TECHNICAL BULLETIN

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

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?

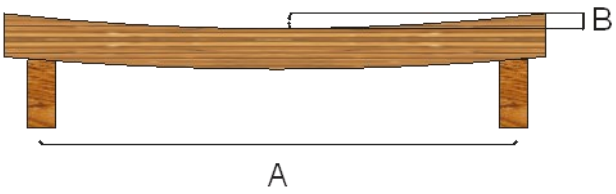
The greatest physical challenge to overcome in tiling timber or metal stair treads is the high degree of movement and vibration that stairs are subjected to. For example, a metal staircase often has a skeleton type frame, and most spiral staircases are made of steel. These staircases commonly vibrate 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.

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.

The next page has a flow chart which shows the considerations required when looking into tiling stairs.



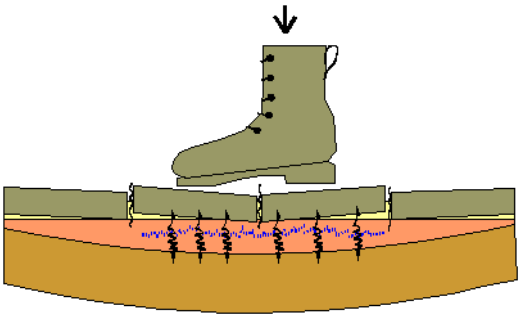
The diagram shows a typical floor or step-tread with the bearer span shown as A and the deflection as B.

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

For example;

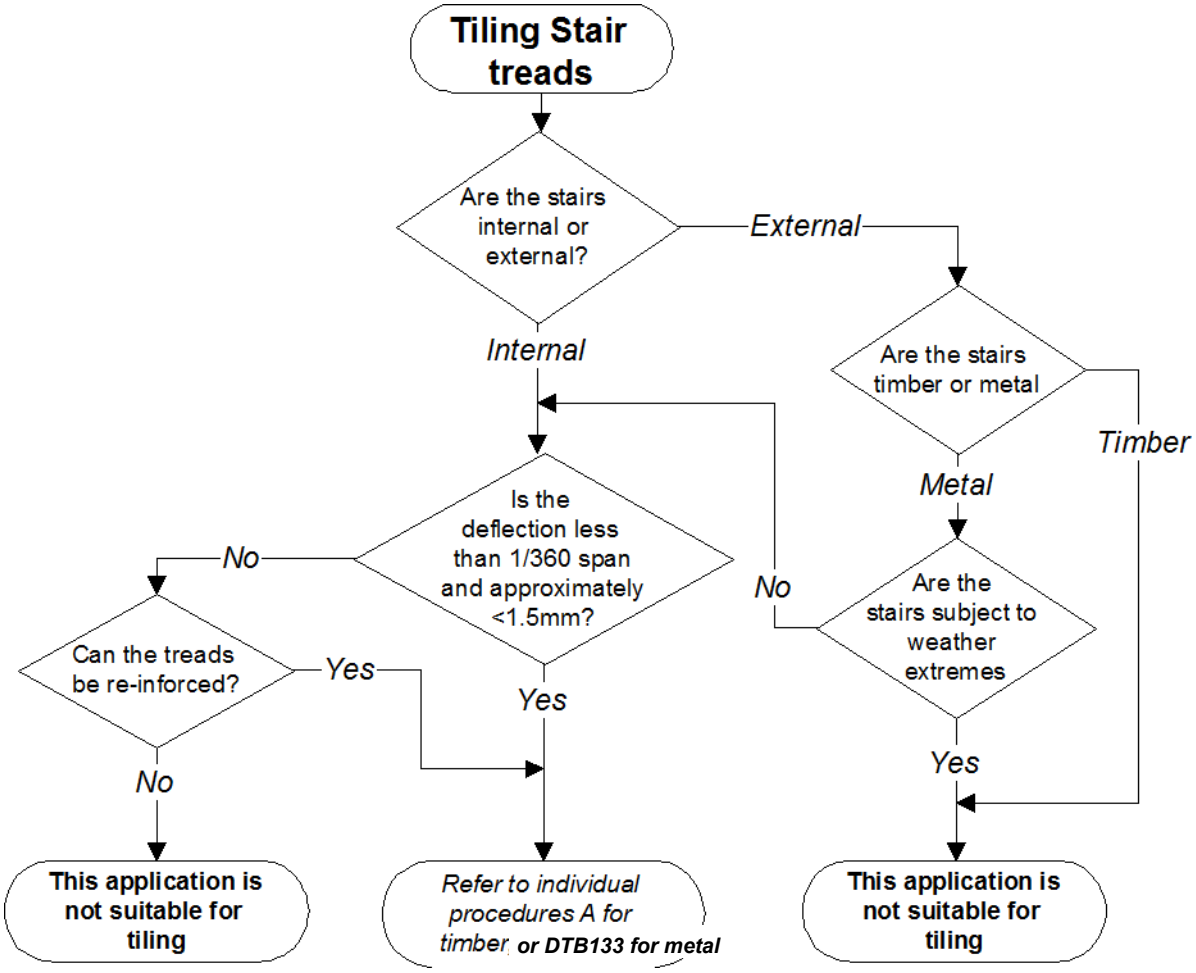
Where A is 600mm B shall be <1.6mm

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.

TECHNICAL BULLETIN



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 flow chart on the next page. The recommended adhesives over timber are either DUNLOP WALL AND FLOOR TILE ADHESIVE which can used for direct stick or over fibre-cement underlay. These adhesives 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.

