MAPEGROUT BETONTECH HPC10

Rheoplastic cementitious mortar with added structural fibre reinforcement with a work-hardening effect for restoring concrete requiring a high level of ductility

CE EN 1504-3

IN COMPLIANCE WITH EUROPEAN STANDARD
EN 1504-3
R4
MAPEI
REPAIR MORTAR

WHERE TO USE

Repairing and strengthening structural elements in areas where particular types of dynamic stress require the use of free-flowing, high performance micro-concrete with a work-hardening effect.

Some application examples

- Rebuilding and strengthening motorway kerbs.
- Anchoring barriers (acoustic barriers and guardrails).
- Strengthening structural elements and members such as reinforced concrete pillars and beams.
- Rebuilding pier caps and bearing elements on motorway viaducts.
- Integrating floor slabs on bridges and viaducts after removing damaged areas.
- Repairing concrete floors (roads and airports).
- Repairing joints in motorways.
- Repair work on hydraulic structures (breather channels, canals and forced run-off channels).

TECHNICAL CHARACTERISTICS

Mapegrout Betontech HPC10 is a ready-mixed, fibre-reinforced micro-concrete made from high-strength cement, selected aggregates, special admixtures and structural polymer fibres according to a formula developed in MAPEI research laboratories.
When **Mapegrout Betontech HPC10** is mixed with water it forms highly fluid micro-concrete suitable for casting into formwork without segregating, including in areas where thick layers need to be installed, up to a maximum of 30 cm thick, without the support of electro-welded mesh.
To allow the product's expansive properties to develop fully and correctly in the open air, **Mapegrout Betontech HPC10** must be damp-cured. **Mapegrout Betontech HPC10** may also be admixed with 0.25% of **Mapecure SRA**, a special admixture which has the capacity to improve the dimensional stability of the system. **Mapecure SRA** guarantees better curing of the mortar by reducing surface tension in the pores and delaying evaporation of the mixing water, thereby enhancing the development of hydration reactions.

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Mapecure SRA acts as an internal curing agent and, by interacting with some of the main components in the cement, reduces final shrinkage by 20% to 50% compared with the same product without the admixture, thereby reducing the risk of micro-crack formation.

Once hardened, **Mapegrout Betontech HPC10** has the following characteristics:

- high compressive strength;
- modulus of elasticity, thermal expansion coefficient and permeability coefficient similar to high-quality concrete;
- impermeability to water;
- excellent adhesion to old concrete, if roughened prior to application (surface roughness > 5 mm) and dampened with water, and to rebar, especially when treated with **Mapefer** or **Mapefer 1K Zero**.

Mapegrout Betontech HPC10 complies with the principles defined in EN 1504-9 (*"Products and systems for the protection and repair of concrete structures: definitions, requirements, quality control and evaluation of conformity. General principles for the use of products and systems"),* and the minimum requirements of EN 1504-3 *("Structural and non-structural repair")* for R4-class structural mortars.

RECOMMENDATIONS

- Do not apply **Mapegrout Betontech HPC10** on smooth concrete. Make sure the surface of concrete is very rough and add rebar where required.
- Do not use **Mapegrout Betontech HPC10** for anchoring elements accurately in place (use **Mapefill Zero** or **Mapefill R**).
- Do not add cement or admixtures to **Mapegrout Betontech HPC10**.
- Do not add water once the mix has started to set.
- Do not apply **Mapegrout Betontech HPC10** if the temperature is below +5°C.
- Do not use **Mapegrout Betontech HPC10** if the bag is damaged or if it has already been opened.

APPLICATION PROCEDURE

Preparation of the substrate

- Remove all deteriorated and loose concrete to form a sound, rough and strong substrate. Any areas previously repaired and which are not perfectly bonded must be removed.
- Remove all dust, rust, cement laitance, grease, oil and old paint from the concrete and rebar by sandblasting.
- Saturate the substrate with water.
- Before casting the product, wait until excess surface water has evaporated off. Use compressed air to accelerate this process if required.

Preparation of the micro-concrete

Pour approximately 2.37-2.50 litres of water into a cement mixer and slowly add a 25 kg bag of **Mapegrout Betontech HPC10**.

To improve open-air curing, add 0.25% by weight of **Mapecure SRA** after mixing (0.25 kg every 100 kg of **Mapegrout Betontech HPC10**).

Mix for 1-2 minutes, remove any powder which has stuck to the sides of the mixing drum and mix again for 2-3 minutes to form a fluid, lump-free mix.

