

MAPEGROUT HI-FLOW

Shrinkage-compensated, fibre-reinforced mortar for concrete repair



WHERE TO USE

Repairing structures where particular thicknesses and the state of deterioration require the use of high flow mortars.

Some application examples

- Structural reinstatement of reinforced concrete beams and pillars.
- Restoring the lower flanges of pre-stressed concrete beams of viaducts.
- Reinstatement of floor beams and slabs after scarification of deteriorated areas.
- Restoring concrete floors (industrial, road and airport).
- Grouting rigid joints between concrete elements.

TECHNICAL CHARACTERISTICS

Mapegrout Hi-Flow is a ready-mixed mortar in powder form composed of highly resistant cements, selected aggregates, special admixtures and synthetic fibres prepared according to a formula developed in the MAPEI Research & Development Laboratories.

Mapegrout Hi-Flow when mixed with water, becomes a highly fluid mortar, suitable for pouring into formwork without separation of the aggregates even when forming great thicknesses.

If **Mapegrout Hi-Flow** is prepared by only adding water, it must be cured under damp conditions in order to guarantee that the product's expansive properties develop completely and correctly. However, it is not easy to ensure these conditions on site.

To guarantee the expansive properties of **Mapegrout Hi-Flow** in the open air, 0.25% of **Mapecure SRA**, a special admixture which has the property of reducing both plastic and hydraulic shrinkage, may be used to great advantage by adding it to the mix.

Mapecure SRA has a very important role to play, in guaranteeing better mortar curing. When **Mapecure SRA** is mixed with **Mapegrout Hi-Flow**, it is considered a technologically advanced system, as the admixture has the capacity of slowing down the evaporation of the water from the mortar and of promoting the development of hydration reactions.

Mapecure SRA acts like an internal curing agent and, due to its interaction with some of the main components which make up the cement, it helps to reduce shrinkage by between 20 and 50% compared with the standard values of the product without the admix. This reduces the risk of cracking.

The product can be used also without using **Mapecure SRA** when environmental conditions permit an optimal curing. **Mapegrout Hi-Flow**, once cured, has the following qualities:

- high flexural and compressive strength;
- the modulus of elasticity and coefficients of thermal expansion and permeability to water vapour are similar to those of high quality concrete;
- waterproof;
- very high adhesion to old concrete, when it has been saturated with water beforehand, and to reinforcing rods especially if they have been treated with **Mapefer** or **Mapefer 1K**;
- high resistance to wear from abrasion.

Mapegrout Hi-Flow meets the requirements defined by 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 claimed by EN 1504-3 ("Structural and non structural repair") for structural mortars of class R4.

Mapegrout Hi-Flow is recommended for thicknesses up to 40 mm thick. For greater thicknesses, it is recommended to add suitable graded aggregates from 30 to 50% by weight of **Mapegrout Hi-Flow**, only after consulting our Technical Services Department.

If higher flexural and impact resistance are required, **Mapegrout Hi-Flow TI 20** should be used, castable, shrinkage-compensated, fibre-reinforced, high-ductility cementitious mortar with stiff steel fibres.

RECOMMENDATIONS

- Do not use **Mapegrout Hi-Flow** on smooth concrete surfaces; roughen them to reach the sound, resistant and rough substrate with more than 5 mm coarseness and insert reinforcing rods if needed.
- Do not use **Mapegrout Hi-Flow** for precision anchoring (use **Mapecoll** or **Mapecoll R**).
- Do not use **Mapegrout Hi-Flow** for applications by spray or trowel (use **Mapegrout Thixotropic**).
- Do not add cement or admixtures to **Mapegrout Hi-Flow**.
- Do not add water after the mix has begun to set.
- Do not use **Mapegrout Hi-Flow** at temperatures below +5°C (use **Mapecoll R**).
- Do not use **Mapegrout Hi-Flow** if its packing has been damaged or if it has been opened prior to use.

