TECHNICAL BULLETIN – TB136

APPLICATION OF CERAMIC TILES TO STAIR TREADS & LANDINGS – TIMBER AND METAL

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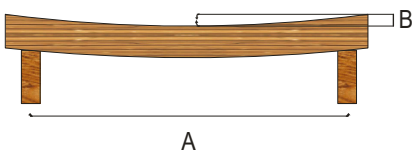
INTRODUCTION & SCOPE

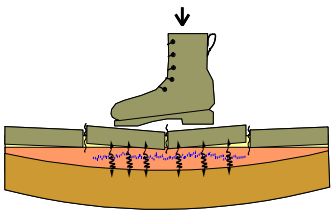
In order to match to the surrounding floor spaces, provide a hard covering, or to create a new appearance, ceramic tiles are being installed onto staircase treads. These staircases can be masonry, timber or even metal and whilst traditional masonry stairs are no different to a concrete subfloor in terms of application, timber and metal substrates create a series of challenges for the tile adhesive and grouts.

In this bulletin we will examine some of those challenges and look at possible solutions to the problems of tiling onto stair treads.

WHAT ARE THE CHALLENGES FOR TILING NON-MASONRY STAIR TREADS?

The greatest physical challenge to overcome in tiling timber or metal stair treads is the high degree of movement and vibration that stairs are subjected to. For example, a metal staircase often has a skeleton type frame, and most spiral staircases are made of steel. These staircases commonly vibrate significantly when walked on, and the treads are usually 6mm thick plate which can deflect when placed under load. A timber stair tread is normally thicker so is more rigid overall, but unless the span is kept within reasonable limits and a riser is in place the treads may still deflect more than the tile adhesive can handle. Also, where a larger span is used and the riser is at the very front of the tread, torsional deflections can result with the rear of the step twisting more.





The diagram shows a typical floor or step-tread with the bearer span shown as A and the deflection as B.

The tiling standard specifies that B must not exceed 1/360 of A.

For example:

