

Emaco[®] NanoCrete R4

Extra high-strength, shrinkage compensated, fibre reinforced, structural repair mortar



**Certificate Number BB-563-0013-0006-001
Certification Institute BCCA**

CE	
0749	
BASF Construction Chemicals Belgium NV Nijverheidsweg 89, B-3945 Ham	
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0749 - CPD BC2-563-0013-0002-001	
EN 1504-3	
Concrete repair product for structural repair CC mortar (based on hydraulic cement)	
Compressive strength	class R4
Chloride ion content	≤ 0,05 %
Adhesive bond	≥ 2,0 MPa
Restrained shrinkage	≥ 2,0 MPa
Carbonation resistance	passes
Elastic modulus	≥ 25 GPa
Thermal compatibility	
- Freeze-Thaw	≥ 2,0 MPa
- Thunder Shower	≥ 2,0 MPa
- Dry cycling	≥ 2,0 MPa
Capillary Absorption	≤ 0,5 kg m ⁻² hr ^{0,5}
Reaction to fire (MPA Dresden)	A1
Dangerous substances	complies with 5.4

Approved by the United Kingdom Water Regulations Advisory Scheme , Listing No.0609502



Description

EMACO NANOCRETE R4 is a single component, extra high-strength, high modulus, shrinkage compensated structural repair mortar that meets the requirements of the new European Norm EN 1504 part 3 class R4.

EMACO NANOCRETE R4 is a ready-to-use material that contains sulphate resistant Portland cement (HSR LA), hydraulic binders, well graded sands, specially selected polymer fibres (PAN – polyacrylonitril) and special additives to significantly reduce the risk and incidence of shrinkage cracking.

When mixed with water, EMACO NANOCRETE R4 forms a highly thixotropic mortar that can easily be spray or trowel applied.

Field of application

EMACO NANOCRETE R4 is used for the structural repair of concrete elements such as:

- Columns, piers and cross beams of all bridges
- Cooling towers and chimneys and other industrial environments
- Water treatment and sewerage facilities
- Tunnels, pipes, outfalls and all below ground construction especially in harsh ground conditions
- Marine structures

Coverage / Yield

One 25 kg bag EMACO NANOCRETE R4 will yield approximately 11 litres of mortar.

Consumption: 2,2 kg of mixed product per m² per mm layer thickness (approx. 2 kg of dry powder per m² and mm layer thickness).

This consumption is theoretical and depends on the roughness of the support, amount of rebar, wastage, etc.,



for which reason it should be adjusted in each particular job by means of "in situ" tests.

Packaging, storage and shelf life

EMACO NANOCRETE R4 is packaged in 25 kg moisture-resistant bags.

Store EMACO NANOCRETE R4 in cool and dry warehouse conditions with temperatures between 15°C and 25°C. Protect the product against frost.

Shelf life in these conditions is 12 months in unopened original bags.

Benefits

- Can be applied inside and outside, on vertical and overhead surfaces, in dry and wet environments.
- Formulated with new nanotechnology, shrinkage compensation systems and fibre reinforcement (polyacrylonitril fibres) to minimise crack tendency.
- Highly thixotropic - can be applied up to 50 mm without the need of secondary reinforcement.
- High early and ultimate strengths.
- Outstanding workability for easy placing and finishing.
- High modulus and excellent adhesion to host concrete ensuring load transfer.
- Excellent freeze/thaw resistance.
- High carbonation resistance.
- Sulphate resistant.
- Very low permeability to water and chlorides.
- Low chromate (Cr[VI] < 2 ppm).
- Chloride-free.

Application instructions

1. Surface preparation: concrete

Concrete must be fully cured, clean and sound to ensure good adhesion. All loose traces of concrete or mortar, dust, grease oil, etc. must be removed.

Concrete must have a minimum direct tensile strength of 1,5 N/mm².

Damaged or contaminated concrete should be removed to obtain a keyed surface. Non-impact/vibrating cleaning methods, e.g. gritblasting, sandblasting or high water pressure blasting are recommended. Aggregate should be clearly visible on the surface of the concrete structure after surface preparation.

Cut the edges of the repair vertically to a minimum depth of 5 mm.

2. Surface preparation: reinforcing steel

If reinforcing steel is visible, clean to a minimum grade of Sa 2 according to ISO 8501-1 / ISO 12944-4. Ensure back of rebar is also clean.

Only in case of chloride contamination of the concrete or when depth of cover is less than 5 mm, should the reinforcement be protected by using EMACO NANOCRETE AP (see *technical data sheet*).

3. Priming

For hand applications we advise to apply a brushable bonding layer of EMACO NANOCRETE R4.

For spray applications it is not necessary to apply a bonding layer of EMACO NANOCRETE R4.

Note: Apply EMACO NANOCRETE R4 wet on wet on the bonding layer.

4. Mixing

Open the bags EMACO NANOCRETE R4 a short time before the mixing is started. Damaged or opened sacks should not be used.