APPLICATION PROCEDURE

TECHNICAL INFORMATION FOR THE APPLICATION

Composition of mix:	100 kg of Mapegrout Hi-Flow 13-14 kg of water 0.25 kg of Mapecure SRA (optional *)
Layer thickness:	From 10 to 40 mm (Please refer to "Applying the mortar" paragraph for greater thicknesses)
Application temperature range:	Environmental and substrate temperature from +5°C to +35°C
Pot life of mix:	approx. 60 mins. (at +20°C)

* To allow expansion in air

Preparation of the substrate

- Remove all deteriorated, detaching or contaminated concrete until a rough, sound and resistant substrate is obtained. Remove any previous repair work or coating if not perfectly adhering to the substrate, using suitable tools (mechanical demolishing, hydroscarifying etc.).
- Clean concrete from previous scarifying works and clean reinforcing rods from dust, cement laitance, rust, grease, oil, paint and other contaminants through sandblasting and high-pressure water jets.
- After preparation, the concrete surface to be repaired must be rough, with irregularities at least 5 mm deep and inert fraction exposed to allow correct adhesion of the mortar to the substrate.
- Soak the substrate with water.
- Allow the excess water to evaporate before pouring in the mix; if necessary, use compressed air to facilitate the removal of the excess water.

Preparing the mortar

Pour 3.25-3.5 litres of water into a cement mixer and then slowly add **Mapegrout Hi-Flow**.

If improved open-air curing of the mortar is required, add **Mapecure SRA** at the end of the mixing phase at a dosage of 0.25% by weight of the mortar (0.25 kg every 100 kg of **Mapegrout Hi-Flow**).

Mix for 3-4 minutes, scrape any unmixed powder off the sides of the mixer and remix for another 1-2 minutes until the mix is fluid and free from lumps.

Depending on the quantity being prepared, a mortar mixer or a drilling machine with a stirrer attachment can be used. Avoid stirring an excess of air into the mix. **Mapegrout Hi-Flow** has a pot life of 1 hour at +20°C. Workability time may be extended by using **Dynamon EW** liquid admixture, according to MAPEI Technical Assistance recommendations.

The expansion of **Mapegrout Hi-Flow** has been calculated to compensate for hygro-metric shrinkage. To be effective, the forces of expansion must be countered with suitable reinforcement or formwork around the substrate.

The product may be transported using pumping or worm-screw double mixing rendering machine. For further information about mixing and pumping of the product contact MAPEI Building Technical Assistance.

Instructions for the preparation of mortar for Lab testing samples can be found in the TECHNICAL DATA section.

Applying the mortar

To facilitate the expulsion of air, pour **Mapegrout Hi-Flow** continuously into the formwork by one side only.

Water from **Mapegrout Hi-Flow** must not be absorbed by the formwork, which we recommend to be pre-treated with a form-release oil (e.g. MAPEI's **DMA 1000 Form Release Agent**).

The pour does not need to be vibrated. Make sure that all the parts to be repaired have been filled. If necessary, use sticks or rods to tamp the slurry into particularly difficult areas.

The repair process is complete when a coat of **Elastocolor Paint** is applied on the surfaces.



Pours thicker than 3 cm must be carried out after placing reinforcement steel rebar of at least 5 mm diameter and anchored to the substrate, with at least 2 cm concrete covering.

Lower thicknesses may be carried out without applying reinforcing rods as long as the substrate is roughened with irregularities equal to or greater than 5 mm, in order to counter the expansion of mortar which completes during the first days of curing.

To complete the repair cycle paint surfaces using **Elastocolor Paint**.



Pouring into a formwork



Removing wooden formwork



Deteriorated concrete structure



Pouring Mapegrout Hi-Flow into metal formwork



Restored structure



Reforming road joints

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

- To prepare the mix, only use bags of **Mapegrout Hi-Flow** which have been stored on their original pallets.
- In hot weather, store the product in a cool place and use only cold water to blend the mortar.
- In cold weather, store the product in a place which is protected from frost at a temperature of +20°C, and use tepid water to blend the mortar.
- After laying **Mapegrout Hi-Flow**, we recommend that it is cured carefully, especially in hot or windy weather, to avoid the water evaporating too quickly and causing the formation of surface cracks due to plastic shrinkage.
- For horizontal pours spray water on the surface during application and immediately cover with a waterproof sheet for at least 3 days.
- For vertical pours spray water on the surface immediately after form-release and cover with a waterproof sheet for at least 3 days.

