

MAPEGROUT HI-FLOW GF

Fluid, compensated-shrinkage cementitious mortar reinforced with inorganic fibres, for repairing concrete structures where higher fluidity is required



WHERE TO USE

Repairing deteriorated concrete structures and/or increasing the section of concrete structures where certain thicknesses and special contours determine the use of a free-flowing mortar.

Some application examples

- Structural reinstatement of reinforced concrete pillars and beams.
- Repairing motorway, road and railway viaduct piles.
- Repairing the lower spigots on pre-compressed beams for viaducts.
- Reinstatement floor slabs after removing deteriorated areas by scarifying.
- Repairing concrete floors (industrial, roads, airports).
- Repairing hydraulic structures (breather channels, dams, basins, forced run-off channels, etc.).
- Filling rigid joints between concrete elements.

TECHNICAL CHARACTERISTICS

Mapegrout Hi-Flow GF is a one-component pre-blended mortar in powder form, made from high-strength cement, selected graded aggregates, special admixtures and inorganic polyacrylonitrile fibres, according to a formula developed in MAPEI R&D laboratories.

The inorganic fibres have the following characteristics:

- length: 12 mm
- diameter: 14 µm
- tensile strength: 1700 MPa
- modulus of elasticity: 72 GPa

When **Mapegrout Hi-Flow GF** is mixed with water, it forms a highly fluid mortar which is suitable for pouring into formwork, without segregation, at a thickness between 1 and 5 cm, and does not require electro-welded mesh as a support.

To allow the product's expansive properties to develop fully and correctly, **Mapegrout Hi-Flow GF** must be mixed with water and cured in a damp environment. However, it is very difficult to guarantee these conditions on site.

In order to guarantee that its expansive properties develop correctly, adding **Mapecure SRA** to **Mapegrout Hi-Flow GF** offers certain advantages.

After mixing with 0.25% of **Mapecure SRA**, a special curing agent which reduces both plastic and hydraulic shrinkage, the excellent performance characteristics of **Mapegrout Hi-Flow GF** are further improved.

In fact, **Mapegrout Hi-Flow GF** mixed with **Mapecure SRA** may be considered a highly advanced technological system, in that the admix has the capacity of reducing quick evaporation of water from the mortar and promoting the development of hydration.

Mapecure SRA acts as an internal curing agent and, thanks to its interaction with some of the main components in the cement, reduces final shrinkage by 20% to 50% less than the same product without the admix. This means there will be a lower risk of cracking.

The product can also be used without adding **Mapecure SRA**, in those cases where favourable climatic conditions allow for correct curing.

Once hardened, **Mapegrout Hi-Flow GF** has the following characteristics:

- high flexural and compressive strength;
- modulus of elasticity, thermal expansion coefficient and permeability coefficient similar to high quality concrete;
- impermeability to water;
- excellent bond strength to old concrete, if dampened with water before application, and to reinforcement rods, especially if treated beforehand with **Mapefer** or **Mapefer 1K**;
- high resistance to wear from abrasion.

Mapegrout Hi-Flow GF meets the main requirements of EN 1504-9 ("*Products and systems for protecting and repairing concrete structures: definitions, requirements, quality control and conformity assessment. General principles for the use and application of systems*"), and the minimum requirements for EN 1504-3 ("*Structural and non-structural repairs*") for R4-class structural mortars.

Mapegrout Hi-Flow GF is recommended for thicknesses of up to 5 cm. If a thicker layer is required, we recommend adding 30 to 50% in weight of a suitable size aggregate; refer to MAPEI Technical Services Department for further details.

RECOMMENDATIONS

- Do not apply **Mapegrout Hi-Flow GF** on smooth substrates: create a very rough surface.
- Do not use **Mapegrout Hi-Flow GF** for anchoring (use **Mapefill** or **Mapefill R**).
- Do not apply **Mapegrout Hi-Flow GF** by spray or with a trowel (use **Mapegrout Thixotropic**).
- Do not add cement or admixtures to **Mapegrout Hi-Flow GF**.
- Do not add water once the mix has started to set.
- Do not use **Mapegrout Hi-Flow GF** if the temperature is lower than +5°C.
- Do not use **Mapegrout Hi-Flow GF** if the bag is damaged or if it has been opened previously.

