

PLANITOP SMOOTH & REPAIR R4

Structural R4-class, rapid-setting, shrinkage-compensated, thixotropic, fibre-reinforced, cementitious mortar, applied in a single layer from 3 to 40 mm thick, for repairing and smoothing concrete



WHERE TO USE

Structural repairs and smoothing over internal and external horizontal and vertical concrete surfaces; suitable for repairing structures exposed to the open air and in permanent contact with water.

Some application examples

- Rapid repair work on deteriorated concrete beams, pillars, buffer walls, cornices, edges of balconies and structural members and elements that require the use of mortar with high mechanical performance characteristics.
- Quickly smoothing over surface defects in cast concrete, such as deep gravel clusters, spacer holes, second pours, etc. before painting the surface.
- Repairs and structural strengthening of concrete.
- Repairing precast concrete members and elements.
- Repairs to concrete damaged by rusty reinforcing bars due to carbonation.

TECHNICAL CHARACTERISTICS

Planitop Smooth & Repair R4 is a one-component, thixotropic mortar with very low emission of volatile organic compounds (EMICODE EC1 Plus) made from special, highly reactive hydraulic binders, fine selected aggregates, synthetic polyacrylonitrile fibres, synthetic polymers and special admixtures according to a formula developed in the MAPEI Research Laboratories. After mixing, the product forms a mortar with good workability and with setting and hardening times that can be modulated by adding **Mapetard ES**. It is applied by trowel in a single layer from 3 to 40 mm thick to repair and smooth over concrete.

Planitop Smooth & Repair R4 hardens without shrinking and is characterised by its excellent adhesion to concrete substrates.

Once hardened, **Planitop Smooth & Repair R4** has the following characteristics:

- excellent adhesion to both old concrete (≥ 2 MPa), if wetted beforehand with water, and to steel reinforcement, especially when treated with **Mapefer** or **Mapefer 1K** anti-corrosion and re-alkalising cementitious mortar, certified EN 1504-7 "Corrosion protection of reinforcement";
- high dimensional stability and, therefore, low risk of cracking and crazing during both the plastic phase and when hardened;
- thermal compatibility to freeze/thaw cycles, measured as adhesion according to EN 1542;
- high resistance to carbonation;

- impermeable to water.

Planitop Smooth & Repair R4 complies with the principles defined in EN 1504-9 (*“Products and systems for protecting and repairing concrete structures: definitions, requirements, quality control and conformity assessment. General principles for the use of products and systems”*) and the minimum requirements of EN 1504-3 (*“Structural and non-structural repairs”*) for structural R4-class mortars and the requirements of EN 1504-2 coating (C) according to principles MC and IR (*“Concrete surface protection systems”*).

RECOMMENDATIONS

- Do not add extra water to the mix once it starts to set to make it more workable.
- Do not add cement or admixtures, except **Mapetard ES**.
- Do not apply **Planitop Smooth & Repair R4** on smooth substrates: roughen surfaces beforehand.
- Do not apply **Planitop Smooth & Repair R4** on dry substrates.
- Do not use **Planitop Smooth & Repair R4** for anchoring elements accurately in place (use **Mapectill** or **Mapectill R**).
- Do not leave bags of **Planitop Smooth & Repair R4** exposed to the sun before use.
- Do not use **Planitop Smooth & Repair R4** if the temperature is lower than +5°C.
- Do not use **Planitop Smooth & Repair R4** if the bag is damaged or if it has been opened previously.

APPLICATION PROCEDURE

Preparation of the substrate

- Remove all deteriorated and loose concrete to form a sound, strong substrate with a rough surface. Any areas previously repaired which are not perfectly adhered must also be removed.
- Remove all dust, rust, cement laitance, grease, oil and paint from the concrete and reinforcement rods by sandblasting or hydro-sandblasting.
- Treat reinforcing bars with **Mapecter** or **Mapecter 1K** according to the procedure illustrated in the relative data sheet for each product. Before applying **Planitop Smooth & Repair R4** wait until **Mapecter** or **Mapecter 1K** are completely dry.
- Saturate the substrate with water.
- Before carrying out repairs with **Planitop Smooth & Repair R4**, wait until any excess water has evaporated off. If necessary, use compressed air to help remove excess water. The substrate must be saturated with water but with a dry surface (s.s.d.).

