PLANITOP HPC

Two-component, ultra-high performance, shrinkage-compensated, free-flowing, high ductility fibre-reinforced cementitious mortar with stiff steel fibres





BENEFITS AND FEATURES

- Low-thickness application
- Less load added to the structure
- Reduced material handling on site
- Very high flexural and compressive strength
- High ductility
- Excellent adhesion to existing concrete
- High abrasion wear and impact resistance
- CVT and CE certified

WHERE TO USE

Reparation and strengthening of reinforced concrete structures that require the use of a free-flowing, ultra-high performance, and high ductility mortar without using reinforcing bars in order to limit the thickness applied.

Some application examples

- Seismic retrofitting of elements subject to high stresses and where high ductility is required.
- Structural strengthening of reinforced concrete pillars and beams by column and beam jacketing.
- Repairs to the lower sections of pre-tensioned beams in viaducts.
- Rebuilding and levelling off the upper parts of piers caps and bearings on motorway viaducts.
- Reparation of floor slabs after removal of damaged areas by scarifying;

TECHNICAL CHARACTERISTICS

Planitop HPC is a two-component fluid mortar suitable for casting into formwork without risk of segregation. When applied in layers up to 40 mm thick, it can be cast without using reinforcing bars; for thicker applications, it is possible to design a suitable reinforcement mesh.

Planitop HPC is a ready-mixed free-flowing mortar made of two components: component A (powder) and component B (**Fibre HPC**).

Planitop HPC component A (powder) is made of high-strength cement, selected aggregates and special additives, according to a formula developed in the MAPEI Research and Development labs. It is supplied in 25 kg bags. Component A must be mixed with 6.5% by weight of component B (**Fibre HPC**), stiff steel fibres.

To allow the product's expansive properties to develop fully and correctly, **Planitop HPC** must be cured in a damp environment. To allow expansion in the open air, **Planitop HPC** can also be admixed with 0.25% of **Mapecure SRA**, a special admixture that reduces plastic and hydraulic shrinkage.

Mapecure SRA carries out an extremely important role and guarantees better curing of the mortar. When mixed with **Planitop HPC**, it can be considered a technologically advanced system, as it is able to reduce the rapid evaporation of water and promote the development of hydration reactions.

Mapecure SRA acts basically 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% compared with the same product without the admixture, which means there is also a lower risk of cracking.

The use of **Mapecure SRA** could slightly reduce mechanical performance characteristics by 5-6%.

The product may also be used without adding **Mapecure SRA** when climatic conditions allow a favourable curing cycle to be carried out.

Once hardened, **Planitop HPC** has the following characteristics:

- very high flexural and compressive strength.
- High ductility.
- High resistance to cyclical loads.
- Impermeability to water.
- Excellent adhesion to both old concrete (if soaked with water before application) and rebars, especially if treated beforehand with **Mapefer** or **Mapefer 1K**;
- high resistance to wear due to abrasion or impact.

Planitop HPC complies with the principles defined in 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 of EN 1504-3 ("*Structural and non-structural repair*") for R4-class structural mortars and with the requirements of EN 1504-6 ("*Anchoring of reinforcing steel bars*").

Planitop HPC is covered by the Certificate of Technical Assessment (CVT) No. 264/2020 issued by the 2nd Division of the STC (Italian Central Technical Service) of the CSLP (Italian High Council for Public Works).

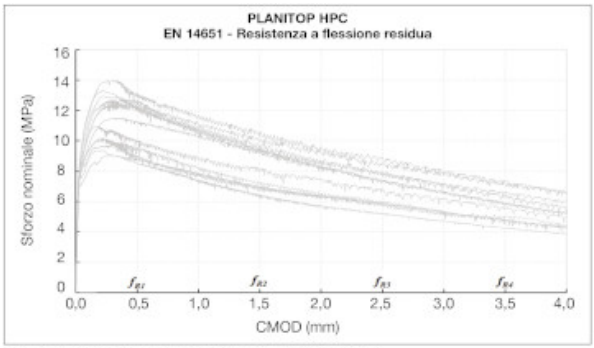


Grafico resistenza a flessione residua in accordo alla norma EN 14651

Graph of residual flexural strength according to EN 14651

RECOMMENDATIONS

- Do not apply **Planitop HPC** on smooth concrete substrates.

- Do not use **Planitop HPC** for precision anchoring (use **Mapefill** or **Mapefill R**).
- Do not apply **Planitop HPC** by spray or with a trowel (use **Planitop HPC Tixo** for application by trowel).
- Do not add cement or admixtures to **Planitop HPCC**.
- Do not add water once the mix has started to set.
- Do not use **Planitop HPC** if the bag is damaged or if it has been opened previously.

