PLANITOP HPC

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

WHERE TO USE

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

Some application examples

· Seismic upgrading of elements subjected to high stresses where high ductility is required.
· Structural strengthening by cladding reinforced cement pillars and beams.
· Repairing the lower spigots on pre-compressed viaduct beams.
· Reconstructing and levelling off the upper parts of pulvinos and bearing elements of piles for motorway viaducts.
· Reinstating floor slabs after removing deteriorated areas by scarifying.

TECHNICAL CHARACTERISTICS

Planitop HPC is a two-component fluid mortar suitable for casting into formwork without the risk of the mortar segregating. Areas up to 40 mm thick can be cast without using reinforcing steel; for thicker areas, it is possible to use suitable reinforcement steel.

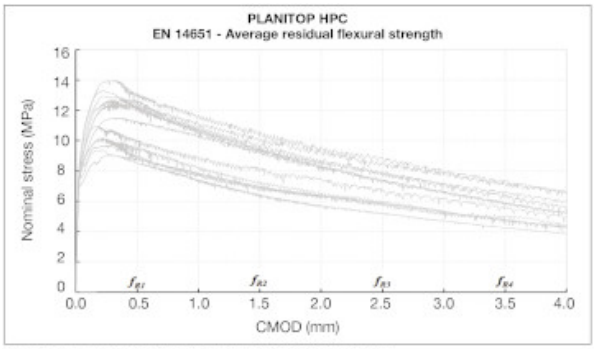
Planitop HPC is a ready-mixed free-flowing mortar made from two components: component A (powder) and component B (**HPC Fibres**).
Planitop HPC component A (powder) is made from high-strength cement, selected aggregates and special additives according to a formulation developed in the MAPEI Research and Development laboratories and is supplied in 25 kg bags. Component A must be mixed with 6.5% by weight of component B (**HPC Fibres**) 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** may also include 0.25% of **Mapecure SRA**, a special admixture which has the capacity to reduce 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 may be considered a highly advanced technological system, in that the admixture has the capacity of reducing the water evaporation and encourages the development of the hydration process.
Mapecure SRA acts 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 admix, which means there is also a lower risk of cracking.
The use of **Mapecure SRA** may reduce the mechanical properties 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;
· impermeable to water;

· excellent adhesion to old concrete, if dampened with water before application, and to reinforcement rods, 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 use of products and systems*"), and the requirements of EN 1504-3 ("*structural and non-structural repair*") for R4-class structural mortars and the minimun requirements EN 1504-6 ("*anchoring of reinforcing steel bar*").
Planitop HPC is covered by the Certificate of Technical Assessment (CVT) n° 264/2020 released by 2^ Div. II of STC - CSLP.



Graph of residual flexural strength in compliace with EN 14651 standard

Graph of residual flexural strength in compliace with EN 14651 standard

RECOMMENDATIONS

· Do not use **Planitop HPC** on smooth concrete substrates.
· Do not use **Planitop HPC** for fixing elements accurately in place (use **Mapefill** or **Mapefill R**).
· Do not apply **Planitop HPC** by spray or with a trowel (use **Planitop HPC Tixo** applied by trowel).
· Do not add cement or additives to **Planitop HPC**.
· 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

Preparation of the substrate

· Remove all deteriorated and loose concrete until there is a solid, strong and very rough substrate with roughness almost about 5 mm. Any areas previously repaired and which are not perfectly adhered must be removed.
· Remove all dust, rust, cement laitance, grease, oil and old paint from the concrete and reinforcement rods by sandblasting.
· Saturate the substrate with water.
· Before casting, wait until excess surface water has evaporated off. Use compressed air to accelerate this process if required.

Preparation of the mortar

Pour **Planitop HPC** component A (powder) in the mixer and add 3.0 litres of water per each bag of product used.
Mixing time of the product depends on the efficiency of the employed mixer. For example, with a forced-action mixer, mixing requires approximately 4 minutes.
When the product is well blended and lump-free, add the respective quantity of component B (**Fibre HPC**) and mix for 2 more minutes.
If a traditional cement mixer is used, mix component A (powder) with water for 8 minutes. After the addition of component B (**Fibre HPC**), mix again for 4 to 5 minutes.
Stir until fibres are completely dispersed and a homogeneous, fluid and lump-free mix is obtained. Mixing water may vary slightly (2.9-3.1 litres) to cope with different types of mixers used and weather conditions on site.
It is recommended to apply the product within 30 minutes of mixing.

Application of the mortar

Pour **Planitop HPC** into the formwork in a continuous flow from one side only, and make sure all the air is expelled.
The formwork must not absorb any of the water from **Planitop HPC**, so treat the formwork beforehand with a form release agent (such as **DMA 1000 Form Release Agent**).
Make sure that all the elements to be reinforced are completely filled. To help the mortar flow into the more difficult areas, use wooden rods, round iron bars or vibrate lightly.

CMOD controlled bending test in compliance with EN 14651 standards

FINISHING AND PROTECTIVE COATING

If the product is applied in exterior, protect **Planitop HPC** applying finishing cycles of **Primer EP Rustop** and **Mapecoat PU33** or alternatively **Mapelastic** and **Elastocolor Paint**.
The protective finish can be applied both directly on the surface of **Planitop HPC** or on a surface skimcoat, if present.
Always consult the respective Technical Data Sheets for preparation and application procedure of each product.

