

Mapegrout FMR

Two-component shrinkage compensated sulphate resistant mortar, to be reinforced with flexible metal alloy fibres, particularly suitable for the repair of concrete structures where more ductility is required



WHERE TO USE

Repair of damaged concrete structures on vertical or horizontal surfaces or on ceilings.

Some application examples

- Repairing deteriorated areas of concrete damaged by the oxidation of reinforcing rods.
- Reconstruction of reinforcing rod covers in reinforced concrete structures.
- Repairing surfaces subjected to heavy abrasion and impact (canals, industrial floors, ramps, etc.).
- Levelling diaphragm and tunnel walls.
- Repairing viaducts for highways, roads and railways.
- Repairing spillways.

TECHNICAL CHARACTERISTICS

Mapegrout FMR is a ready-mixed powder composed of high-strength cements, selected aggregates and special fibres manufactured to a formula developed in the Mapei research laboratories. **Mapegrout FMR** must be mixed with water and 375 g of flexible metal fibres, **Fibres FF**, for every 25 kg of powdered product. The fibres, which are supplied separately in water soluble bags, are manufactured with corrosion resistant amorphous metal alloy of iron-chrome having the following properties:

- length/diameter ratio: 125
- length: 30 mm
- tensile strength: > 1,900 N/mm²

The **Fibres FF** improve the mortar's flexural performance and considerably increase resistance to impact.

When mixed with **Fibres FF** and water, **Mapegrout FMR** becomes an easily workable highly thixotropic mortar, easy to apply on vertical and horizontal surfaces or on ceilings, even in thick layers without needing formwork.

If **Mapegrout FMR** is prepared by adding water only, it must be cured in a damp environment in order to develop and fully exploit its expansive properties correctly. These conditions are difficult to obtain on site. Therefore, to guarantee its expansive properties, 0.25-0.5% of **Mapecure SRA** may be added to the **Mapegrout FMR** mix, in order to reduce the amount of plastic and hydraulic shrinkage.

Mapecure SRA plays a very important role by guaranteeing improved curing of the mortar. When mixed with **Mapegrout FMR**, it may also be considered a technologically advanced system, since the admix has the capacity of reducing quick evaporation of the water in the blend and helps develop the hydration.

Mapecure SRA behaves as an internal curing agent. Thanks to its interaction with some of the main components of cement, final shrinkage is reduced by 20-50% compared with the normal shrinkage of the product without admix. This reduces the potential formation of cracks.

Once hardened, **Mapegrout FMR** has the following properties:

- Very high flexural and compressive strength.
- Coefficient of thermal expansion and permeability to water vapour similar to those of high quality concrete.
- Is waterproof.



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- Excellent adhesion to old concrete, provided that it has been wetted with water beforehand, and also to reinforcing rods, especially if they have been treated with **Mapefer** or **Mapefer 1K**.

ADVANTAGES

The expansion of **Mapegrout FMR**, as that of all the products of the **Mapegrout** line, has been calculated to compensate for hygrometric shrinkage. For it to be effective, the substrate needs to be well roughened. This is a necessary condition because, due to high bonding properties and content of fibres, an internal constraint should be generated in the mortar which should be like that found in concrete by pre-compression. Because of this effect, **Mapegrout FMR** can be used without using a reinforcing metal net (which is necessary when using normal repair mortars) even if the thicknesses of the concrete that needs repair are high.

RECOMMENDATIONS

- Do not use **Mapegrout FMR** on smooth concrete surfaces: roughen them well.
- Do not add water to a mix that has already begun to set.
- Do not use **Mapegrout FMR** at temperatures below +5°C.
- Do not use **Mapegrout FMR** if the packaging has been damaged or if it has been opened beforehand.
- Do add cement or additives to **Mapegrout FMR**.
- Do not use **Mapegrout FMR** to repair structures by pouring into formwork (use **Mapegrout Hi-Flow**).
- Do not use **Mapegrout FMR** for anchoring (use **Mapefill**).

APPLICATION PROCEDURE

Preparing the substrate

Remove deteriorated and loose concrete until the substrate is solid, strong and rough at

least 5 mm. Any previous repairs that are not perfectly bonded to the substrate should be removed.

Clean the concrete and reinforcing rods until free of dust, rust, cement, laitance, grease, oils and previously applied paints, by sand-blasting.

After cleaning, treat the reinforcing rods with **Mapefer** or with **Mapefer 1K**, corrosion-inhibiting cement mortars, following the application procedure described in their technical data sheets. Wait until **Mapefer** or with **Mapefer 1K** have dried completely then soak the substrate with water.

Wait for the excess water to evaporate before applying **Mapegrout FMR**. To facilitate the elimination of free water, use compressed air or a sponge.

Preparing the mortar

Pour into the mixer the amount of water needed to obtain the consistency required for the application (16-17% of the amount of powder).

Application	Litres of water per 25 kg bag
Trowel and spray	4.0-4.25

Start the mixer and slowly add the **Mapegrout FMR** to the water in a continuous flow.

If open air curing of the mortar needs to be improved, add 0.25-0.5% by weight of **Mapecure SRA** (0.25-0.5 kg per 100 kg of **Mapegrout FMR**).

Mix for 1 to 2 minutes, then check to make sure the mix is well blended. Scrape any unmixed powder from the bottom and sides of the mixer and add **Fibres FF** (one 375 g water soluble bag of fibres for each 25 kg bag of powder). Mix again for another 2 to 3 minutes.