Preparation of the mortar

Pour approximately 4 litres of clean water into a container and slowly add a 25 kg bag of **Planitop Smooth & Repair R4** while mixing.

Carefully mix the blend for several minutes then remove any powder which has stuck to the sides and bottom of the container.

Add more water to obtain the consistency required without exceeding the recommended amount (approximately 4.1-4.4 litres).

Mix again for several minutes to form a well-blended, plastic, lump-free mix.

To make it easier to form a smooth, even mix, use an immersion mixer or a drill at low speed with a spiral mixing attachment to avoid entraining air into the mix. Mixing by hand is not recommended, more than the recommended amount of water would be required. If manual mixing is unavoidable, use a trowel and press the mortar against the sides of the container to break down all the lumps.

Planitop Smooth & Repair R4 remains workable for approx. 15 minutes at a temperature of +10 to +25°C.

If the workability time of **Planitop Smooth & Repair R4** needs to be increased due to specific site requirements or if the weather is particularly hot, the set-retarding admixture **Mapetard ES** for rapid-setting cementitious mortar may be added to the product.

This special admixture, which may be added at a rate of up to one 0.25 kg canister every 25 kg of **Planitop Smooth & Repair R4**, allows the already excellent workability time of the mortar to be extended by a further 15-20 minutes.

Due to its plasticising effect, adding **Mapetard ES** to **Planitop Smooth & Repair R4** allows the amount of mixing water to be reduced by 0.2-0.3 litres. In this case, pour approximately 3.7 litres of clean water and a canister of **Mapetard ES** into a container and slowly add a 25 kg bag of **Planitop Smooth & Repair R4** while mixing.

Carefully mix the blend for several minutes then remove any powder which has stuck to the sides and bottom of the container.

Add more water to obtain the consistency required without exceeding the recommended maximum amount of 4.1 litres.

Application of the mortar

Apply the mortar with a smooth trowel in a single layer from 3 to 40 mm thick without using formwork.

As soon as the mortar starts to set, tamp the surface with a sponge float. The waiting time required before carrying out this operation depends on surrounding weather conditions. To paint and protect the surface, apply a coat of an elastomeric product from the **Elastocolor** range or an acrylic product from the **Colorite** range. The finishes available may be chosen from product's relative colour chart or from a much wider range of shades available using the **ColorMap**[®] automatic colouring system.

If the structure to be repaired is subject to high dynamic stress, it may be advantageous to apply a 2 mm thick layer of flexible smoothing and levelling compound such as **Mapelast**, **Mapelast Guard** or **Mapelast Smart** before applying the coloured finish. In such cases, **Elastocolor Paint** must be used for the coloured finishing coat.



Applying Planitop Smooth & Repair R4 with a trowel



Floating the surface of Planitop Smooth & Repair R4 to create a smooth finish



Applying Planitop Smooth & Repair R4 with a trowel



Floating the surface of Planitop Smooth & Repair R4

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

- Only use bags of **Planitop Smooth & Repair R4** to prepare the mortar 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 a closed area and protect from frost. Use warm water to prepare the mortar.
- After applying and tamping **Planitop Smooth & Repair R4**, and particularly in hot or windy weather, we recommend curing the mortar carefully to prevent the mixing water evaporating too quickly, otherwise surface cracks may appear due to plastic shrinkage. Spray water on the surface for at least 24 hours after applying the mortar, or use a special curing agent from the **Mapecure** range. If a curing agent is applied, make sure that it is removed from the surface by sand-blasting or hydro-blasting before applying any other product, since the curing agent may impede adhesion of successive layers of coating.

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 17 kg/m² per cm of thickness.

PACKAGING

25 kg bags.

STORAGE

Planitop Smooth & Repair R4 may be stored for 12 months in its original packaging.

The special 25 kg vacuum-packed polyethylene bags may be stored outside for the entire duration 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.com.