A mortar mixer or drill with a mixer fitting may also be used, depending on the amount of mortar to be prepared. Avoid entraining too much air while mixing.

Mapegrout Betontech HPC10 remains workable for approximately 1 hour at +20°C.

Dynamon EW may be added to improve the capacity of **Mapegrout Betontech HPC10** to maintain its workability.

When integrating areas with layers of **Mapegrout Betontech HPC10** more than 10 cm thick without formwork, use additional contrasting rebar and make sure the thickness of mortar applied complies with Eurocode 2, according to the exposure classes in EN 206/1.

Thinner layers may be applied without adding rebar as long as the surface of the substrate is roughened before application to counteract expansion of the micro-concrete. The expansive action of the micro-concrete, takes place during the first few days of hardening.

Application of the micro-concrete

Pour **Mapegrout Betontech HPC10** into the formwork in a continuous flow and vibrate until complete compaction.

The formwork must not absorb any water from **Mapegrout Betontech HPC10**; we recommend treating the formwork with form-release compound (such as **Mapeform DMA 1000**).

Make sure all the gaps in the concrete are completely filled. To help the grout flow into difficult areas, use wooden poles or pieces of bar or lightly vibrate the mortar.

Finishing the micro-concrete

If the concrete repaired with **Mapegrout Betontech HPC10** needs to have a good surface finish, apply a layer of **Mapelastic Guard Zero** two-component, light grey cementitious mortar, used to form accurate protective layers on highly stressed structures, and/or **Elastocolor Paint** elastomeric, acrylic resin-based paint in water dispersion with crack-bridging properties.

Elastocolor Paint complies with the requirements of the technical specifications for the PA cycle of the Italian Highways Authority and is available in a wide range of colours using the **ColorMap**® automatic colouring system. When dry, both products are waterproof, impermeable to aggressive agents present in the atmosphere but permeable to water vapour and comply with the requirements of EN 1504-2 for coatings (C). Surfaces repaired with **Mapegrout Betontech HPC10** may also be protected with an epoxy-polyurethane finish comprising **Mapecoat E23** two-component, polyamide resin-based primer and **Mapecoat PU33** two-component, polyurethane resin-based elastic coating. This cycle meets the requirements of the technical specifications for the PP cycle of the Italian Highways Authority.

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

- Prepare the micro-concrete using bags of **Mapegrout Betontech HPC10** that have been stored on their original closed pallets.

- In hot weather, store the product in a cool area and use cold water to prepare the mix.

- In cold weather, store the product in a closed area at a temperature of +20°C and protect from frost. Use lukewarm water to prepare the micro-concrete.

- After applying the product, and particularly in hot or windy weather, we recommend curing **Mapegrout Betontech HPC10** carefully to prevent the mixing water evaporating off too quickly, otherwise surface cracks may appear due to plastic shrinkage. **Mapegrout Betontech HPC10** must always be protected by spraying water on the surface while pouring operations are being carried out. Then immediately cover it with waterproof sheets and keep covered for at least 3 days. Alternatively, after tamping the mortar, apply **Mapecure E**, anti-evaporation agent in water emulsion with a low-pressure pump, **Mapecure S**, film-forming curing agent for mortar and concrete, or **Elastocolor Primer**, a high-penetration solvent fixing agent for absorbent surfaces and curing agent for repair mortar. As with all the best products available on the market in this category, **Mapecure E** and **Mapecure S** impede the bond with successive layers. Therefore, if a smoothing layer or paint is to be applied after curing, they must be completely removed by sandblasting. If **Elastocolor Primer** is used to prevent evaporation, on the other hand, the final protective layer of **Elastocolor Paint** or **Elastocolor Rasante** may be applied directly on the surface without removing it.

CLEANING

Wash micro-concrete from tools with water before it hardens. Once hardened, cleaning is much more difficult and it must be carried out mechanically.

CONSUMPTION

Approximately 21 kg/m² per cm of thickness.

PACKAGING

Mapegrout Betontech HPC10 is supplied in 25 kg bags and in 1000 kg big-bags.

STORAGE

Mapegrout Betontech HPC10 may be stored for 12 months in its original packaging. The special 25 kg vacuum-packed polyethylene bags may be stored outside for the entire duration of the site. Rain has no effect on its characteristics.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

Instructions for the safe use of our products can be found on the latest version of the Safety Data Sheet, available from our website www.mapei.com.
PRODUCT FOR PROFESSIONAL USE.