Where A is 600mm B shall be <1.6mm

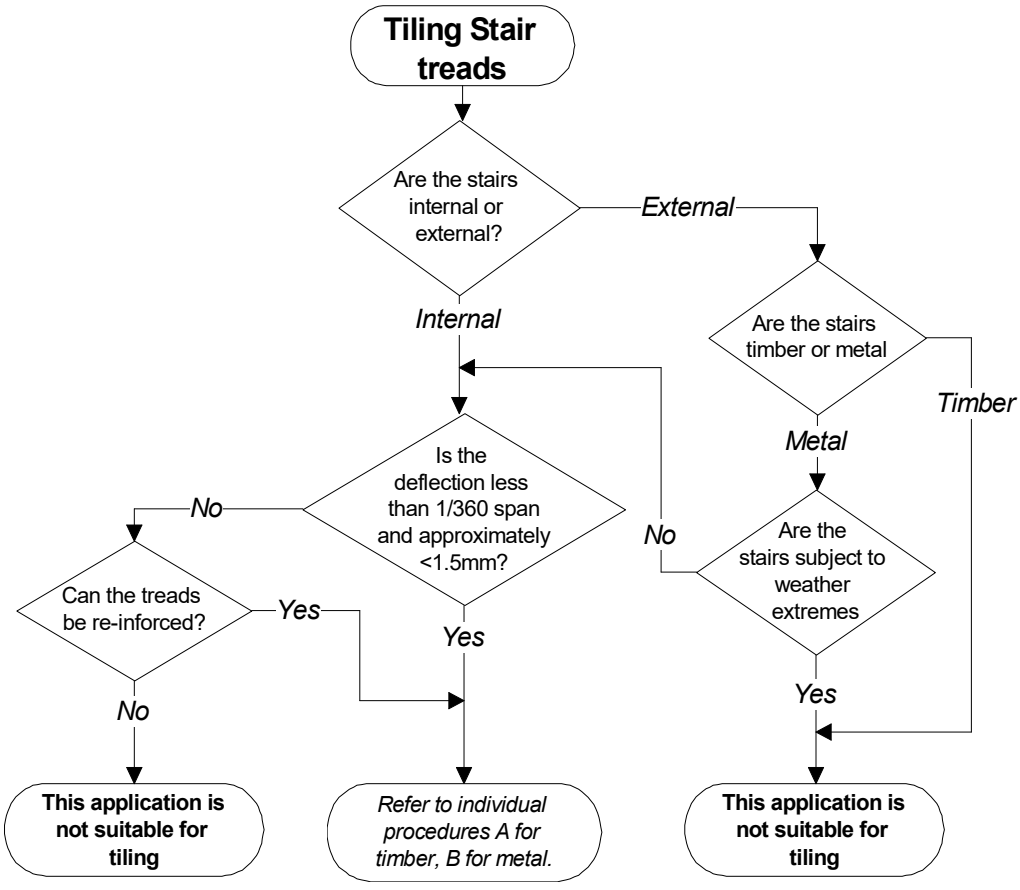
and where A is 450mm B shall be <1.3mm

Where the deflection exceeds the recommended limits, or the maximum permissible movement for the adhesive, the adhesive can shear which will result in de-bonded tiles and cracked and popping grout.

Where a large format tile is used, such as 600mm x 600mm porcelain, there can be problems where the tile spans a bearer or support, but is unsupported at the centre or edges, and so is subject to bending moments. Where the deflection is excessive the tiles can crack or de-bond.

The next issue to consider is obtaining a suitable bond to the tread surface. Timber can present problems with the wood's natural oils, and also the presence of coatings or other contaminants. Metal surfaces present some different problems in addition to surface oils and contaminants. They can have a surface layer of atmospheric corrosion or be susceptible to corrosion from the adhesive itself. For example, aluminium and zinc-aluminium galvanised surfaces are attacked by the alkaline compounds (i.e. cement) in the adhesive.

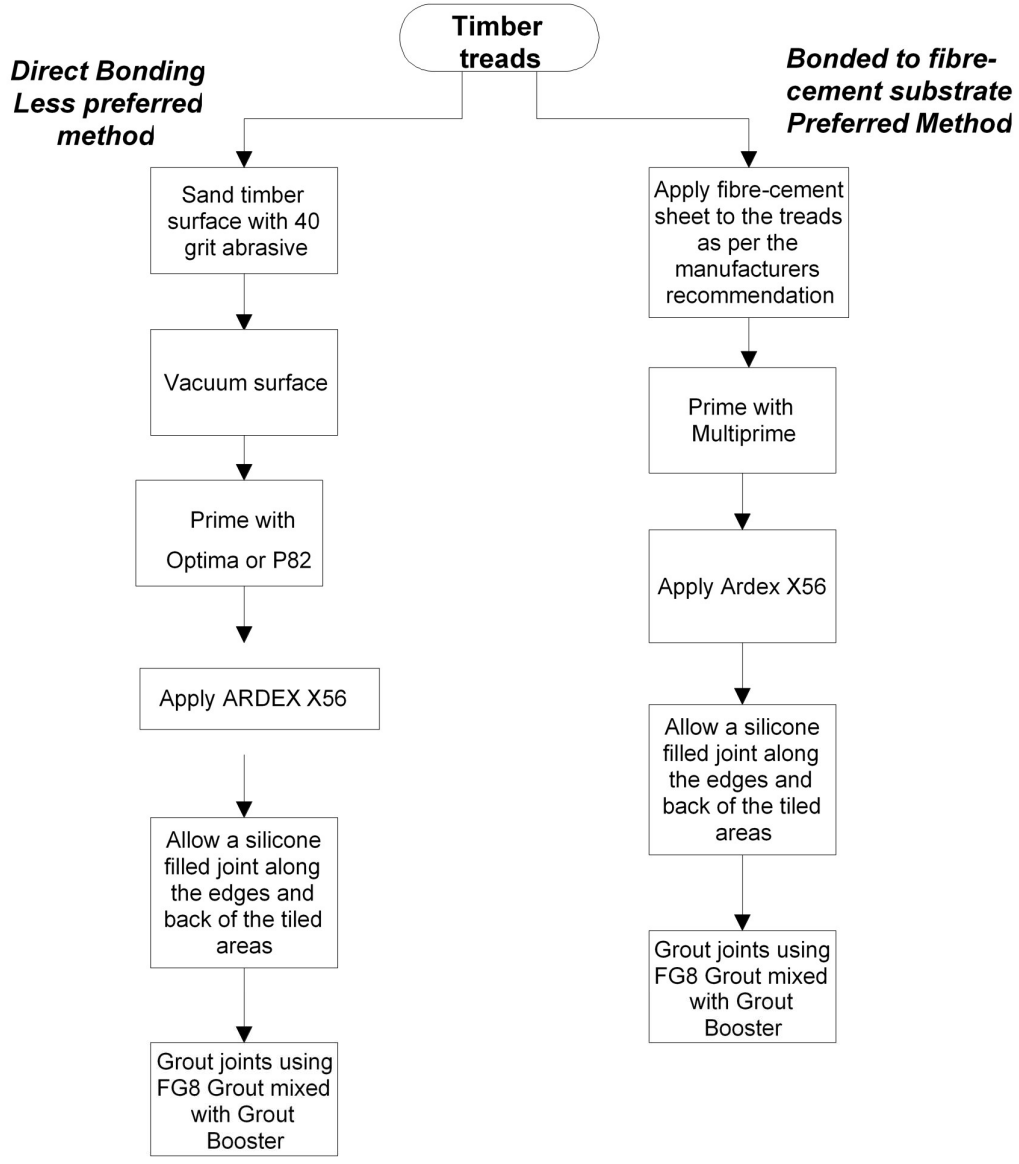
A final thing to consider with metal is that it can move significantly with changes in temperature which creates considerable stresses in the tile adhesive. Therefore, tiling external metal staircases is a practice which needs to be considered very carefully before proceeding.