APPLICATION PROCEDURE

TECHNICAL INFORMATION FOR PRODUCT PREPARATION	
Mix composition:	100 kg of component A (powder **Planitop HPC**) 11.5-12.5 kg of water 6.5 kg of component B (**Fibre HPC**)
Thickness applied:	up to 40 mm (without additional reinforcement mesh).
Application temperature:	Surrounding and substrate temperature from +5°C to +35°C
Pot life of mix:	approx. 45 minutes (at +20°C)
Set to light traffic:	24 h at +20°C
Set to heavy traffic:	72 h at +20°C

Preparation of the substrate

- Remove all damaged and detached areas of concrete to form a sound, rough (roughness of at least 5 mm) and strong substrate. Any areas previously restored which are not perfectly attached must also be removed.
- Remove all dust, rust, cement laitance, grease, oil and old paint from the concrete and reinforcing bars by sandblasting.
- Saturate the substrate with water.
- Before casting, wait until the excess water has evaporated. If necessary, this operation may be speeded up by using compressed air.

Preparation of the mortar

Pour **Planitop HPC** component A (powder) in the mixer and add 3.0 litres of water per bag of product.

The mixing time depends on the efficiency of the mixer.

For example, with a forced-action mixer, mixing requires approximately 4 minutes. When the product is well blended and lump-free, add the relevant quantity of component B (**Fibre HPC**) and mix for 2 more minutes.

If a traditional cement mixer is used, mix component A (powder) with the relevant quantity of water for 8 minutes. After the addition of component B (**Fibre HPC**), mix for 4 - 5 more minutes.

At the end of the mixing process, the mix must be smooth (the fibres must be completely dispersed), fluid, and lump-free.

Small variations in the quantity of mixing water (2.9-3.1 l) are allowed depending on the mixing equipment and the climate conditions.

It is recommended to apply the product within 30 minutes of mixing.

The instructions for the preparation of the mortar to be used for the creation of concrete samples for laboratory tests are reported in the Technical Data table.

Application of the mortar

Pour **Planitop HPC** into the formwork in a continuous flow from one side only, making sure all the air is expelled.

The formwork must not absorb any of the water from **Planitop HPC**. It is recommended to treat the formwork beforehand with a form release agent (such as **Mapeform DMA 1000**).

Make sure that all the members to be strengthened are completely filled. To help the mortar flow into the more difficult areas, use wooden rods, round iron bars, or vibrate lightly.



Bending tests in CMOD control mode, according to EN 14651

FINISHING AND PROTECTIVE COATING

In the case of application in exteriors, protect **Planitop HPC** with the finishing cycles composed of **Primer EP Rustop** and **Mapecoat PU33**, or **Mapelastic** and **Elastocolor Pittura**. The protective finish can be applied directly on **Planitop HPC** or on the overlaying skim coat, if any. Refer to the relevant Technical Data Sheet for details on how to apply the aforementioned products.

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

- To prepare the mortar, use only **Planitop HPC** bags that have been stored on their original pallets, in a covered area.
- 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 an area protected from frost at a temperature of +20°C and use lukewarm water to prepare the mortar.
- After applying **Planitop HPC**, it is recommended to cure it very carefully, particularly in hot or windy weather, to prevent the mixing water from evaporating off too quickly and causing surface cracks. Always protect **Planitop HPC** by spraying water on the surface during the casting operations. Then cover the surface with a waterproof sheet for at least 5 days.

CLEANING

Wash mortar from tools with water before it hardens. Once hardened, cleaning is much more difficult and must be carried out only mechanically.

CONSUMPTION

Approx. 20 kg/m² per cm of thickness.

PACKAGING

Planitop HPC is supplied in 25 kg bags (component A) and 6.5 kg boxes of metal rigid fibres **Fibre HPC** (component B).

STORAGE

12 months in its original packaging, in a dry sealed covered place.

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:	class R4
Type according to EN 1504-1:	CC
Cementitious mortar	
Consistency:	powder
Colour:	grey
Maximum size of aggregate:	1.0 millimeters
Chloride ion content according to EN 1015- 17: (minimum requirements according to EN 1015 ≤ 0.05%)	≤ 0.05 %
Fibres	
Shape:	straight
Aspect ratio:	62
Material:	steel
Material density - according to EN 14889-1:	7.85 g/cm³
Length - according to EN 14889-1:	13 mm
Equivalent diameter - according to EN 14889-1:	0.21 mm
Tensile strength - according to EN 14889-1:	2,750 MPa
Modulus of elasticity - according to EN 14889-1:	200 GPa
Elongation at failure - according to EN 14889-1:	1.5-3.0 %

TECHNICAL INFORMATION FOR PRODUCT PREPARATION

Mix composition:	100 parts by weight of component A (**Planitop HPC** powder with 6.5 parts by weight of component B (**Fibre HPC**) and 12% of water (by component A)
Preparation of the mix:	according to the internal procedure MGE 71-C or Application and Preparation Manual