TECHNICAL DATA (typical values)

PRODUCT IDENTITY	
Strength class according to EN 1504-3:	R4
Type:	CC
Consistency:	powder
Colour:	grey
Maximum size of aggregate (prEN 12620):	10 mm
Bulk density:	1,400 kg/m³
Dry solids content:	100%
Ion chloride content - minimum requirement ≤ 0.05% according to EN 1015-17:	≤ 0.05%

APPLICATION DATA (at +20°C - 50% R.H.)	
Colour of mix:	grey
Mixing ratio:	100 parts of **Mapegrout Betontech HPC10** with 9.5-10 parts of water (approx. 2.37-2.5 l of water per 25 kg bag)
Slump test according to EN 12350/2:	160-210 mm (S4)
Density of mix:	2,300 kg/m³
pH of mix:	> 12.5
Application temperature:	+5°C to +35°C
Pot life of mix:	approx. 1 hour

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FINAL PERFORMANCE (9.7% mixing water)

Performance characteristic	Test method	Requirements according to EN 1504-3 for R4 class mortar	Performance of product
Compressive strength:	EN 12390/3	≥ 45 MPa (after 28 days)	20 MPa (after 1 day) 50 MPa (after 7 days) 75 MPa (after 28 days)
Compressive modulus of elasticity:	EN 13412	≥ 20 GPa (after 28 days)	30 GPa (after 28 days)
Adhesion to concrete (substrate in MC 0.40 type concrete) according to EN 1766:	EN 1542	≥ 2 MPa (after 28 days)	> 2 MPa (after 28 days)
Resistance to accelerated carbonation:	EN 13295	Depth of carbonation ≤ than the reference concrete (MC 0.45 type water/cement ratio = 0.45) according to UNI 1766	meets specifications
Impermeability to water under pressure – penetration depth:	EN 12390/8	not required	< 5 mm
Capillary absorption:	EN 13057	≤ 0.5 $kg/m^2 \cdot h^{0.5}$	< 0.5 $kg/m^2 \cdot h^{0.5}$
Thermal compatibility measured as adhesion according to EN 1542: – freeze-thaw cycles with de-icing salts: – storm cycles: – dry heat cycles:	EN 13687/1 EN 13687/2 EN 13687/4	≥ 2 MPa (after 50 cycles) ≥ 2 MPa (after 30 cycles) ≥ 2 MPa (after 30 cycles)	> 2 MPa > 2 MPa > 2 MPa
Resistance to freeze-thaw cycles in the presence of salts-flaking (g/m²):	EN 12390/9	not required	< reference concrete (XF4) *
Exposure class:	EN 206/1	not required	X0 XC1, XC2, XC3; XC4 XD1, XD2, XD3 XS1, XS2, XS3 XF1, XF2*, XF3*, XF4* XA1
Post-crack ductility index: – D_0 (0-0.6 mm): – D_1 (0.6-3.0 mm):	UNI 11039/2	not required	D_P (≥ 0.9) D_{H1} (≥ 1.3)
Limit of proportionality (LOP):	EN 14651	not required	$f_{ct,L}$ 7.0 MPa
Residual flexural strength: CMOD 1 = 500 µm CMOD 2 = 1,500 µm CMOD 3 = 2,500 µm CMOD 4 = 3,500 µm	EN 14651	not required	f_{R1} 6.8 MPa f_{R2} 8.4 MPa f_{R3} 7.4 MPa f_{R4} 6.4 MPa
Toughness characteristics – load at first cracking: – toughness index:	ASTM C1018	not required	> 20 kN I_{20} > 20
Reaction to fire:	EN 13501/1	Euroclass	A1

Mapegrout Betontech HPC10 has been tested according to EN 12390-9 and with respect to a reference concrete with a class XF4 mix design according to EN 206-1.

WARNING

Although the technical details and recommendations contained in this product data sheet correspond to the best of our knowledge and experience, all the above information must, in every case, be taken as merely indicative and subject to confirmation after long-term practical application; for this reason, anyone who

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intends to use the product must ensure beforehand that it is suitable for the envisaged application. In every case, the user alone is fully responsible for any consequences deriving from the use of the product.
The values declared in the TECHNICAL DATA table (typical values) were obtained in compliance with test methods and curing cycles defined in the technical standards referenced therein. Therefore, please note that the use of test procedures or methods other than those indicated in the table could lead to different values and that, in such cases, any liability of our company is excluded.
Please refer to the current version of the Technical Data Sheet, available from our website www.mapei.com

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