Surface anti-evaporation products may be applied alternatively to wet curing, provided they are selected according to following operational steps.

CLEANING

Before hardening, the mortar can be cleaned from tools with water. After setting, cleaning is very difficult and it can only be removed mechanically.

CONSUMPTION

Approx. 21 kg/m² per cm of thickness.

PACKAGING

25 kg bags.

STORAGE

Mapegrout Hi-Flow may be stored for up to 12 months in its original packaging.

The special 25 kg vacuum-packed polyethylene bags offer better protection of the product from rainfall.

Some characteristic of the product are heavily influenced by storage conditions. It is advisable to stock the product in a dry and covered area at a temperature between +5°C and +35°C, in its original unopened packaging.

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 according to EN 1504-1:	CC
Consistency:	powder
Colour:	grey
Maximum size of aggregate:	2.5 mm
Ion-chloride content according to EN 1015-17: (minimum requirement according to EN 1504 ≤ 0.05%)	≤ 0.05 %

TECHNICAL INFORMATION FOR THE PREPARATION OF PRODUCT

Composition of mix:	100 parts by weight of Mapegrout Hi-Flow with 13 % water
Preparation of mix:	mixing of product according to EN 196-1

CHARACTERISTICS OF FRESH MIX (at +20°C - 50% R.H.)

Colour of mix:	grey
Consistency of mix:	fluid
Density of mix:	2300 kg/m ³

FINAL PERFORMANCE

According to curing defined in test methods

Performance characteristic	Test method	Requirements EN 1504-3 R4	Product performance
Compressive strength: - 1 day - 7 days - 28 days	EN 12190	- - ≥ 45 MPa	> 30 MPa > 60 MPa > 70 MPa
Flexural strength: - 1 day - 7 days - 28 days	EN 196-1	Not required	6 MPa 10 MPa 12 MPa
Compressive modulus of elasticity:	EN 13412	≥ 20 GPa	27 GPa
Bond strength by pull-off:	EN 1542	≥ 2.0 MPa	> 2.0 MPa
Contrasted expansion in air (24h):	UNI 8147 B method mod.	Not required	400 µm/m ⁽¹⁾
Warp test:	-	Not required	Convex behaviour ⁽¹⁾
Resistance to cracking:	"O Ring Test"	Not required	No cracking after 180 days ⁽¹⁾
Resistance to accelerated carbonation:	EN 13295	Carbonation depth ≤ than reference concrete	Meets specifications
Water impermeability – penetration depth:	EN 12390-8	Not required	< 5 mm
Capillary absorption:	EN 13057	≤ 0.5 kg/m ² ·h ^{0.5}	< 0.08 kg/m ² ·h ^{0.5}
Pull-out strength of steel rebar – tension of adhesion:	RILEM-CEB- FIP RC6-78	Not required	> 25 MPa
Thermal compatibility – freeze-thaw cycles using de-icing salts (50 cycles):	EN 13687-1	≥ 2.0 MPa	> 2.0 MPa
- Storm cycles (30 cycles):	EN 13687-2	≥ 2.0 MPa	> 2.0 MPa
- Dry thermal cycles (30 cycles):	EN 13687-4	≥ 2.0 MPa	> 2.0 MPa
Freeze-thaw resistance in presence of salts – scaling:	EN 12390-9	Not required	< than reference concrete (XF4) ⁽²⁾
Exposure class:	/	Not required	X0 XC1, XC2, XC3, XC4 XD1, XD2, XD3 XS1, XS2, XS3 XF1, XF2, XF3, XF4 ⁽²⁾ XA1 A1
Reaction to fire:	EN 13501-1	Euroclass	A1

NOTES:

Preparation of test samples: pour mortar in the moulds without settling.

⁽¹⁾ Performance figures obtained by adding 0.25% of **Mapecure SRA**.

⁽²⁾ **Mapecrout Hi-Flow** has been tested according to EN 12390-9 by comparing it with reference concrete with a composition specified for class XF4 according to EN 206-1 standards.

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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