S.P.C. requirements).
3. Vacuum to remove all traces of loose particles, dust, and 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 installing INTERGARD 269 (International Marine Coatings –Akzo Nobel) at a minimum of 40 microns D.F.T @ 25ºC, per the manufacturer's instructions.
6. As per the manufacturer's recommendations, allow the two-part epoxy primer to dry thoroughly for at least three days until it reaches full cure.
7. Ensure the epoxy primer surface is free from salts, foot traffic grime, dust, steel shavings, fillings, particles, and any other foreign matter prior to applying *ARDEX Optima* adhesive.
8. Grouting (1-8mm width) shall be done using ARDEX FG8 Grout mixed with ARDEX Grout Booster in a ratio 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. The aluminium decking must be solid, firm, and well bonded. Aluminium deflects more easily than steel, so it must be especially well attached, and deflection must be 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 aluminium is not subject to the same type of "rusting" as steel, it is necessary to protect it 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. The aluminium surface shall be prepared to receive a two-part primer in strict accordance with procedures 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 manufacturer's written instructions.

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

ARDEX Technical Bulletin TB100 covers the installation of floor smoothing cements onto metal decking, and these make suitable underlayment for tiles.

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

CONCLUSIONS

Tiling on metal surfaces can be achieved with the correct surface preparation and use of a flexible adhesive. However, metal surfaces that are exposed to full sunshine and weathering should be considered 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 using solvents, emulsions, cleaning compounds, steam, or other similar materials and methods that 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 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 be free of oil, grease, dirt, soil, salts, and other contaminants. The 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 using 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 using 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 provides details for preparing metals' surfaces. Part 1 deals with degreasing, Part 2 with power tool cleaning, and Part 4 with 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.

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