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

- Only use bags of **Planitop HPC** which have been stored on their original, covered pallets.
- 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. Use lukewarm water to prepare the mortar.
- After stripping the formwork, we recommend curing **Planitop HPC** carefully to prevent the mixing water evaporating too quickly, especially in hot or windy weather, otherwise surface cracks may appear. **Planitop HPC** must be protected at all times by spraying the surface with a water mist while pouring operations are being carried out. Cover the surface with waterproof sheets and keep covered for at least 5 days.

CLEANING

Wash the mortar from tools before it hardens using water. Once hardened, cleaning is much more difficult and it must be removed mechanically.

CONSUMPTION

Approximately 20 kg/m² per cm of thickness.

PACKAGING

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

STORAGE

12 months in a dry, covered area in its original 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	
Class according to EN 1504-3:	R4
Type::	CC
CEMENTITIOUS MATRIX	
Consistency:	powder
Colour:	grey
Bulk density (kg/m³):	1,400
Maximum size of aggregate (mm):	1.0
Dry solids content (%):	100
Ion chloride content – minimum requirement ≤ 0.05% - according to EN 1015-17 (%):	≤ 0.05
FIBRES	
Shape:	straight
Material:	Steel
Density of material according to EN 14889-1 (g/cm³):	7.85
Length according to EN 14889-1 (mm):	13
Diameter according to EN 14889-1 (mm):	0.21
Tensile strength according to EN 14889-1 (MPa):	2,750
Modulus of elasticity according to EN 14889-1 (GPa):	200
Elongation at failure according to EN 14889-1 (%):	1.5-3.0
APPLICATION DATA (at +20°C - 50% R.H.)	
Colour of mix:	grey
Mixing ratio:	100 parts by weight of component A (powder) with 6.5 parts by weight of component B (**Fibre HPC**) (1.625 kg fibres for every 25 kg bag) and 11.5-12.5 parts of water (2.9-3.1 l water for every 25 kg bag)
Consistency class according to EN 12350-8:	SF3
Viscosity class- t500	VS2
Density according to EN 12390-7 (kg/m³):	2,450
pH of mix:	> 12.5

Application temperature range:	+5°C to +35°C
Pot life of mix:	approx. 45 minutes (at +20°C)
Set to light foot traffic:	24 h (at +20°C)
Set to heavy foot traffic:	72 h (at +20°C)

FINAL PERFORMANCE (12% mixing water - Mixing *)

Performance characteristic	Test method	Requirements according to EN 1504-3 for R4 class mortars	Requirements according to EN 1504-6	Performance of product
Compressive strength (MPa):	EN 12190	≥ 45 (after 28 days)	>80% of value declared by manufacturer (after 28 days)	130 (after 28 days)
Compressive modulus of elasticity (GPa):	EN 13412	≥ 20 (after 28 days)	none	37 (after 28 days)
Shear strength and slip resistance (τ-bond) concrete substrate with roughened surface (MPa):	experimental method (**)	none	none	≥ 3.5
Adhesion to concrete (MC 0.40 substrate type - w/c ratio = 0.40) according to EN 1766 (MPa):	EN 1542	≥ 2 (after 28 days)	none	≥ 3 (after 28 days)
Accelerated carbonatation resistance:	EN 13295	Depth of carbonatation ≤ than reference concrete (MC 0.45 type w/c ratio = 0.45) according to UNI 1766	none	Test passed
Capillary absorption ($kg/m^2 \cdot h^{0.5}$):	EN 13057	≤ 0.5	None	< 0.5
Impermeability to water – penetration depth (mm):	EN 12390-8	none	none	< 2
Thermal compatibility measured as bond strength according to EN 1542 (MPa): – freeze-thaw cycles with de-icing salts:	EN 13687/1	≥ 2 (after 50 cycles)	none	> 2
Resistance to freeze-thaw cycles in presence of salts- flaking (g/m^2):	EN 12390-9	none	none	< 100 (after 56 cycles)
Slip resistance of steel reinforcing bars - movement under a load of 75 KN (mm):	EN 1881	none	< 0.6	< 0.6
Residual flexural strength (MPa): – CMOD 1 = 500 µm: – CMOD 2 = 1,500 µm: – CMOD 3 = 2,500 µm: – CMOD 4 = 3,500 µm	EN 14651	none	none	f_{R1} 10.9 f_{R2} 8.6 f_{R3} 7.1 f_{R4} 5.8
Reaction to fire:	EN 13501-1	Euroclass		A1, $A1_{FL}$

(*) Mixing: see paragraph "Preparation of the mortar".
For this type of product, the preparation of test samples (cubes and beams) requires compaction with a concrete vibrator (in compliance with § 3.3 EN 12390-2).
(**) Experimental method. Test report available on request (contact Technical Services).

MECHANICAL PROPERTIES and DURABILITY according to CVT n° 264/2020 (mixing water 12%)		
Properties	**Test method / norm reference**	**Performance of product**
Compressive strength Class:	NTC 2018 Tab. 4.1.I	C 90/105
Compressive modulus of elasticity (GPa):	NTC 2018 § 11.2.10.3	43.9 (charted value)
Toughness class:	EN 14651	8.0 a
Tensile strength at limit of proportionality: **– average value $f^f_{ct,L,m}$ (MPa):** **– typical value $f^f_{ct,L,k}$ (MPa):**	EN 14651	8.6 7.2
Exposure class:	EN 206-1	X0 XC1, XC2, XC3, XC4 XD1, XD2, XD3 XS1, XS2, XS3 XF1, XF2, XF3, XF4 (***) XA1
Resistance to freeze-thaw cycles:	FRC Guidelines (January 2019) § 3.4.1	test passed

*(***) **Planitop HPC** 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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