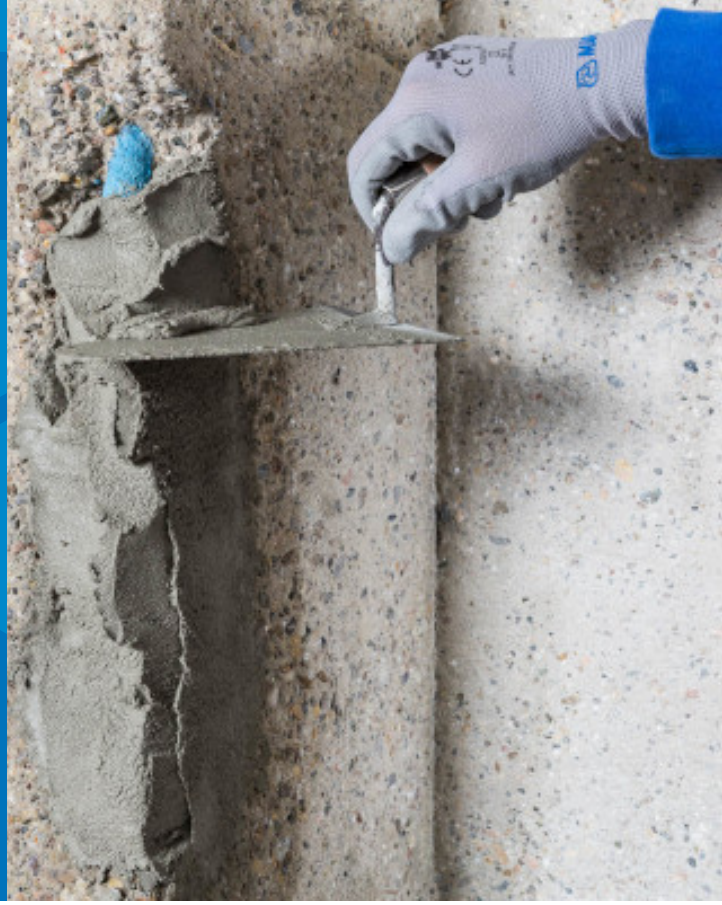
PLANITOP SMOOTH & REPAIR R4 ZERO

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



CO_2 FULLY OFFSET PRODUCTS

Planitop Smooth & Repair R4 Zero is part of the *CO_2 Fully Offset in the Entire Life Cycle* line of products. CO_2 emissions measured throughout the life cycle of products from the Zero line in 2023 using Life Cycle Assessment (LCA) methodology, verified and certified with EPDs, have been offset through the acquisition of certified carbon credits in support of renewable energy and forestry protection projects. A commitment to the planet, to people and to biodiversity. For more details on how emissions are calculated and on climate mitigation projects financed through certified carbon credits, visit the webpage zero.mapei.com.

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 Zero is a one-component, thixotropic mortar 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.
Thanks to its particular formulation the product has excellent fatigue behaviour up to at least 300,000 cycles, which gives repaired structures a high level of resistance to cracking, including when subject to dynamic loads induced during normal service conditions.
This particular characteristic, together with the requirements of EN 1504, helps increase the durability of elements restored with **Planitop Smooth & Repair R4 Zero**.
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 Zero hardens without shrinking and is characterised by its excellent adhesion to concrete substrates.
Once hardened, **Planitop Smooth & Repair R4 Zero** 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 Zero** 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 Zero is a product with very low emission of volatile organic compounds (VOC), which safeguards the health and safety of installers and final users. It is certified as EC1 Plus by the German association GEV.
Planitop Smooth & Repair R4 Zero helps earn important LEED credits.

Planitop Smooth & Repair R4 Zero 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 Zero** on smooth substrates: roughen surfaces beforehand.
- Do not apply **Planitop Smooth & Repair R4 Zero** on dry substrates.
- Do not use **Planitop Smooth & Repair R4 Zero** for anchoring elements accurately in place (use **Mapefill Zero** or **Mapefill R**).
- Do not leave bags of **Planitop Smooth & Repair R4 Zero** exposed to the sun before use.
- Do not use **Planitop Smooth & Repair R4 Zero** if the temperature is lower than +5°C.
- Do not use **Planitop Smooth & Repair R4 Zero** if the bag is damaged or if it has been opened previously.

