



## Concrete Replacement in Compliance with EN 1504

Nafufill – offering more than the standard specifies

EXPERTISE  
CONCRETE REPAIR



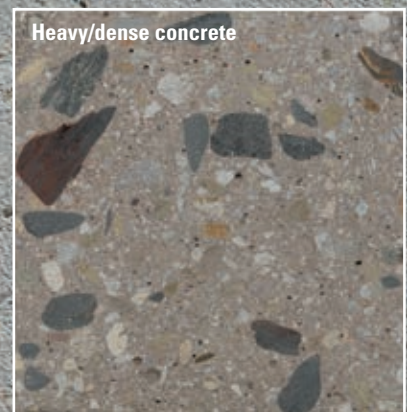
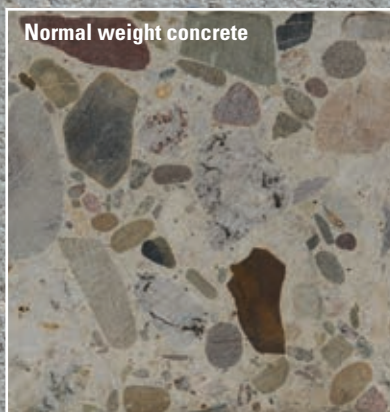
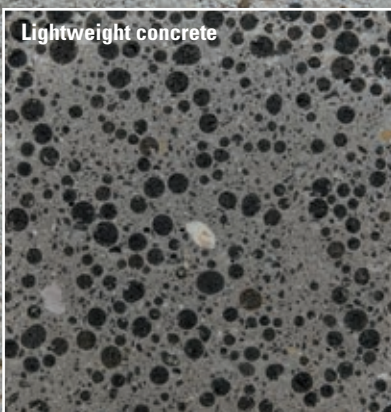
# Every Concrete Application Requires a Tailored Solution

One concrete construction is never the same as the next because of the huge variations and divergences encountered in old concrete. This is not new knowledge. However, over the last two decades, such differences have played an ever more important role when it comes to planning concrete repair measures.

Structure-related requirements placed on concrete mean differing specifications with regard to strength and modulus of elasticity. As a result, old concrete components in need of repair will inevitably have their own distinct quality characteristics within the low to high spectrum.

In order to ensure durable repairs, the repair mortar (concrete replacement) thus has to offer a technical performance profile (compressive strength/modulus of elasticity) comparable to that of the old concrete to make it properly fit for purpose for each individual application.

In order to ensure compliance with the technological requirements, the repair mortars that come into question are nowadays divided into performance classes by both national and international standards. One example is the European concrete repair norm EN 1504 Part 3. This groups concrete replacement materials into classes from R1 to R4 so as to provide a good match to the structural and substrate-typical conditions that occur in different applications.



# Concrete Replacement for Each Individual Task

With **Nafufill LM** [R1], **Nafufill KM 220** [R2], **Nafufill KM 230** [R3] and **Nafufill KM 250** [R4], you have at your disposal four high-performance repair mortars that not only fulfil the requirements of the European repair standard EN 1504 Part 3, but can also be used for applications far exceeding the overall performance spectrum specified.

Now you can choose the right product for each old concrete class, for each modulus of elasticity and for all structural requirements.

Numerous national and international test reports confirm the high technical performance level of this range, providing you with maximum security when tackling your daily challenges relating to concrete repair.

## Facets of concrete repair

- Corrosion protection of the reinforcing steel
- Bonding with the reinforcing steel
- Fire protection of the reinforcing steel

## Technical characteristics in comparison

Product	Nafufill LM	Nafufill KM 220	Nafufill KM 230	Nafufill KM 250
Class according to EN 1504-3	<b>R 1</b> ≥ 10 N/mm <sup>2</sup>	<b>R 2</b> ≥ 15 N/mm <sup>2</sup>	<b>R 3</b> ≥ 25 N/mm <sup>2</sup>	<b>R 4</b> ≥ 45 N/mm <sup>2</sup>
	Non-structural		Structural	
Compressive strength [28 d] in N/mm <sup>2</sup>	14	25	34	55
E-modulus, dyn. in N/mm <sup>2</sup>	10 000	16 200	19 300	32 500
Largest particle size	1.2 mm	1.0 mm	2.0 mm	2.0 mm
Layer thicknesses in mm	5 – 100	2 – 50	6 – 100	6 – 100

# [R1]

## Nafufill LM

### The strong lightweight

Lightweight concretes and also, in some regions, crushed brick aggregate concretes, are often used on multi-storey buildings such as schools, universities, residential blocks and industrial buildings in order to reduce the structural loads. Compared to a standard concrete, these alternative concretes exhibit significantly lower gross densities and strength and e-modulus values. The special conditions encountered when repairing such structures require an equally special solution – which is where Nafufill LM comes in!