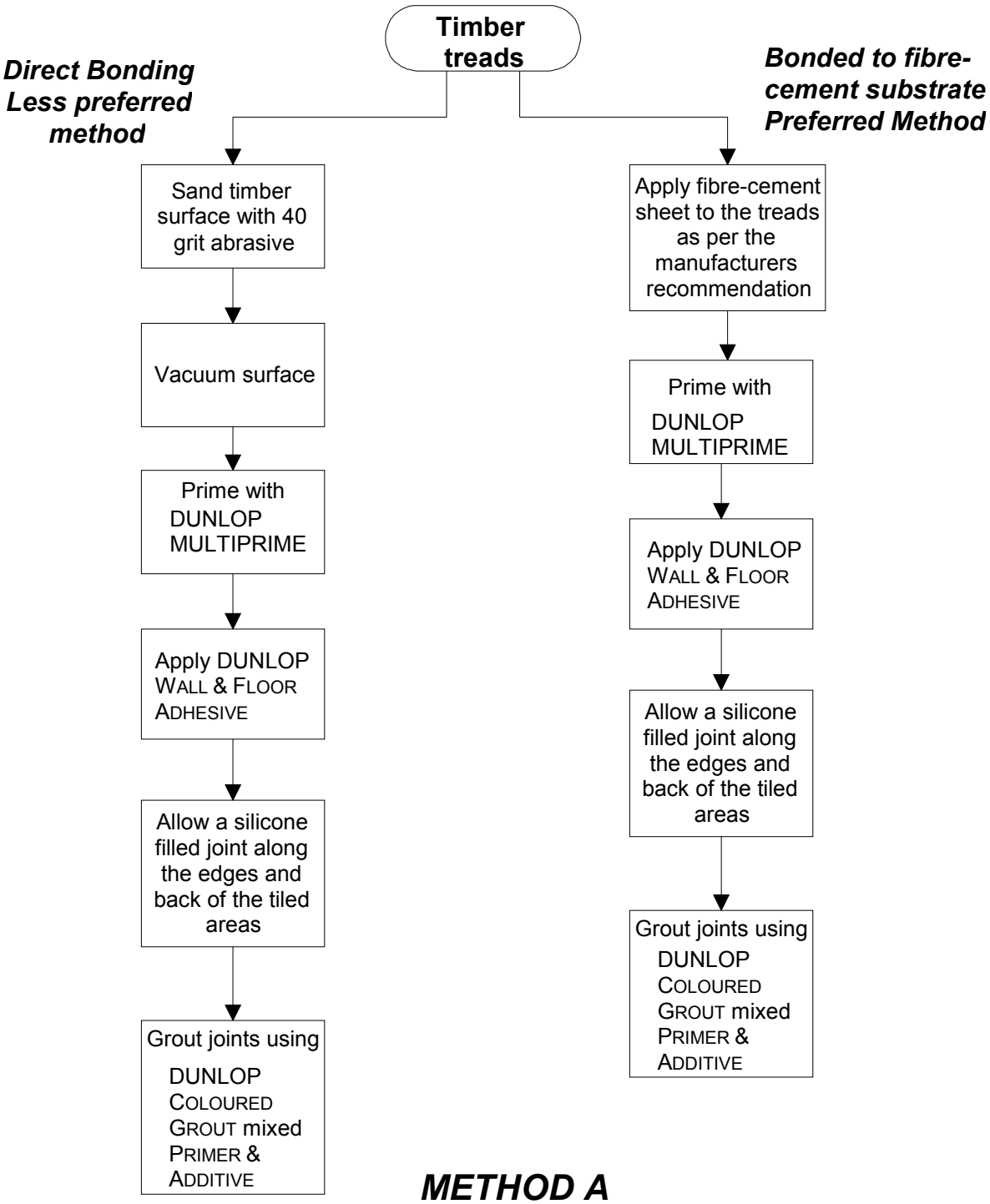
METAL STAIRS

Application of tiles on metal stairs should be examined carefully as this material requires surface treatment prior to installation of the tiles, and can be subject to greater degrees of flexing and movement as they often do not have risers. Also metal staircases tend to be more common in commercial or industrial applications where higher traffic loads are likely to occur.

The general issues of tiling on metal are discussed in DUNLOP Technical Bulletin DTB133 and the only adhesive acceptable is DUNLOP TILE ALL.

External metal stairs are not a recommended surface for tiling under any circumstances.

TECHNICAL BULLETIN



METHOD A

Timber Stair Treads & Landings

TECHNICAL BULLETIN

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.

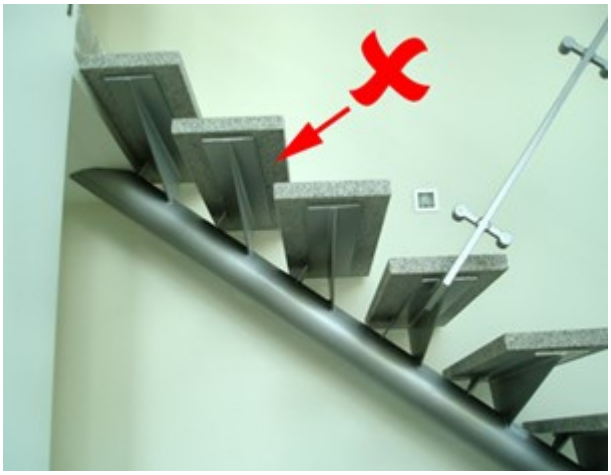
Overhang and Support of Tiles

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,



Tiling these stairs would be questionable. Fixing tiles with adhesive to this type of riser would be highly risky.

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.

NOTES

Always refer to the product data sheets for specific usage details.

The information contained herein 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 the product application.

Users are asked to check that the literature in their possession is the latest issue.

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