

# TECHNICAL BULLETIN – TB028

## ARDEX K15 MICRO, K12 *NEW*, K80 OR K55

FOR HIGH STRESS APPLICATIONS: INCLUDING CASTOR WHEELS & HEAVY ROLLING LOADS, RUBBER MATTING FLOORS & FLOORS SUBJECT TO VIBRATIONS

**Date, Monday, 25 September 2017**

### INTRODUCTION & SCOPE

Floors can be subjected to high stress environments, and so the underlayment and floor coverings must be able withstand these conditions.

Supermarkets, hospitals and other institutional buildings, storage areas etc are subjected to forklift and pallet jacks with heavy loads often require high quality flooring. Where vibration, high abrasion resistance, slip resistance or noise abatement may be necessary, rubber flooring can be used. In buildings adjacent to major highways and railways, or with moving machinery, vibration can be a consideration,

Such flooring requires a very smooth, hard and durable underlayment to assure structural and aesthetic success.

Underlayments that are either structurally unsound, unable to absorb vibrations or high point loadings can be damaged when subjected to heavy rolling loads. The resultant damage to floor coverings may be indentations (vinyl tiles and sheet), roller marks or telegraphing through of cracking or break up of the material.

Systems based around ARDEX K15 Microtec or ARDEX K12 *New* mixed with ARDEX E25 Resilient Emulsion, ARDEX K80\* or ARDEX K55 neat produce an underlayment with improved flexural and ball impact hardness suitable for installations where high point loadings, heavy rolling loads and where subfloors may be subjected to vibrations.

The fast track system enables floor coverings to be installed after less than 12 hours for K55 and 16 – 18 hours for K15 Micro, K12 *New* or K80, with forklift traffic after only 48 hours.

\*K80 is used at a minimum thickness of 5-6mm and has a slightly rougher surface which is not normally a show through problem for heavy duty floor coverings such as rubber matting.

### SURFACE PREPARATION

Concrete floors must be structurally sound with all previous coatings removed, clean and free of oil, grease, wax, latex compounds, curing compounds, efflorescence, laitance, dust and all foreign matter. The surface must be prepared back to an open porous matrix of the concrete and professional cleaning by mechanical means in line with sound building industry practices is advised.

Suggested cleaning & preparation methods in line with AS1884-2012 need to be performed prior to the installation of any underlayment.

ARDEX TB041 gives details on surface preparation, and recommendations therein are based on the "International Concrete Repair Institute" Guideline No. 310.2R-2013 (formerly Guideline No. 03732-1997) are shotblasting, scarifying or diamond grinding to provide a surface profile of between CSP3 to CSP7. The "International Concrete Repair Institute" (I.C.R.I) Technical guidelines No 310.2R-2013 is an independent guide for preparing concrete surfaces prior to the application of sealer, coating and polymer overlay systems (includes floor levelling and repair cements).

### PRIMING

Prime the porous concrete with ARDEX P51 Primer. Mix ARDEX P51 1:2 with water and apply evenly with a soft pushbroom. Do not leave any bare spots and remove all puddles and excess primer. Allow to dry to a clear, thin film (min. 3 hours max. 24 hours).

The underlayment shall not be applied until primer is dry.



Other surfaces may require the use of ARDEX P82 primer, ARDEX P9 primer, ARDEX WPM368 moisture barrier or ARDEX WPM300 with broadcast sand. Contact Technical Services for more information on these primers and their uses with specific products.

### MIX DESIGNS

1. The ARDEX K15, or K12 New shall be mixed with ARDEX E25 Resilient Emulsion in the following mix ratio:

#### **K15 Microtech**

4 litres of water plus 1.6 litres ARDEX E25  
per 20 kg ARDEX K15.

#### **K12 New**

4 litres of water plus 1.6 litres ARDEX E25  
per 20 kg ARDEX K15.

#### **K55 or K80**

No E25 required

2. Application is by normal methods for ARDEX floor smoothing cements.
3. Underlayment can be walked on in about 60 minutes for K55 or 2 to 3 hours at 20°C for the K15 Micro, K12 New or K80. They can accept floor covering material after 60-90 minutes for K55, 16 – 18 hours for K15 Micro, K12 New or K80
4. ARDEX K55 and K80 alone, or ARDEX K15 Micro and K12 New plus ARDEX E25 with applied floor coverings are intended for moderate forklift traffic such as hand pallet trucks and similar uses. The underlayment can accept these traffic conditions after approximately 48 hours at 20°C.

### FLOORING ADHESIVES

ARDEX recommends the use of ARDEX AF545 epoxy adhesive for heavy duty applications.

ARDEX AF178 for sheet vinyl and ARDEX AF142 for vinyl planks.

### CONSIDERATIONS FOR ROLLING WHEEL TYPES

The types of wheels that rolling loads are moved on has an effect on the actual point loading applied.

