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MAPEGROUT HI-FLOW

Shrinkage-compensated, fibre-reinforced mortar for concrete repair



WHERE TO USE

To repair structures where particular thicknesses and the state of deterioration require the use of high flow mortars. **Mapegrout Hi-Flow** is suitable to repair bridge structure where a flowable repair concrete is required and complies with the HE standard for repairing such structures.

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 the product, 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 **Mapecfill** or **Mapecfill 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 **Mapecfill R**).
- Do not use **Mapegrout Hi-Flow** if its packing has been damaged or if it has been opened prior to use.

APPLICATION PROCEDURE

Preparation of the substrate

- Remove degraded and loose concrete until the substrate is sound, resistant and rough, with more than 5 mm coarseness. Any previous restoration work which is not soundly bonded should also be removed.
- Clean the concrete and reinforcing rods by sandblasting, to remove all dirt, rust, cement laitance, grease, oil, and previously applied paints.
- 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.

The expansion of **Mapegrout Hi-Flow** has been calculated to compensate for hygrometric shrinkage.

To be effective, the forces of expansion must be countered with suitable reinforcement or formwork around the substrate.

Without formwork, **Mapegrout Hi-Flow** can only be applied in thicknesses greater than 40 mm on the condition that reinforcing rods have been fixed. The reinforcement cover must be at least 20 mm thick.

Smaller thicknesses can be applied without reinforcement as long as the substrate is sufficiently rough to be able to counter the expansion.

The expansion phase is completed during the first days of curing.

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.

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. Spray water on the surface after 5-8 hours of laying the mortar, and repeat the operation every 3-4 hours for at least the first 48 hours. As an alternative, after tamping the mortar, spread on a layer of **Mapecure E** anti-evaporation treatment, water-based emulsion with a low-pressure pump, **Mapecure S** solvent-based curing film for mortar and concrete or **Elastocolor Primer** solvent-

based, high-penetration primer for absorbent substrates and curing agent for repair mortar. **Mapecure E** and **Mapecure S**, as with all the best quality products in the same category which are currently available on the market, impede bonding of successive coating layers. Therefore, if a smoothing layer or paint is to be applied later, they must be completely removed by sandblasting. If **Elastocolor Primer** is used as an anti-evaporation treatment, on the other hand, a final protective layer of **Elastocolor Paint** or **Elastocolor Rasante** may be applied directly on the treated surface without having to remove it.

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 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.co.uk.

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 aggregate size (mm):	2.5
Bulk density (kg/m ³):	1,300
Dry solids content (%):	100
Chloride ions content: – minimum requirements ≤ 0.05% - according to EN 1015-17 (%):	≤ 0.05
PRODUCT APPLICATION DATA (at +20°C - 50% R.H.)	
Colour of mix:	grey
Mixing ratio:	100 parts of Mapegrout Hi-Flow with 13-14 parts water (approx. 3.25-3.5 l per 25 kg bag) and 0.25% of Mapecure SRA (one 0.25 kg canister every 4 bags of Mapegrout Hi-Flow)
Consistency of mix:	fluid
Slip value of mortar according to EN 13395/2 (cm):	> 45

Density of 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 h		
FINAL PERFORMANCE (13% blending water - mixing according to EN 196-1)			
Performance characteristic	Test method	Requirements according to EN 1504-3 for R4 class mortar	Product performance
Compressive strength (MPa):	EN 12190	≥ 45 (after 28 days)	> 30 (after 1 day) > 60 (after 7 days) > 75 (after 28 days)
Flexural strength (MPa):	EN 196-1	not required	6 (after 1 day) 10 (after 7 days) 12 (after 28 days)
Modulus of elasticity in compression (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)
Contrasted expansion in air drying (µm/m):	UNI 8147 mod.	not required	> 400 after 1 day (*)
Bending test:	//	not required	convex (*)
Crack resistance:	"O Ring Test"	not required	no cracks after 180 days (*)
Resistance to accelerated carbonation:	EN 13295	depth of carbonation ≤ reference concrete (MC 0.45 type with water/cement ratio = 0.45) according to UNI 1766	test passed
Impermeability to water - penetration depth - (mm):	EN 12390-8	not required	< 5
Capillary absorption (kg/m ² ·h ^{0.5}):	EN 13057	≤ 0.5	< 0.08
Slip resistance of steel 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 30 cycles) ≥ 2 (after 30 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 figures obtained by adding 0.25% of **Mapecure SRA**

(**) **Mapegrout 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.co.uk

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