



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 slurries.

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 additives and synthetic fibres prepared according to a formula developed in the MAPEI research laboratories.

Mapegrout Hi-Flow, once 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 very easy to guarantee that these conditions are created 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.

In fact, **Mapecure SRA** has a very important role to play, in guaranteeing better mortar curing. Also, when mixed with **Mapegrout Hi-Flow**, it may be considered a technologically advanced system, in that the admixture has the capacity of slowing down quick evaporation of the water from the mortar and of promoting the development of hydration reactions.

Basically, **Mapecure SRA** behaves like an internal curing agent and, thanks 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 will obviously lead to a lower incidence of cracking phenomena.

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;
- modulus of elasticity and coefficients of thermal expansion and permeability to water vapour similar to those of high quality concrete;

Mapegrout Hi-Flow



Pouring into a formwork



Removing wooden formwork

- waterproof;
- very high adhesion to old concrete, providing it has been saturated with water beforehand, and to reinforcing rods especially if they have been treated with **Mapecer** or **Mapecer 1K**;
- high resistance to wear from abrasion.

Mapegrout Hi-Flow meets the requirements defined by ENV 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 4 cm thick. For greater thicknesses, it is recommended to add suitable graded aggregates from 30 to 50% by weight of the product, only after consulting Technical Assistance. If higher flexural and impact resistance are required, **Mapegrout Colabile TI 20** should be used, castable, shrinkage-compensated, fibre-reinforced, high-ductility cementitious mortar, to be used along with stiff steel fibres **Fibres R60**.

RECOMMENDATIONS

- Do not use **Mapegrout Hi-Flow** on smooth concrete surfaces; roughen them well and insert reinforcing rods if needed.
- Do not use **Mapegrout Hi-Flow** for precision anchorages (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 additives 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

Preparing the substrate

- Remove degraded and loose concrete until the substrate is solid, resistant and rough. 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 free 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.

In order 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 4 cm on the condition that reinforcing rods have been fixed. The reinforcement cover must be at least 2 cm 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 should 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 sacks of **Mapegrout Hi-Flow** which have been stored on their original pallets and covered and stored in a dry place.
- 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.

TECHNICAL DATA (typical values)

PRODUCT IDENTIFICATION

Strength class according to EN 1504-3:	R4
Type:	CC
Consistency:	powder
Colour:	grey
Maximum aggregate size (mm):	2.5
Bulk density (kg/m³):	1,300
Dry solids content (%):	100
Chloride ions content - minimum requirements $\leq 0.05\%$ - according to EN 1015-17 (%):	≤ 0.05
Storage:	12 months in original packaging in a dry place
Hazard classification according to CE Directive 1999/45:	irritant. Before using refer to the "Safety instructions for preparation and application" paragraph and the information on the packaging and Safety Data Sheet
Customs class:	3824 50 90

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 sack) and 0.25% of Mapecure SRA (one 0.25 kg canister every 4 sacks of Mapegrout Hi-Flow)
Consistency of mix:	fluid
Slip value of mortar according to EN 13395/2 (cm):	> 45
Density of mix (kg/m³):	2,350
pH of mix:	> 12.5
Application temperature range:	from +5°C to +35°C
Pot life of mix:	1 h

FINAL PERFORMANCE (13% blending water)

Performance characteristic	Test method	Minimum 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	none	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/concrete ratio = 0.40) according to EN 1766 (MPa):	EN 1542	≥ 2 (after 28 days)	> 2 (after 28 days)
Contrasted expansion in air drying ($\mu\text{m/m}$):	UNI 8147 MOD.	none	> 400 after 1 day (*)
Bending test:	//	none	convex (*)
Crack resistance:	"O Ring Test"	none	no cracks after 180 days (*)
Resistance to accelerated carbonatation:	EN 13295	Depth of carbonatation \leq reference concrete (MC 0.45 type with water/concrete ratio = 0.45) according to UNI 1766	test passed
Impermeability to water - penetration depth - (mm):	EN 12390/8	none	< 5
Capillary absorption ($\text{kg/m}^2 \cdot \text{h}^{0.5}$):	EN 13057	≤ 0.5	< 0.08
Slip resistance of steel rods - bonding stress - (MPa):	EN 15184	none	≥ 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
Reaction to fire:	Euroclass	value declared by manufacturer	A1



Deteriorated concrete structure



Pouring Mapegrout Hi-Flow into metal formwork



Restored structure

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

All relevant references
for the product are available
upon request and from
www.mapei.com



Reforming road joints

- 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 dressing 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 slurry can be cleaned from tools with water. After setting, cleaning is very difficult and it can only be removed mechanically.

CONSUMPTION

21 kg/m² per cm of thickness.

PACKAGING

25 kg bags.

STORAGE

12 months if stored in a dry and sheltered place.

Manufactured in compliance with the regulations of the 2003/53/EC Directive.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

Mapegrout Hi-Flow contains cement that, when in contact with sweat or other bodily fluids, produces an irritant alkaline reaction and allergic reactions in those predisposed. Wear protective clothing, gloves and eye/face protection. For further information refer to the Safety Data Sheet.

PRODUCT FOR PROFESSIONAL USE.

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 applications; 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.