APPLICATION PROCEDURE

TECHNICAL INFORMATION FOR THE APPLICATION	
Composition of the mix:	100 kg of **Planitop Smooth & Repair R4 Zero** 16.5-17.5 kg of water *If **Planitop Smooth & Repair R4 Zero** is admixed with **Mapetard ES** (1 kg per 100 kg of product) the mixing water must be reduced by 0.2-0.3 kg.*

Thickness of layer:	from 3 to 40 mm
Application temperature range:	surrounding and substrate temperature from +5°C to +35°C
Workability time:	approximately 15 min. (at +20°C) *Adding **Mapetard ES** allows the workability time of **Planitop Smooth & Repair R4 Zero** to be extended by 15-20 minutes.*
Waiting time before floating:	approximately 20 min.
Setting time:	approximately 25 min.

Preparation of the substrate

- Remove all deteriorated and loose concrete to form a sound, rough and strong substrate. Any areas previously repaired and which are not perfectly bonded must also be removed.
- After preparation, the surface of the substrate must be uneven with irregularities at least 5 mm deep.
- Remove all dust, rust, cement laitance, grease, oil and old paint from the concrete and reinforcement rods by sandblasting.
- Treat reinforcing bars with **Mapefer** or **Mapefer 1K Zero** according to the procedure illustrated in the relative data sheet for each product. Before applying **Planitop Smooth & Repair R4 Zero** wait until **Mapefer** or **Mapefer 1K Zero** are completely dry.
- Saturate the substrate with water.
- Before carrying out repairs with **Planitop Smooth & Repair R4 Zero**, 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

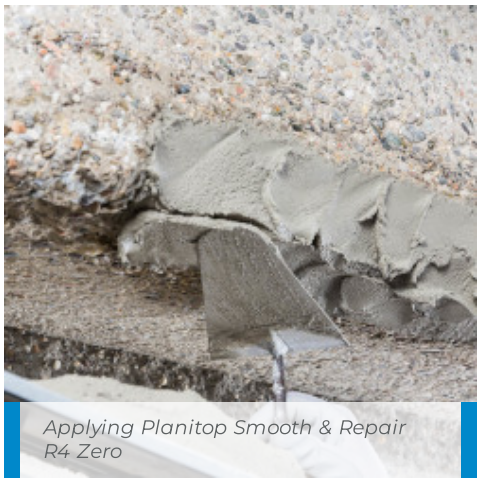
Pour approximately 4.1 litres of clean water into a container and slowly add a 25 kg bag of **Planitop Smooth & Repair R4 Zero** while mixing.
Carefully mix the blend for several minutes then remove any powder which has stuck to the sides and bottom of the container.
Add more water to obtain the consistency 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 Zero remains workable for approx. 15 minutes at a temperature of +10 to +25°C.
If the workability time of **Planitop Smooth & Repair R4 Zero** 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 Zero**, 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 Zero** 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 Zero** 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.
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

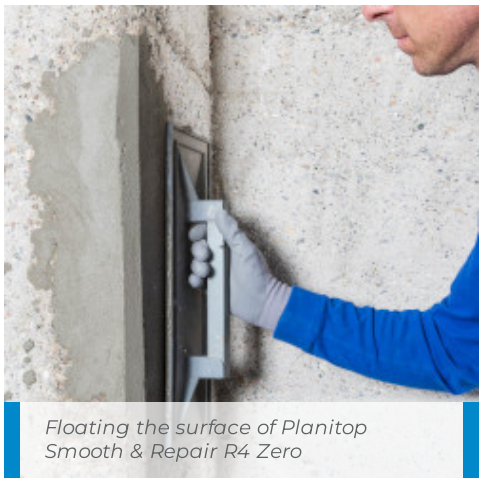
Apply the mortar with a smooth trowel in a single layer from 3 to 40 mm thick without using formwork.
As soon as the mortar starts to set, tamp the surface with a sponge float. The waiting time required before carrying out this operation depends on surrounding weather conditions. To paint and protect 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 **Mapelastic**, **Mapelastic Guard** or **Mapelastic Smart** before applying the coloured finish. In such cases, **Elastocolor Paint** must be used for the coloured finishing coat.
The product is not compatible with rendering machines.