Offering a low compressive strength value and a modulus of elasticity of just 10,000 N/mm<sup>2</sup>, this special, polymer-modified lightweight mortar is ideally tailored to repair of such substrates. Similarly, Nafufill LM is also suitable for standard concrete of low strength grades.

The lightweight mortar is used without a bond coat and comes highly recommended for reprofiling of chipped and broken areas and also for providing full-surface concrete levelling repairs on facades, balconies, loggias, attics, ribbed slabs, lightweight concrete flooring elements and similar.

#### Ideally suited to:

- Old concrete of classes A1/A2 with compressive strength values up to 15 N/mm<sup>2</sup>
- Old concrete of classes A1/A2 with e-modulus values up to 15,000 N/mm<sup>2</sup>

#### What Nafufill LM offers you:

- R1 concrete replacement acc. to EN 1504 Part 3, certified for methods 3.1 and 3.3
- Fire-resistant acc. to DIN 4102-2, Fire Resistance Class F 120
- Non-flammable acc. to EN 13501-1, Class A1
- Very low consumption per m<sup>2</sup>/mm
- Suitable for interior and exterior applications
- Application by hand or wet spraying

#### Also suitable for:

- Sand-lime masonry
- Spot repairs of cellular lightweight concrete



Fire resistance class

 **F 120**

#### Layer thickness range

- Min. layer thickness 5 mm
- Max. overall layer thickness 70 mm
- Reprofiling of chipped and broken areas 100 mm

#### Consumption (dry mortar)

- 1.12 kg/m<sup>2</sup>/mm

#### Dynamic modulus of elasticity

- 10,000 N/mm<sup>2</sup>

#### Compressive strength [28 d]

- 14 N/mm<sup>2</sup>



# [R2]

## Nafufill KM 220

### One mortar – two applications

The repair mortar Nafufill KM 220 is suitable for two different uses – concrete replacement and fine mortar work!

As a concrete replacement, Nafufill KM 220 can be used for both structural and non-structural repairs. It is primarily used for reprofiling of chipped and broken areas or in order to increase the concrete cover on normal, lightweight and crushed brick aggregate concretes. The main fields of application are concrete constructions in high-rise, residential and industrial buildings.

You can also use Nafufill KM 220 as a fine mortar from layer thicknesses of 2 mm in combination with surface protection systems. This offers a number of real advantages for your repair processes:

- Complete repair with just two products
- No risk of mixing up concrete replacement and fine mortar on site
- Simplified logistics and stocking

#### Ideally suited to:

- Old concrete of classes A2/A3 with compressive strength values up to 25 N/mm<sup>2</sup>
- Old concrete of classes A2/A3 with e-modulus values up to 20,000 N/mm<sup>2</sup>

#### What Nafufill KM 220 offers you:

- R2 concrete replacement acc. to EN 1504 Part 3, certified for methods 3.1, 3.3, 7.1 and 7.2
- Non-flammable acc. to EN 13501-1, Class A1
- Resistant to temperature, frost-thaw cycling and de-icing salts
- High resistance to carbonation
- Low consumption per m<sup>2</sup>/mm
- Suitable for interior and exterior applications
- Hand and wet spray application

#### Also suitable as:

- Fine mortar in layer thicknesses from 2 mm
- Fine mortar in OS 4/OS 5 surface protection systems



### Layer thickness range

- Min. layer thickness 2 mm per coat
- Max. layer thickness 30 mm per coat
- Max. overall layer thickness 30 mm
- Reprofiling of chipped and broken areas 50 mm

### Consumption (dry mortar)

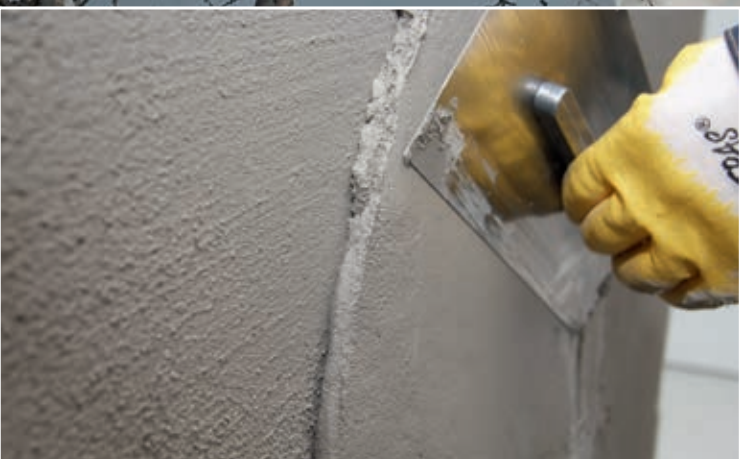
- 1.67 kg/m<sup>2</sup>/mm

### Dynamic modulus of elasticity

- 16,200 N/mm<sup>2</sup>

### Compressive strength [28 d]

- 25 N/mm<sup>2</sup>



# [R3]

## Nafufill KM 230

### High-resistance concrete replacement

The emphasis when performing structural repairs on concrete components is often on ensuring the corrosion protection of the reinforcing steel, whether this be for civil engineering works, industrial buildings, high-rise constructions or residential buildings. To ensure that durable corrosion protection is achieved, the concrete replacement material must offer high resistance to carbonation and frost-thaw cycling. Nafufill KM 230 offers precisely these properties.

