MAPESHIELD E

Self-adhesive zinc plates applied directly on the surface of the structure to provide galvanic cathodic protection for rebar and prevent corrosion

WHERE TO USE

Mapeshield E are particularly recommended for protecting rebar against corrosion in reinforced concrete structures that do not require any repair work, and to reduce or interrupt oxidation in reinforced concrete structures that need to be restored.

Some application examples

- Piles and abutments of bridges or viaducts
- Slabs
- Car parks
- Prestressed reinforced concrete structures
- Beams and columns
- Front edges of balconies

TECHNICAL CHARACTERISTICS

Mapeshield E are composed of a 99.9% pure zinc layer coupled with an adhesive gel f new formulation that is also an excellent ion conductor.
After connecting **Mapeshield E** to the rebar with metal connectors, a difference in potential is created between the steel and the zinc which stops corrosion and impedes its formation, even if the surrounding environment is particularly aggressive due to the presence of chlorides, for example.
In fact, when two different metals in a suitable electrolyte (in this case the concrete) are connected together, the metal with the most negative potential (zinc) corrodes, while the metal with the least negative potential (rebar) remains protected against corrosion.
Also, the current generated provokes an increase in the pH level which leads to a slow re-alkalisation of the concrete and, if chloride ions are present, pushes them away.
The **Mapeshield E** plates are available in different weights and thicknesses to make application possible in all types of structures.
Mapeshield E are available in the following formats:

- **Mapeshield E 25**, 250 µm plates
- **Mapeshield E 45**, 450 µm plates

Mapeshield E plates comply with European standard EN 12696 "Cathodic protection of steel in concrete".

RECOMMENDATIONS

- **Mapeshield E** cannot be used where rebars structure is damaged. In this case, the rebar must be repaired or replaced according to calculations made by specialist engineers.

- Do not use epoxy or polyurethane mortar, or mortar reinforced with metal fibres, to carry out the restoration work.
- When **Mapeshield E** is to be used, do not apply **Mapefer**, **Mapefer 1K Zero** or any other rust protection to the rebar prior to repair works.
- If the structure needs to be repaired, it is recommended to use compensated-shrinkage mortar in compliance with EN 1504-3 standards.
- Do not use the product if water is percolating into the structure. In such cases, use **Mapeshield I**.

DESIGN PHASE

The design of the galvanic cathodic protection system is mainly based on these factors:

- Type of structure (new or existing)
- Geometry of the structure
- Rebar density
- Expected durability
- Exposure class:

The design approach uses Faraday's law to determine the amount of zinc needed to protect the rebar in the structure.
For system design, MAPEI has developed and provides **Mapeshield Software Design**, a free and easy-to-use tool.
Mapeshield Software Design, evaluates all possible combinations and automatically identifies the most technically and cost-effective solution by indicating the type, number and spacing of anodes needed to protect the structure.
The software can be downloaded from the website www.mapei.it. MAPEI Technical Service is available to provide any technical support needed.

APPLICATION PROCEDURE

Preparation of the substrate

Structures requiring restoration work

The substrate must be prepared according to specification by removing the deteriorated and detached concrete, including from below and around the rebar, until there is a sound, strong substrate with a rough surface.
Any areas previously restored which are not perfectly bonded must also be removed.
Clean all corrosion and loose particles from the exposed rebar to make sure there is good contact between the steel and the repair mortar.
Once the concrete has been removed, connect pieces of electrical cable or solder a piece of threaded galvanised bar to the rebar, which will then be connected to the anodes after the restoration mortar has been applied.
Each structural element (column, beam, etc.) must have at least two connections. Check the electric continuity in the rebar with an ohmmeter before installation: resistance of up to 1 ohm is acceptable.