APPLICATION PROCEDURE

Preparation of the substrate

- Remove all deteriorated and loose concrete to form a solid, rough and strong substrate. Any areas previously repaired and which are not perfectly bonded must also be removed.
- After preparing the substrate, the surface must be uneven with roughness at least 5 mm deep.
- Remove all dust, rust, cement laitance, grease, oil and old paint from the concrete and reinforcement rods by sandblasting.
- Treat reinforcement rods with **Mapefer** or **Mapefer 1K**, according to the procedure illustrated in the relative data sheet for each product.
- Wait until **Mapefer** or **Mapefer 1K** are dry.
- Saturate the substrate with water.
- Before carrying out repairs with **Mapegrout Hi-Flow GF**, wait until excess water has evaporated. If necessary, use compressed air to help remove excess water.

Preparation of the mortar

Pour 3.5-4.0 litres of water into the cement mixer and slowly add **Mapegrout Hi-Flow GF**. If better curing in open air is required, add 0.25% **Mapecure SRA** by weight of the mortar after mixing (1 0.25 kg canister every 100 kg of **Mapegrout Hi-Flow GF**).

Mix for 3-4 minutes, make sure that all the ingredients are well blended, remove all powder which has stuck to the walls of the mixer 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, according to the quantity of mortar required. Mixing must be carried out at a low speed to avoid the entrapment of air.

Only under exceptional circumstances should the mix be prepared by hand. In this case, prepare only small amounts each time, and mix for at least 5-6 minutes to form a completely homogenous blend. Please be advised that, if the mortar is prepared by hand, more water will be required. This will lead to lower performance of some of the characteristics, such as mechanical strength, shrinkage, waterproofing, etc.

Mapegrout Hi-Flow GF remains workable for approximately 1 hour at +20°C.

The expansion rate of **Mapegrout Hi-Flow GF** has been calculated so that it compensates for hygrometric shrinkage. If there is insufficient boundary support, filling layers of **Mapegrout Hi-Flow GF** thicker than 5 cm must only be applied after inserting reinforcing rods. A layer of at least 2 cm thick must be applied over the rods. Thinner layers may be applied if there is no reinforcement, but the surface of the substrate must be well roughened before application to counter the expansion. The expansion phase of the product takes place during the first few days of curing.

Application of the mortar

Pour **Mapegrout Hi-Flow GF** into the formwork in a continuous flow from one side only, in order to help all air to be expelled.

The formwork must not absorb water from **Mapegrout Hi-Flow GF**. In this case, we recommend treating the formwork with a form release oil (for example **Form Release Agent DMA 1000**).

Ensure all deteriorated areas are completely filled. To help the mortar enter into the more difficult areas, use tamping bars, round bars or a vibrator.

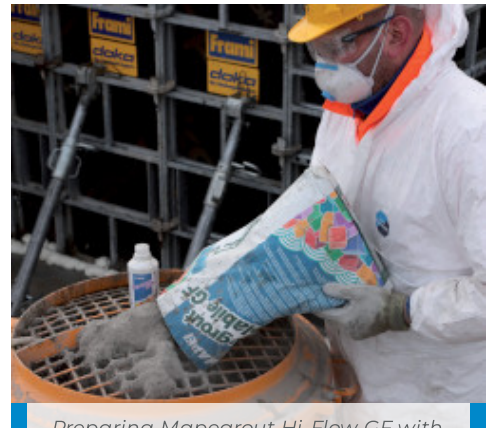
The complete repair cycle includes painting the surface with **Elastocolor Paint**.



Positioning the sealed formwork once it has been carefully prepared



Mapegrout Hi-Flow GF before mixing



Preparing Mapegrout Hi-Flow GF with an addition of Mapecure SRA



Application of Mapegrout Hi-Flow GF



Mapegrout Hi-Flow GF after stripping the formwork

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

- Only use bags of **Mapegrout Hi-Flow GF** which have been stored on their original 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 mortar.
- After application, and particularly in hot or windy weather, we recommend curing **Mapegrout Hi-Flow GF** carefully, to avoid the mixing water evaporating too quickly, otherwise surface cracks may appear due to plastic shrinkage. Spray water on the surface 8-12 hours after applying the mortar and repeat this operation at regular intervals (every 3-4 hours) for at least the first 48 hours.