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

Colour of mix:	grey
Slump flow according to EN 12350- 8:	Class SF3 according to EN 206
Density according to EN 12390-7:	2450 kg/m³

FINAL PERFORMANCE
According to the curing times defined in the test methods

Performance characteristic	Test method	Requirements according to EN 1504-3 R4	Requirements according to EN 1504-6	Performance of product
Compressive strength: **- 28 days**	EN 12190	≥ 45 MPa	not required	**130 MPa**
Compressive modulus of elasticity:	EN 13412	≥ 20 GPa	not required	**37 GPa**
Shear strength and slip resistance (τ-bond) concrete substrate with roughened surface:	experimental method (1)	not required	not required	**≥ 3.5 MPa**
Bond strength to concrete by pull-off:	EN 1542	≥ 2.0 MPa	not required	**≥ 3.0 MPa**
Resistance to accelerated carbonation:	EN 13295	depth of carbonation ≤ to reference concrete	not required	**meets specifications**
Water impermeability – depth of penetration:	EN 12390-8	not required	not required	**< 2 mm**
Capillary absorption:	EN 13057	< 0.5 kg/m²·h$^{0.5}$	not required	**< 0.5 kg/m²·h$^{0.5}$**
Thermal compatibility: **- freeze-thaw cycling with de-icing salt (50 cycles):**	EN 13687-1	≥ 2.0 MPa	not required	**> 2.0 MPa**
Freeze-thaw resistance with de-icing salts - scaling (after 56 cycles):	EN 12390-9	not required	not required	**< 100 g/m²**
Pull-out strength of steel rebar – displacement at load of 75 kN:	EN 1881	not required	≤ 0.6 mm	**< 0.6 mm**
Average residual flexural strength: (2) **- CMOD 1 = 0.5 mm** **- CMOD 2 = 1.5 mm** **- CMOD 3 = 2.5 mm** **- CMOD 4 = 3.5 mm**	EN 14651	not required	not required	**f_{R1} 10.9 MPa** **f_{R2} 8.6 MPa** **f_{R3} 7.1 MPa** **f_{R4} 5.8 MPa**
Reaction to fire:	EN 13501-1	Euroclass	Euroclass	**A1**

Notes:

Specimens preparation 40x40x160 mm: pour the mortar into the moulds filling them up to half. Compact the mortar manually. Complete the fill. Compact the mortar manually and strike off the excess.
The presence of structural metal fibres in the mixture requires particular care in the preparation of specimens intended for bending tests so that the fibres are distributed homogeneously and evenly. If the fibres in the specimen are not evenly distributed, the test result is not valid. In such cases, the test must be repeated.
During the bending test, the specimen initially cracks, butbut the load continues to rise due to the presence of the fibres. It is therefore necessary to continue the test until there is a reduction in the maximum load of at least 50%.
(1) Experimental method. Test report available upon request (contact Mapei Technical Service).
(2) For the mixing process and the specimen preparation, please make reference to the Application and Preparation Manual. The product must be vibrated and compacted in compliance with EN 12190 (§ 6).

MECHANICAL and DURABILITY PROPERTIES according to CVT No. 264/2020 (12% of mixing water)

Properties	Test method / Reference standard	Performance of product (*)
Mechanical behaviour:	-	**non-strain hardening**
Compressive strength class:	NTC 2018 Tab. 4.1.I	**C 90/105**
Compressive modulus of elasticity:	NTC 2018 § 11.2.10.3	**43.9 GPa** *(calculated value)*
Residual strength class:	EN 14651	**8.0 a**
Limit of proportionality:		
- **avarage value $f^{f}_{ct,L,m}$:**	EN 14651	**8.6 MPa**
- **characteristic value $f^{f}_{ct,L,k}$:**		**7.2 MPa**
Ratf$_{R,1k}$ /f $^{f}_{ct,\ Lk}$:	EN 14651	**1.21**
Ratf$_{R,3k}$ /f$_{R,1k}$:	EN 14651	**0.63**
Exposure class:	EN 206 – Table F.1	**X0** **XC1, XC2, XC3, XC4** **XD1, XD2, XD3** **XS1, XS2, XS3** **XF1, XF2, XF3, XF4 (**)** **XA1**
Freeze-Thaw resistance:	Guidelines FRC § 3.4.1	**Test passed**

Notes:

(*) For the mixing process and specimen preparation, please make reference to the Application and Preparation Manual. The product must be vibrated and compacted accordingly as per EN 12190 (§ 6).

(**) **Planitop HPC** was tested according to the standard EN 12390-9 compared with reference concrete with composition in compliance with class XF4 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.

The values declared in the TECHNICAL DATA table (typical values) were obtained in compliance with test methods and curing cycles defined in the technical standards referenced therein. Therefore, please note that the use of test procedures or methods other than those indicated in the table could lead to different values and that, in such cases, any liability of our company is excluded.

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

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