SOLUTIONS

TIMBER STAIRS

For timber stair treads the choice is between using direct bonding, or the use of a fibre-cement underlay which provides a good bonding surface and reduces deflection. The latter method is preferred as it provides a more rigid surface and eliminates potential bonding problems where the timber may contain natural oil. The recommended procedure is shown in the attached flow chart (A).

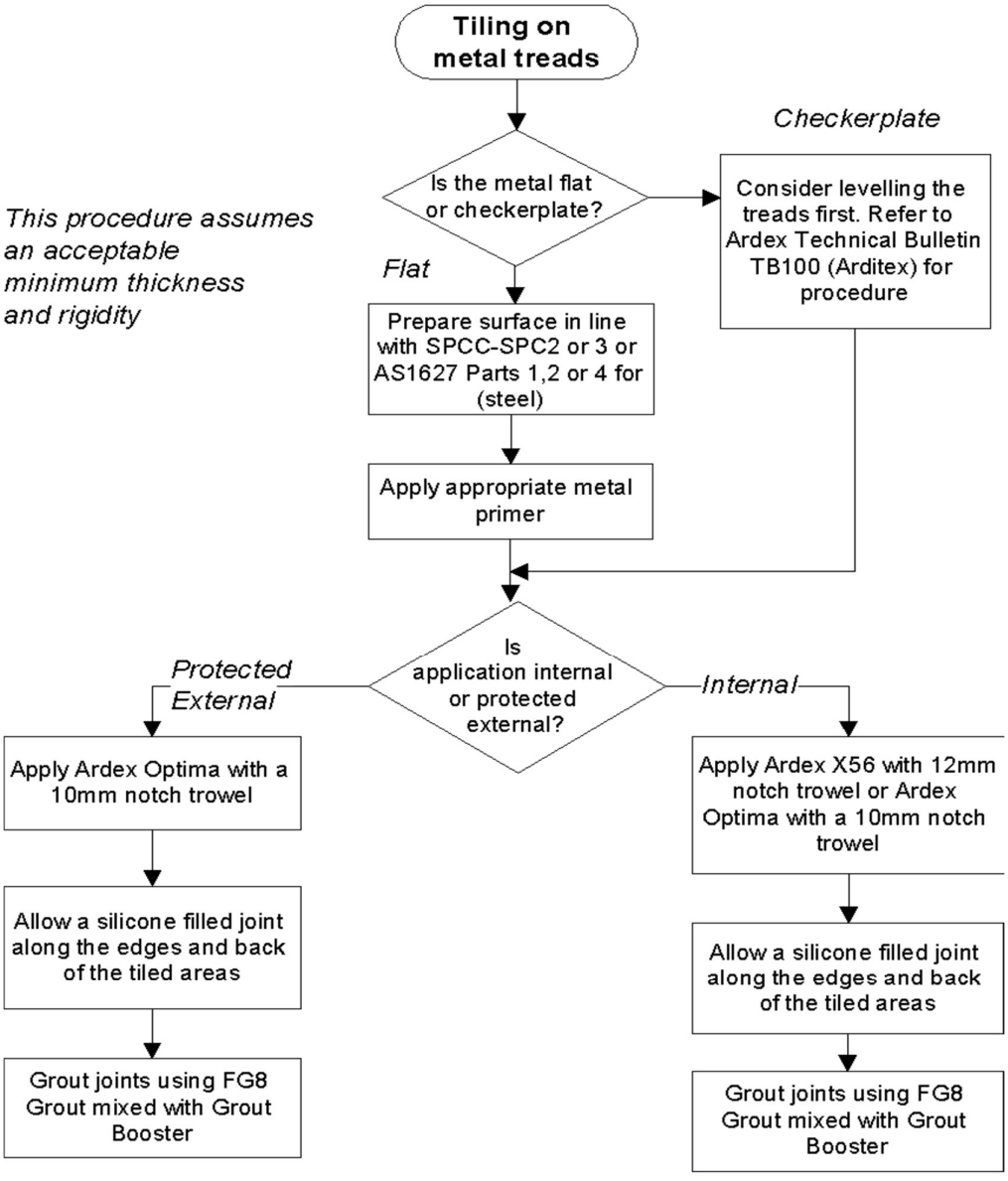


METHOD A
Timber Stair Treads & Landings

The recommended adhesive over timber is ARDEX X56 which can be used for direct stick or over fibre-cement underlay. This adhesive will provide flexibility to absorb a degree of movement and will resist vibration. Note that thicker fibre-cement sheets will increase rigidity.

NOTE: Screws used for fixing fibre-cement sheet must be recessed into the sheet with no part of the screw head proud.

See also ARDEX Technical Bulletins TB168 and TB218 which give general information for application of tiles on timber substrates.



METHOD B
Metal Stair Treads

Adhesives suitable for direct adhesion to metal treads & landings

LOCATION	SUBSTRATE	SURFACE PREPARATION	PRIMING	ADHESIVE
Internal	Stainless steel sheet	De-oiled with Methylated Spirits Abrasive cleaned[3], vacuumed and dried	NA ✦Optional ARDEX P9 ARDEX P82	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 metal primer ✦Optional ARDEX P9 ARDEX P82	Optima X56
	Galvanised steel	Clean with Detergent & Light scour[2]	Epoxy two pack metal primer ✦Optional ARDEX P9 ARDEX P82	Optima X56
	Galvanised steel with spangled surface or Zincalume®	Properly sanded[2]	Epoxy two pack metal primer ✦Optional ARDEX P9 ARDEX P82	Optima X56
	Aluminium	Abraded[2 or 3] to remove oxide coating	Epoxy two pack metal primer ✦Optional ARDEX P9 ARDEX P82	Optima X56

LOCATION	SUBSTRATE	SURFACE PREPARATION	PRIMING	ADHESIVE
External ***Protected areas only***	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 metal primer	Optima
	Galvanised steel	Clean with Detergent & Light scour[2]	Epoxy two pack metal primer	Optima
	Galvanised steel with spangled surface or Zincalume®	Properly sanded[2]	Epoxy two pack metal primer	Optima
	Aluminium	Abraded[2 or 3] to remove oxide coating	Epoxy two pack metal primer	Optima

Zincalume® is a registered trademark of BlueScope Steel