As an alternative, after tamping the surface of 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**, high-penetration solvent fixing agent for absorbent surfaces and curing agent for repair mortar.

Mapecure E and **Mapecure S**, as with all the best products in this category available on the market, impede the bond of successive coating. Therefore, if smoothing and levelling compound or paint are to be applied, they must be completely removed. If **Elastocolor Primer** is used to block evaporation, the smoothing and levelling layer or final protective layer of **Elastocolor Paint** or **Elastocolor Rasante** may be applied directly onto the surface without removing it.

CLEANING

Mortar which has not yet hardened may be washed from tools using water. Once hardened, cleaning is much more difficult, and must be removed mechanically.

CONSUMPTION

Approximately 21 kg/m² per cm of thickness.

PACKAGING

25 kg bags.

STORAGE

Mapegrout Hi-Flow GF may be stored for up to 12 months in its original packaging. The product is available in special 25 kg vacuum-packed polyethylene bags which may be stored outside for the entire construction phase 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			
Class according to EN 1504-3:	R4		
Type:	CC		
Consistency:	powder		
Colour:	grey		
Maximum size of aggregate (mm):	2.5		
Bulk density (kg/m ³):	1,300		
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 Hi-Flow GF with 14-16 parts of water (3.5-4.0 litres of water per 25 kg bag) and 0.25% of Mapecure SRA (1 0.25 kg canister every 4 bags of Mapegrout Hi-Flow GF)		
Consistency of mix:	fluid		
Density of the mix (kg/m ³):	2,350		
pH of mix:	> 12.5		
Application temperature range:	from +5°C to +35°C		
Pot life of mix:	approximately 1 hour		
FINAL PERFORMANCE (14.5 % mixing water - mixing and compaction according to EN 196-1)			
Performance characteristics	Method Test	Requirements according to EN 1504-3 for R4 class mortar	Performance of product
Compressive strength (MPa):	EN 12190	≥ 45 (after 28 days)	> 25 (after 1 day) > 55 (after 7 days) > 65 (after 28 days)

Flexural strength (MPa):	EN 196-1	not required	7 (after 1 day) 9 (after 7 days) 10 (after 28 days)
Compressive modulus of elasticity (GPa):	EN 13412	≥ 20 (after 28 days)	27 (after 28 days)
Bond strength to concrete MC 0.40 type substrate - water/cement ratio = 0.40 according to EN 1766 (MPa):	EN 1542	≥ 2 (after 28 days)	> 2 (after 28 days)
Impeded contraction in open air (µm/m):	UNI 8147 A method	not required	> 400 (after 1 day) (*)
Warp test:	//	not required	convex (*)
Crack resistance:	"O Ring Test"	not required	no cracks after 180 days (*)
Resistance to accelerated carbonation:	EN 13295	carbonation depth < reference concrete (MC 0.45 type with water/cement ratio = 0.45) according to UNI 1766	meets specifications
Impermeability to water - penetration depth - (mm):	EN 12390-8	not required	< 5
Capillary absorption (kg/m ² ·h ^{0.5}):	EN 13057	≤ 0.5	< 0.25
Slip-resistance of steel reinforcement rods (bonding stress) - (MPa):	RILEM-CEB-FIP RC6-78	not required	> 25
Thermal compatibility measured as bonding according to EN 1542 (MPa): - freeze-thaw cycles with deicing salts: - storm cycle: - dry thermal cycle:	EN 13687-1 EN 13687-2 EN 13687-4	≥ 2 (after 50 cycles) ≥ 2 (after 50 cycles) ≥ 2 (after 50 cycles)	> 2 > 2 > 2
Exposition class:	EN 206-1	not required	X0, XC1, XC2, XC3, XC4, XS1, XS2, XS3, XD1, XD2, XD3, XF1, XF2, XF3, XF4 (**), XA1
Reaction to fire:	EN 13501-1	Euroclass	A1

(*) Performance reached by adding 0.25% of **Mapecure SRA**

(**) **Mapegrout Hi-Flow GF** was tested according to EN 12390-9 and was compared to reference concrete with XF4 class composition 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 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.

Please refer to the current version of the Technical Data Sheet, available from our website www.mapei.com

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