Depending on the amount needed, a mortar mixer or a drill fitted with an agitator attachment may also be used. Mix at low speed to avoid air entrapment.

Avoid mixing manually unless absolutely necessary. If so, mix small amounts at time for at least 5 to 6 minutes until a completely homogenous paste is obtained.

Mixing by hand requires a larger amount of water. This adversely affects several of the mortar's properties, including mechanical strength, shrinkage, watertightness, etc.

Mapegrout FMR remains workable for approximately 60 minutes at +23°C.

Applying the mortar

The grout can be applied with a trowel or sprayed using a piston sprayer (e.g. Turbosol or Putzmeister) without formwork even on vertical surfaces or soffits. The maximum thickness per coat must not be more than 50 mm. If a second coat of **Mapegrout FMR** is required, it must be applied before the previous one has completely set. If it has to be applied on a layer which has already hardened, we recommend that the surface of the first layer is left rough and that the substrate is dampened with water.

The mortar can be finished with a wooden or plastic tamper once it has hardened. If a further protective finish is required, remove any fibres that cover the surface with a flat trowel and clean with high pressure water jets before finishing.



A detail of a concrete surface during repair

TECHNICAL DATA (typical values)	
PRODUCT IDENTIFICATION DATA WITHOUT FIBRES:	
Consistency:	powder
Colour:	grey
Bulk density (kg/m³):	1250
Maximum diameter of aggregate (mm):	2.5
Dry solid content (%):	100
Storage:	12 months in a cool dry place in original packaging
Hazard classification according to EC 99/45:	irritant. Before using refer to the "Safety instructions for the preparation and application" paragraph and the information on the packing and Safety Data Sheet
Customs class:	3824 50 90
APPLICATION DATA WHEN MIXED WITH FIBRES at +23°C - 50% R.H.	
Colour of mix:	grey
Mix ratio:	one 25 kg bag of Mapegrout FMR , 4 to 4.25 l of water and one 375 g bag of Fibres FF
Consistency of mix:	plastic-thixotropic
Slump according to UNI 7044/72 (%):	50-90
Density of mix:	2100-2250
Application temperature range:	+5°C to +35°C
Workability of mix:	approx. 60 min.
Waiting time between coats:	max 1-2
Thickness per coat (mm):	max 50
FINAL PERFORMANCES	
Mechanical characteristics (curing at +20°C and 95% R.H.): Compressive mechanical strength (EN 196/1) (N/mm²): - after 1 day: - after 7 days: - after 28 days:	 ≥ 30 ≥ 55 ≥ 70
Flexural mechanical strength (EN 196/1) (N/mm²): - after 1 day: - after 7 days: - after 28 days:	 ≥ 8 ≥ 9 ≥ 12
Direct adherence to concrete (breaking of the substrate) (N/mm²): - after 28 days in open air: - after 7 days in open air + 21 days in water: - after 7 days in open air + 21 days at +60°C:	 ≥ 2.0 ≥ 2.0 ≥ 2.0
Compressive modulus of elasticity (UNI 6556) (N/mm²): - after 28 days:	 27,000

Note: the metal fibres in the mix require special care in preparing the sample used for testing flexural strength. They must be uniformly distributed throughout the mix.

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Precautions to be taken during and after application

- When preparing the mix, only use bags of **Mapegrout FMR** that have been stored on original pallets in a dry place.
- During hot weather, store the product in a cool place and only use cold water when preparing the mix.
- During cold weather, protect the product from frost at a temperature of 20°C and use lukewarm water when preparing the mix.
- After applying **Mapegrout FMR**, we recommend that it is cured carefully to avoid rapid evaporation of the mixing water causing surface cracks due to plastic shrinkage, especially in hot, windy weather. Spray water on the surface 8-12 hours after applying the mortar and repeat this process every 3-4 hours for at least the first 48 hours. As an alternative, after tamping the mortar, apply a coat of either **Mapecure E** anti-evaporation agent with a low pressure pump, **Mapecure S** solvent-based curing film for mortar and concrete or **Elastocolor Primer** solvent-based, high penetration sealing base for absorbent substrates and curing agent for repair mortar. As with all top quality products in this category, **Mapecure E** and **Mapecure S** impedes bonding of successive layers. Therefore, if smoothing compound or paint is to be applied later, they must be completely removed beforehand by sandblasting. If **Elastocolor Primer** is used to reduce evaporation, a final protective layer of **Elastocolor Paint** or **Elastocolor Rasante** may be applied directly on the treated surface without removing it.

Cleaning

Mortar that has not hardened can be removed from tools with water. After setting, cleaning is very difficult and can only be carried out mechanically.

CONSUMPTION

19 kg/m² per cm of thickness.

PACKAGING

Mapegrout FMR is available in:

- 25 kg paper bags.
- Water soluble bags each containing 375 g of **Fibres FF** flexible metal fibres.

STORAGE

Store in a dry, sheltered place.

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

SAFETY INSTRUCTIONS FOR THE PREPARATION AND APPLICATION

Mapegrout FMR contains cement that on contact with sweat or other body fluids produces an irritant alkaline reaction and allergic reactions to those predisposed. Wear protective gloves and goggles. For further information refer to the Safety Data Sheet.

FOR PROFESSIONALS.

WARNING

Although the technical details and recommendations contained in this product report 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.

All relevant references of the product are available upon request



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