PRODUCT FOR PROFESSIONAL USE.

Planitop Smooth & Repair R4: <i>thixotropic, shrinkage-compensated, rapid-setting, fibre-reinforced, structural cementitious mortar for repairing and smoothing concrete in compliance with the requirements of EN 1504-3 class R4 and EN 1504-2 coating (C), principles MC and IR</i>	
TECHNICAL DATA (typical values)	
PRODUCT IDENTITY	
Class according to EN 1504-3	R4
Type:	CC
Consistency:	powder
Colour:	grey
Maximum size of aggregate (EN 1015-1) (mm):	0.4
Dry solids content (%):	100
Ion chloride content: – minimum requirement $\leq 0.05\%$ according to EN 1015-17 (%):	≤ 0.05
EMICODE:	EC1 Plus - very low emission
APPLICATION DATA OF PRODUCT (at +20°C - 50% R.H.)	
Colour of mix:	grey
Mixing ratio:	100 parts of Planitop Smooth & Repair R4 with 16.5-17.5 parts of water (approximately 4.1-4.4 litres of water per 25 kg bag) (*)
Consistency of mix:	thixotropic-trowellable
Density of mix (EN 1015-6) (kg/m ³):	2,000
pH of mix:	12
Application temperature range:	from +5°C to +35°C
Pot life of mix:	approximately 15 mins. (**)
Waiting time before finishing with float:	approximately 20 mins.
Time to completely set:	approximately 25 mins.
FINAL PERFORMANCE (17% mixing water)	

Performance characteristic	Test method	Requirements according to EN 1504-2 coating (C) principles MC and IR	Requirements according to EN 1504-3 for R4-class mortar	Performance of product
Compressive strength (MPa):	EN 12190	not required	≥ 45 (after 28 days)	7 (after 3 h) 18 (after 1 day) 30 (after 7 days) 50 (after 28 days)
Flexural strength (Mpa):	EN 196-1	not required	not required	2 (after 3 h) 4 (after 1 day) 5 (after 7 days) 7 (after 28 days)
Compressive modulus of elasticity (GPa):	EN 13412	not required	≥ 20 (after 28 days)	24 (after 28 days)
Adhesion to concrete (substrate type MC 0.40) according to EN 1766 (MPa):	EN 1542	For rigid systems with no traffic: ≥ 1.0 with traffic: ≥ 2.0	≥ 2 (after 28 days)	≥ 2 (after 28 days)
Thermal compatibility measured as adhesion according to EN 1542 (MPa): – freeze-thaw cycles with de-icing salts:	EN 13687-1	not required	≥ 2 (after 50 cycles)	≥ 2
Capillary absorption (kg/m ² ·h ^{0.5}):	EN 13057	not required	≤ 0.5	≤ 0.5
Impermeability expressed as coefficient of permeability to free water (kg/m ² ·h ^{0.5}):	EN 1062-3	W < 0.1	not required	W < 0.1 Class W ₃ (low permeability to water) according to EN 1062-1
Permeability to water vapour - equivalent thickness of air S _D (m):	EN ISO 7783-1	Class I S _D < 5 m Class II 5 m ≤ S _D ≤ 50 m Class III S _D > 50 m	not required	S _D < 5 Class I (permeable to water vapour)
Resistance to accelerated carbonation:	EN 13295	not required	Depth of carbonation ≤ than the reference concrete (MC 0.45 type water/cement ratio = 0.45) according to UNI 1766	meets specifications
Crack resistance:	"O Ring test"	not required	not required	no cracks after 180 days
Reaction to fire:	EN 13501-1	Euroclass		A1

(*) If **Planitop Smooth & Repair R4** is admixed with **Mapetard ES** (one 0.25 kg canister per 25 kg bag) the mixing water must be reduced by 0.2-0.3 l.

(**) Adding **Mapetard ES** allows the workability time of **Planitop Smooth & Repair R4** to be extended by 15-20 minutes.
N.B. The performance characteristics of **Planitop Smooth & Repair R4** admixed with **Mapetard ES** are the same as the product without admixture.

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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