New structures and structures which do not require restoration work

Remove all dust, cement laitance, grease, oil, old paint and any other polluting substance from the concrete. After this operation, the substrate should look perfectly smooth and uniform.
On the surface of the structure, provide the points of connection of the rebars to the anodes, which will be done by simple electric wire or through a galvanized threaded bar soldered onto the same rebar. In these areas, a small portion of the rebar should be exposed from the concrete to allow the wire or threaded rod to be attached.
Each structural element (column, beam, etc.) must have at least two connections.
Check the electric continuity in the rebar with an ohmmeter before installation: resistance of up to 1 ohm is acceptable.

Application of repair mortar

The electrical resistivity of the repair mortar should be within a range of 50% to 200% of that of the original concrete, as prescribed in EN 12696.
Perform restoration following normal application procedures, referring to the relevant data sheets depending on the product chosen for repair work.
During application, make sure not to leave gaps around the anodes.

Application of anodes

On the repaired, new structures, or structures that do not need repair works, apply **Mapeshield E** on the surface by removing the protective film of the conductive gel.
Press the plate against the substrate so that it adheres tightly to the substrate.
Apply the zinc plate along the structure. Do not leave any gaps, which could be the weak points in the system.
Press **Mapeshield E** on the surface using a rubber roller or similar tools to ensure good adhesion.
Connect the previously made connections to the laminar anode by soldering or mechanical fixing.
Continuity between adjacent plates must be ensured through the placement of galvanized expansion plugs installed at their overlaps. Each plate that is not interconnected with others will have to have its own independent connection with the rebars, or a bridging connection must be created between the plates.
In case **Mapeshield E** is applied to the internal face of structures such as beams, slabs or others, for safety reasons, perform additional anchoring with expansion anchors to ensure perfect fastening.

Sealing of outer plates

After applying the anode, it is necessary to seal it in the exposed end areas and joints with **Mapeflex MS40** or **Mapeflex MS45** after treating the edges with **Primer FD** to prevent water ingress between the plates and the substrate.

Skim coat and finish

Skim coat the plate and smooth the substrate with **Mapelastic Guard Zero**, without applying any primer.
For final protection, apply **Elastocolor Pittura Zero**, acrylic resin-based finish coat in water dispersion, available in a wide range of colours obtained with the **ColorMap**® coloring system.

Functional checks

In order to perform the system check, one or more reference electrodes (typically Ag/AgCl electrodes) must be installed in the area to be protected with the plates.
The electrical wire or wires connecting the anode and rebar, fitted with an on/off switch, should lead to a junction box together with those of the reference electrodes.
The procedure for checks is described in EN 12696, which states:

- a depolarization, in the 24 hours after shutdown, of at least 100 mV from the potential value measured between 0.1s and 1s after anode disconnection (instant off);
- a depolarization over a long period (> 24 hours) of at least 150 mV from instant off.

Mapeshield E meets the above criteria.

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

No precautions should be taken with temperature between +5°C and +35°C.

PACKAGING

Mapeshield E 25 roll 25 m x 25 cm (6.25 m^2/ roll)
Mapeshield E 45 roll 20 m x 25 cm (5 m^2/ roll)

STORAGE

Mapeshield E can be stored for 12 months in the original packagings in a dry area.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

Mapeshield E are articles and referring to the current European regulations (Reg. 1906/2007/EC - REACH) do not require the preparation of the Safety Data Sheet. During use, it is recommended to wear gloves and

goggles and follow the safety requirements of the workplace.
For further and complete information about the safe use of our products, please refer to the latest version of our Safety Data Sheet.
PRODUCT FOR PROFESSIONAL USE.