Pour the minimum amount of mixing water into a pure vessel.

Mixing water needed: 3.8 to 4.2 litres per 25 kg bag depending upon consistency required. Add the EMACO NANOCRETE R4 powder rapidly and continuously and mix EMACO NANOCRETE R4 with a suitable paddle attached to a powerful, slow speed electric drill (max. 400 rd/min.) for 3 minutes until a lump-free, plastic consistency is achieved. Only use clean uncontaminated water.

Allow the mortar to rest for 2 - 3 minutes and then remix briefly, adjusting the consistency when required.

Note: Add water if necessary but never exceed the maximum water demand!

5. Mortar application

The prepared substrate should be pre-soaked, preferably for 24 hours, but at least 2 hours before applying EMACO NANOCRETE R4. The surface must be mat-damp, but without standing water.

For optimum curing of the product the temperatures during application of EMACO NANOCRETE R4 are between +5°C and +30°C.

EMACO NANOCRETE R4 can be hand applied using a screeding beam, trowel or wooden board, or can be spray applied to the desired thickness of 5 to max. 50 mm. Apply the mixed EMACO NANOCRETE R4 directly to the prepared damp substrate, or wet on wet onto the primed surface.

Spraying EMACO NANOCRETE R4 with the necessary pressure (namely first a thin contact layer before building up to the required thickness) will improve the adhesion of EMACO NANOCRETE R4;

Before EMACO NANOCRETE R4 is applied to the desired layer thickness, we advise especially in case of hand application and to improve the adhesion, to apply wet in wet a thin scrape coat or contact layer.

Smoothing with a trowel or finishing by float or sponge can be done as soon as the mortar has begun to stiffen.

Consult your BASF-CC specialist for more information.

At lower temperatures and/or higher humidity these times will be extended.

Initial and final setting, and workability

Temp. °C	Initial setting (hours)	Final setting (hours)	Workability (min)
20	2,5 to 4	4 to 6	45 to 60

Curing

The following curing methods are advised:

- polyethylene film
- damp clothes
- Masterkure curing agents

Contact your BASF-CC specialist for more information.

Cleaning of tools

While still wet clean with water. Once dry/cured the material can only be removed mechanically.

Watch points

- Do not apply EMACO NANOCRETE R4 at temperatures below +5°C nor above +30°C.
- Do not add cement, sand or other substances that could affect the properties of EMACO NANOCRETE R4.
- Never add water or fresh mortar to a mortar mix which has already begun to set.

Health and safety

As with other products containing Portland cement, the cementitious material in EMACO NANOCRETE R4 may cause irritation. Avoid contact with eyes and prolonged contact with skin. In case of contact with eyes, immediately flush with plenty of water for at least 15 minutes. Call a physician. In case of contact with skin, wash skin thoroughly. Keep product out of reach of children.

Consult the Material Safety Data Sheet for further information regarding this product.

Technical properties of EMACO NANOCRETE R4

Properties	Standard	Unit	Standard EN 1504-3	Measured value (min. once a year or extern)	Declared value
Appearance	-	-	-		grey powder
Chloride-ion content	EN 1015-17	%	≤ 0,05		≤ 0,02
Grain size	-	mm	-		max. 1,4
Layer thickness minimum	-	mm	-		5} vert./horizont.+
Layer thickness maximum	-	mm	-		50} overhead
Density	-	g/cm ³	-		≥ 2,1
Mixing water per bag of 25 kg	-	litre	-		approx. 3,8 – 4,2
Working time	-	minutes	-		45 - 60
Temperature for application (support and mat.)	-	°C	-		between +5 and +30
Compressive strength after 1 day	EN 12190	N/mm ²	-		≥ 18
Compressive strength after 28 days		N/mm ²	≥ 45		≥ 55
E-modulus (28 days)	EN 13412	N/mm ²	≥ 20.000	29.500 - 30.000	
Adhesion (28 days) concrete	EN 1542	N/mm ²	≥ 2		≥ 2,6
Adhesion after freeze/thaw (50 cycles with salt)	EN 13687-1	N/mm ²	≥ 2	≥ 2,2	
Adhesion after thunder/shower (50 cycles)	EN 13687-2	N/mm ²	≥ 2	≥ 3,5	
Adhesion after dry cycling (50 cycles)	EN 13687-4	N/mm ²	≥ 2	≥ 3,5	
Carbonation resistance	EN 13295	mm	dk ≤ ref. concrete MC (0,45)	≤ ref. concrete	
Capillary absorption	EN 13057	kg/m ² /h ^{-0.5}	≤ 0,5	0,1	
Cracking tendency (I)	Coutinho ring				No cracking after 180 days
Cracking tendency (II)	DIN type V-channel				No cracking after 180 days

Hardening times are measured at 21°C ± 2°C and 60% ± 10% relative humidity. Higher temperatures will reduce these times and lower temperatures will extend them.

Technical data shown are statistical results and do not correspond to guaranteed minima. Tolerances are those described in appropriate performance standards.



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