With Nafufill KM 230, you are able to tackle such tasks quickly and effectively, whether for reprofiling of chipped or broken areas or for increasing the concrete cover!

This concrete replacement formulation has been especially developed for these frequently occurring requirements and is suitable for both interior and exterior applications, particularly those involving exposure classes XC 1-4 and XF 1-4.

#### Ideally suited to:

- Old concrete of classes A3/A4 with compressive strength values up to 40 N/mm<sup>2</sup>
- Old concrete of classes A3/A4 with e-modulus values up to 30,000 N/mm<sup>2</sup>

#### What Nafufill KM 230 offers you:

- R3 concrete replacement acc. to EN 1504 Part 3, certified for methods 3.1, 3.3, 7.1 and 7.2
- Non-flammable acc. to EN 13501-1, Class A1
- Resistant to temperature, frost-thaw cycling and de-icing salts
- High carbonation resistance
- Low consumption per m<sup>2</sup>/mm
- Application by hand (with bond coat) and wet spraying





### Layer thickness range

- Min. layer thickness 6 mm per coat
- Max. layer thickness 30 mm per coat
- Max. overall layer thickness 60 mm
- Reprofiling of chipped and broken areas 100 mm

### Consumption (dry mortar)

- 1.52 kg/m<sup>2</sup>/mm

### Dynamic modulus of elasticity

- 19,300 N/mm<sup>2</sup>

### Compressive strength [28 d]

- 34 N/mm<sup>2</sup>



# [R4]

## Nafufill KM 250

### The all-round performer – even when things get hot

In structural repairs of concrete components, a distinction is made between repairs without restoration of load-bearing capacity and repairs for capacity reinstatement. Depending on the position of the component, not only the structural aspects but also the fire protection properties may be of relevance. Conventional concrete replacement systems quickly come to the limit of their applicability, while with Nafufill KM 250 you are able to meet such requirements without any problem!

With this concrete replacement material, you are able to **verifiably** meet all technological specifications applicable to corrosion protection, bonding and fire protection of the reinforcing steel in civil engineering, industrial and tunnel construction, high-rise building and residential construction.

Nafufill KM 250 is **structurally applicable, non-flammable and fire-resistant** and can be used for reprofiling of chipped and broken areas, and also for increasing the concrete cover of interior and exterior components. It is particularly suitable for exposure classes XC 1-4, XF 1-4, XW 1-2, XD 1-3, XS 1-3, XM 1 and XA 1-2.

#### Ideally suited to:

- Old concrete of classes A4/A5 with compressive strength values  $> 35 \text{ N/mm}^2$
- Old concrete of classes A4/A5 of with e-modulus values  $> 25,000 \text{ N/mm}^2$

#### What Nafufill KM 250 offers you:

- R4 concrete replacement acc. to EN 1504 Part 3, certified for the methods 3.1, 3.3, 4.4, 7.1 and 7.2
- Fire-resistant acc. to DIN 4102-2, Fire Resistance Class F 120
- Non-flammable acc. to EN 13501-1, Class A1
- Structurally applicable
- Resistant to temperature, frost-thaw cycling and de-icing salts
- Electrically conductive
- High resistance to carbonation
- Application by hand (with bond coat) and by wet spraying



### Fire resistance class

 **F 120**

#### Additional performance features:

- Fire-resistance in accordance with the tunnel fire time-temperature curves of ZTV-ING, Part 5 and EBA Code of Practice
- Repair and anode-embedding mortar acc. to EN 12696
- Concrete replacement with SPCC approval

#### Layer thickness range

- Min. layer thickness 6 mm per coat
- Max. layer thickness 30 mm per coat
- Max. overall layer thickness 60 mm
- Reprofiling of chipped and broken areas 100 mm

#### Consumption (dry mortar)

- 1.80 kg/m<sup>2</sup>/mm

#### Dynamic modulus of elasticity

- 32,500 N/mm<sup>2</sup>

#### Compressive strength [28 d]

- 55 N/mm<sup>2</sup>



## **Nafufill concrete replacement** the right solution for every application

- for any grade of old concrete
- for any e-modulus class
- for all structural requirements

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