Mixing Planitop Smooth & Repair R4 Zero



Applying Planitop Smooth & Repair R4 Zero



Floating the surface of Planitop Smooth & Repair R4 Zero

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

- Only use bags of **Planitop Smooth & Repair R4 Zero** 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 Zero**, 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 Zero may be stored for 12 months in its original packaging.
The special packaging, made from 25 kg vacuum-packed polyethylene bags, offers a better protection from accidental rain. Some characteristics of **Planitop Smooth & Repair R4 Zero** make it particularly sensitive to

improper storage conditions; it advisable to stock the product in a dry and covered place at a temperature between +5 and +35°C, in its original unopened 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 according to EN 1504-1:	CC
Identification according to EN 1504-2:(methods and principles)	Coating (C) – MC and IR principles
Consistency:	powder
Colour:	grey
Maximum size of aggregate:	0.4 mm
Chloride ion content according to EN 1015-17: (minimum requirements according to EN 1504 ≤ 0,05%)	≤ 0.05%

TECHNICAL INFORMATION FOR THE PREPARATION OF THE PRODUCT	
Mixing ratio:	100 parts by weight of **Planitop Smooth & Repair R4 Zero** with 17% of water
Preparation of mix:	mixing of product according to EN 196-1

CHARACTERISTICS OF FRESH MIX (at +20°C - 50% R.H.)	
Colour of mix:	grey
Consistency of mix:	tixothropic-trowable
Density of mix:	2000 kg/m³

FINAL PERFORMANCE
According to curing defined in test methods

Performance characteristic	Test method	Requirements EN 1504-2 (C) MC and IR	Requirements EN 1504-3 R4	Product performance
Compressive strength: - **3 hours** - **1 day** - **7 days** - **28 days**	EN 12190	not required	- - - ≥ 45 MPa	**12 MPa** **22 MPa** **30 MPa** **52 MPa**
Flexural strength: - **3 hours** - **1 day** - **7 days** - **28 days**	EN 196-1	not required	not required	**2 MPa** **4 MPa** **6 MPa** **8 MPa**
Compressive modulus of elasticity:	EN 13412	not required	≥ 20 GPa	**24 GPa**
Direct tensile adhesion to concrete:	EN 1542	for rigid systems without traffic ≥ 1.0 MPa	≥ 2.0 MPa	**≥ 2.0 MPa**
Thermal compatibility – freeze-thaw cycles with de-icing salts according (50 cycles):	EN 13687-1	not required	≥ 2.0 MPa	**≥ 2.0 MPa**
Capillary absorption:	EN 13057	not required	≤ 0.5 kg/m²·h$^{0.5}$	**≤ 0.5 kg/m²·h$^{0.5}$**

Impermeability expressed as coefficient of permeability to freewater *W*:	EN 1062-3	W < 0.1 kg/m²·h$^{0.5}$	not required	***W* < 0,1 kg/m²·h$^{0.5}$ Class W_3** *(low permeability to water) according to EN 1062-1*
Permeability to water vapour (wet-cup – B method) expressed as equivalent air thickness S_d:	EN ISO 7783	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 m Class I** *(permeable to water vapour)*
Resistance to accelerated carbonation:	EN 13295	not required	carbonation depth ≤ than reference concrete	**meets specifications**
Resistance to cracking:	"O Ring test"	not required	not required	**no cracks after 180 days**
Reaction to fire:	EN 13501-1	Euroclass	Euroclass	**A1**

NOTES:
Preparation of samples: compaction according to EN 196-1.
The performance characteristics of ***Planitop Smooth & Repair R4 Zero*** *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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