The static or dead load is the force exerted by an object resting on the floor – expressed in Newtons. The force is the weight of the object multiplied by force exerted due to gravity. Dynamic loads are moving loads, whilst rolling loads are a combination of dead load and shear forces. Objects that exert rolling loads produce a point dead load from the contact, and sideways shear load from the roller wheel.

Steel formed wheels are inelastic and transfer all the dead and dynamic loads to the floor, plastic wheels are less severe but still rigid, whereas rubber wheels have some give and absorb some of the stress.

The wider and deeper the wheel contact patch, the lower the applied pressure that the flooring system has to withstand. The dead and rolling loads applied to a floor are usually divided between all the wheels in contact, albeit there may be some asymmetry where heavy weights are placed over some wheels and not evenly across the entire load.

The usual questions we received about pressure involves rollers wheels, usually pallet jacks. The contact area for a roller wheel is related to width and contact angles. Wheel diameter is not important in the general sense other than larger diameter wheels have larger contact widths.

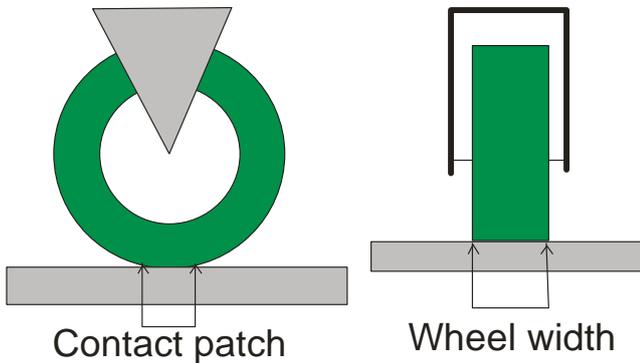
Steel and hard plastic wheels

- transfer more effectively the entire load to the floor
- have less friction and less shearing
- more likely to groove the surface



## Rubber wheels

- deform and take up some of the load in the deformation
- increase the contact patch
- but may increase shearing.



These schematics show the features of a roller which need to be known.

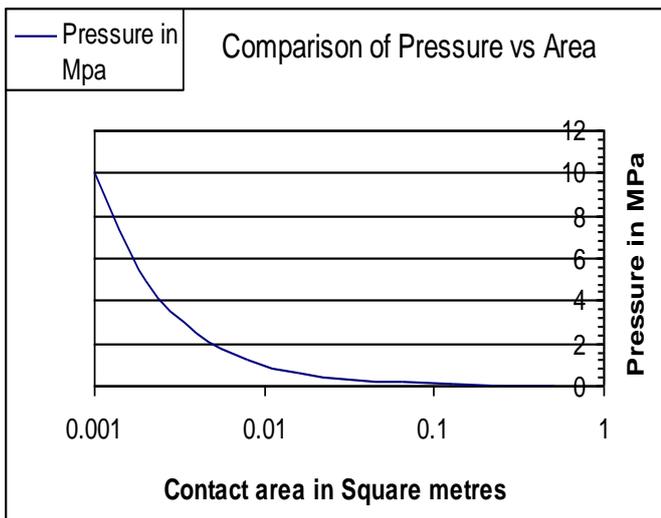
Area for load calculation is-

Wheel width x Contact patch with both dimensions in metres

Examination of the product datasheets show that compressive strength, tensile strength and ball hardness results are expressed in MPa (or N/mm<sup>2</sup>), that is in pressure units.

**Pressure** is defined as force applied over a unit area where force is in Newtons and area is in square metres - 1MPa ~ 140psi ~ 10 atmospheres.

- A typical situation is where a piece of equipment sits on a floor
  - For example what is the exerted pressure for a set load?
    - A 4000kg piece of equipment has 4 legs with contact surface area 50 x 50mm per leg. How much pressure is exerted on each leg?
  - There are three bits to problem..
1. What is the force exerted?
    - a) Force is weight x gravity
    - b)  $4000 \times 10 = 40\text{kN}$
  2. What is the surface area?
    - c)  $50\text{mm} = 0.05\text{m}$  so area for each leg is
    - d)  $0.05 \times 0.05 = 0.0025\text{m}^2$
  3. The force is divided over the four legs
    - e)  $40\text{kN} \div 4 = 10\text{kN}$  per leg
  4. Pressure per leg is force / area
    - f)  $10000 \div 0.0025 = 4 \times 10^6 \text{ Pa}$  or 4 MPa



- Reference to the graph shows how for a 10kN load as contact area decreases the pressure increases rapidly
- This means that small contact areas will develop high point loads

## PRECAUTIONS

This system is not recommended for floors in sports areas or gymnasiums that are subjected to high impact loadings. An impact load is significantly higher in applied force because the stress is related to the moving velocity of the object, the weight and also the shape of the object impacting the floor.

Always install test areas to determine the suitability of the product for the intended purpose. Application of stresses to improperly cured underlayment has resulted in marking on the surface as shown in this image.



**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**

Deletion of AF143 and AF172

**REVIEW PERIOD**

36 months from issue

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