TECHNICAL DATA (typical values)

COMPOSITION		
	Mapeshield E 25	**Mapeshield E 45**
Thickness of zinc plate:	250 µm	450 µm
Thickness of adhesive:	800 µm ± 200	900 µm
Protective film:	100 µm	100 µm
Total weight (kg/m²):	3.15 ± 5%	4.55 ± 5%

CHARACTERISTICS		
Purity of zinc plate:	99.9	99.9
Colour:	metal grey	metal grey
Longitudinal breaking load (N/mm²):	> 130	> 90
Transversal breaking load (N/mm²):	> 150	> 110

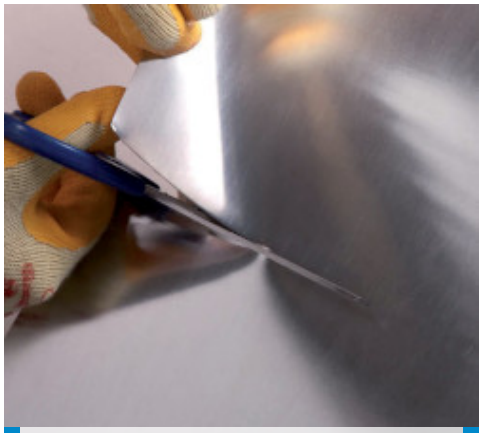
ADHESIVE		
Colour:	transparent	transparent
Minimum application temperature:	+ 5°C	+ 5 °C
Optimum application temperature:	> 10°C	> 10°C
Service temperature:	from -10°C to +60°C	from -10°C to +60°C

WARNING

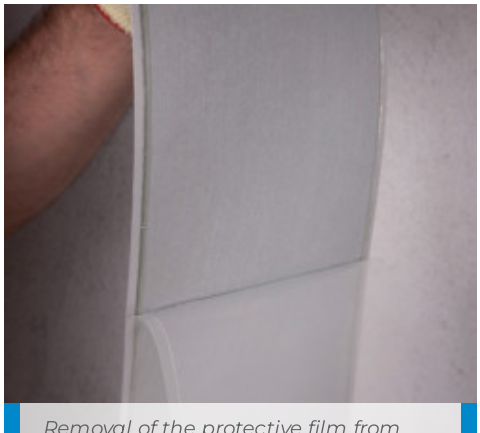
Although the technical details and recommendations contained in this product data sheet correspond to the best of our knowledge and experience, all the above information must, in every case, be taken as merely indicative and subject to confirmation after long-term practical application; for this reason, anyone who intends to use the product must ensure beforehand that it is suitable for the envisaged application.
Please refer to the current version of the Technical Data Sheet, available from our website www.mapei.com

LEGAL NOTICE

The contents of this Technical Data Sheet ("TDS") may be copied into another project-related document, but the resulting document shall not supplement or replace requirements per the TDS in force at the time of the MAPEI product installation.
The most up-to-date TDS can be downloaded from our website www.mapei.com.
ANY ALTERATION TO THE WORDING OR REQUIREMENTS CONTAINED OR DERIVED FROM THIS TDS EXCLUDES THE RESPONSIBILITY OF MAPEI.

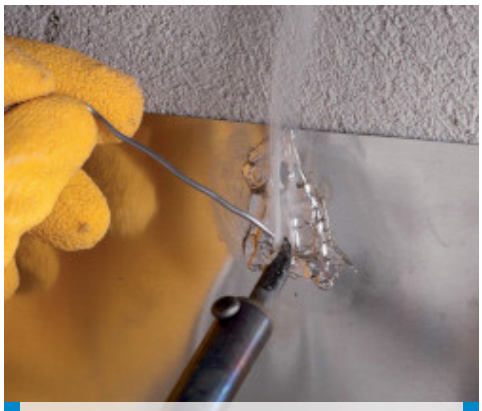


Unwinding and plate cutting



Removal of the protective film from the self-adhesive gel

Electric wire previously connected to rebars



*Connection of electric wire to **Mapeshield E** by soldering*

*Connection of electric wire to **Mapeshield E** by mechanical anchoring*

*Protection of viaduct beams with **Mapeshield E***

*Skim coating and protection of **Mapeshield E** with **Mapelastic Guard Zero** applied by trowel*

*Skim coating and protection of **Mapeshield E** with **Mapelastic Guard Zero** applied by spray*

*Beams protected with **Mapeshield E** and **Mapelastic Guard Zero***

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