© Ardex Australia 2005 - 2020

TECHNICAL BULLETIN – TB111

TILING ADHESIVES FOR USE ADJACENT TO FIREPLACES

Date: May 13th 2020

INTRODUCTION & SCOPE

The National Construction Code Series requires that fireplaces are installed in accordance with AS/NZS 2918.

Volume Two for class 1 and 10 buildings under heating appliances

Class 1 buildings refers to individual domestic residences, and from Part 3.10.7.2 on page 354 of NCC 2019 Building Code of Australia, Volume Two,

3.10.7.2 Open fireplace construction

An open fireplace, or solid-fuel burning appliance in which the fuel-burning compartment is not enclosed must have—

(a) all masonry constructed in accordance with Part 3.3; and

(b) a hearth constructed of stone, concrete, masonry or similar *non-combustible* material so that—

(i) it extends not less than 300 mm beyond the front of the fireplace opening and not less than 150 mm beyond each side of that opening; and

(ii) its upper surface does not slope away from the back hearth; and

(iii) *combustible* material, such as flooring or framing members below the hearth, is situated not less than 150 mm from the upper surface of the hearth (see Figure 3.10.7.1); and

Volume One for Class 2-9 buildings under heating appliances.

From Part G2.3 on page 296 of NCC 2019 Building Code of Australia, Volume One,

G2.3 Open fireplaces

An open fireplace, or solid-fuel burning appliance in which the fuel-burning compartment is not enclosed must have—

(a) a hearth constructed of stone, concrete, masonry or similar *non-combustible* material so that—

(i) it extends not less than 300 mm beyond the front of the fireplace opening and not less than 150 mm beyond each side of that opening; and

(ii) it extends beyond the limits of the fireplace or appliance not less than 300 mm if the fireplace or appliance is free-standing from any wall of the room; and

(iii) its upper surface does not slope away from the grate or appliance; and

(iv) *combustible* material situated below the hearth but not below that part *required* to extend beyond the fireplace opening or the limits of the fireplace is not less than 150 mm from the upper surface of the hearth; and

The older versions of the NCC had different requirements, which may apply to previously made installations. Typically, they said to have a non-combustible and fire retarded hearth with a minimum width around 400mm from the fire box or grate and 150mm from the sides and back.

This might be a concrete slab, brickwork or Compressed Fibre-Cement sheet which for aesthetic reasons may need to be tiled. For the same reason the fireplace wall surrounds might require tiling onto rendered brick or existing masonry.

A common misconception is that tile adhesives are refractory products and can withstand high temperatures or direct flame contact. Special purpose cements are made for these firebrick type applications and tile adhesives should not be used.

In this bulletin we will look at some of the issues that need to be considered when tiling in this situation.

THERMAL RESISTANCE

The area surrounding a fire becomes quite hot and within a certain distance of the combustion area the temperatures experienced will exceed those that the tile adhesive, or even the tiles themselves can withstand.

The tile adhesives contain polymer materials or in some cases rubber which soften and will degrade when exposed to high temperatures. If the temperature is high enough, the cementitious components can be affected as well. When thermal degradation occurs, the adhesive loses its strength and the tiles will de-bond. For this reason, tile adhesive shall not be used in the direct fire contact area.

The International Standard for testing tile adhesives has a thermal ageing test regime that exposes the tiles to 70˚C and this is the temperature that ARDEX tests its adhesives to withstand in service.

EXPANSION & CONTRACTION

The service temperature of hearth areas adjacent to fires can range from ambient room temperature to maybe 70-80^{0}C and this will create expansion and contraction stresses in the tiles and the adhesive. If these stresses exceed the shear strength of adhesive de-bonding can occur. If the tiles are restrained by the adhesive sufficiently that expansion is restricted cracking or de-bonding may also occur. The substrate areas will also expand and contract with the changes in temperature

INSTALLATION CONSIDERATIONS

When considering installation, it is necessary to look at a number of things –

- Type of fire, wood, gas, oil or electric. Wood fires generally create a higher thermal output, and also have the added problem of possible impact from logs or pieces of wood dropped onto the tiles.
- Distance of tiling from the actual fire heating occurs via;
  - ⇒ direct radiation from the fire itself
  - ⇒ thermal conduction through the substrate (i.e. contact of metal hearth parts, and from areas heated by convection or radiation))
  - ⇒ convective heating by air movement (hot air rises so the mantle can be heated this way)
- The types of material used in the construction of the fireplace and surrounds.
- The colour of the tiles (dark heat colours heat up more by radiation) and their heat sensitivity.
- Whether the fireplace has a circulation fan which increases the range of convective heating across the floor.

Every installation is different so it is not possible to make 'hard and fast' rules about the service conditions to which the tiling will be exposed. In light of this general recommendations only can be given.
A contact thermometer can be used to check the temperatures reached when the fireplace is in operation.

As a general rule, if you can't touch it, it's too hot for the adhesive in the long term.

TILING RECOMMENDATIONS

ARDEX recommends that the tiles to be used for the installation are confirmed as suitable by supplier or manufacturer. Some tiles are subject to greater thermal movement than others, and agglomerated tiles made from an aggregate and resin, and also marble with resin backing may be susceptible to high temperature degradation and should not be used.

The following tile adhesives are suggested for installations for a service temperature up to 70^0C. These adhesives have high strengths and flexibility to accommodate movements.

Substrate type	Recommended adhesive
Concrete, Rendered Brickwork and AAC Hebel™ panels	ARDEX ABAFLEX ARDEX OPTIMA ARDEX X77 ARDEX X18 ARDEX S28
Compressed Fibre-Cement Sheet (CFC) over timber	ARDEX ABAFLEX ARDEX OPTIMA ARDEX X77 ARDEX X18 ARDEX S28

GROUTS

The grouting between tiles must be flexible and ARDEX recommends the use of ARDEX GROUT BOOSTER with ARDEX FG8, ARDEX WJ50 or ARDEX FSDD grouts.

The use of this additive is described in the product datasheets.

TILING SITUATIONS THAT ARE NOT RECOMMENDED

- Direct tiling over timber floors adjacent to hearths. This potentially contravenes recommendations in AS2918 and is not recommended for the adhesives indicated.
- Direct tiling over metal stove parts or metal fixtures near the fireplace.
- Tiling inside a fireplace (i.e. tiling onto the back or sides of an inbuilt fireplace) or areas subject to direct flame contact. Not only can the adhesive fail, the tiles may also fail catastrophically.
- Tiling in areas that are subject to temperatures that exceed the recommended service temperature are at the installers risk and not warranted by ARDEX. For example, BBQs and Pizza ovens are not acceptable applications. There are commercial fire brick and oven suppliers who have materials for this sort of application.
- Premixed or mastic type adhesives shall not be in this application, they have low glass transition temperatures.
- Tile over tile installations due possible differential expansions in the tiles.

Problems with heat can be seen in discolouration of grouts and also any silicone sealant joints. These signs should be seen as a warning that the recommended performance temperature of the adhesive may be being exceeded.

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

Australia
Technical Services 1800 224 070. email: technicalservices@ardexaustralia.com
Customer Service and Sales 1300 788 780
Web : www.ardexaustralia.com

New Zealand
Technical/Sales Inquiries 0800 227 339
Web : www.ardex.co.nz

Web Corporate: www.ardex.com