Super script 2 refers to S.S.P.C-SP2 and superscript 3 to S.S.P.C-SP3.

DEFINITIONS FOR SURFACE PREPARATION

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

DRAINAGE FALLS AND EDGE JOINTS

When tiling onto stairs it is important to remember that external stairs will require falls towards the nose of the stair to prevent ponding of water against the riser bottom edge. If this is not done, then there is a risk that adhesives not rated for constant immersion conditions may de-bond. Also, the pooling water then becomes a slip hazard and can lead to discolouration or staining of tiles.

It also important to recognise that movement joints are required at the side edges and rear of the tiled treads, just as if the tiles are going to a wall-floor junction. This allows for movements at these junctions and minimises the risk shear de-bonding of the adhesive or cracking of the tiles due to compressive stresses.

OVERHANG AND SUPPORT OF TILES

In all cases where tiling of stairs is to be undertaken, the tile must be fully supported with no significant overhang of tile relative to the tread. This is to prevent excessive loading of the tile lip which can result in possible de-bonding from the tread, or flexural breakage of the tile itself.

In the example shown below, the stone slabs were adhesive bonded to the treads, but ultimately the torsional forces on the edge of the slabs due to foot traffic, combined with flexion of the steel tread base resulted in de-bonding of the stone slabs. This installation required the use of mechanical fixing of the slabs to the stair treads.

CONCLUSIONS

Whilst it is quite possible to tile onto stair treads, potential installers need to be aware that this application is very demanding. The issues involved have been discussed above, and a successful tiling installation requires attention to detail and good stair stability.

Where the stairs are subject to deflections in excess of those recommended, high traffic areas such as commercial, or are subject to extremes of weather, tiling over stair treads is not recommended.

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 or ARDEX New Zealand 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 – ISSUER

PERIODIC UPDATE

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