Construction Solutions
for

REPAIR AND PROTECTION OF CONCRETE

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INTRODUCTION

GRUPO PUMA

PRODUCTS FOR REPAIRING
AND PROTECTING CONCRETE

1

GRUPO PUMA

GRUPO PUMA is a leading company in the construction sector, formed up of 26 production and distribution centres throughout Spain, Portugal, France and Algeria. An organisation that manufactures high-quality products at competitive prices, using select raw materials and the latest technologies.

An extensive range that covers over 150 products aimed at a whole range of end-uses in the construction sectors: adhesives, grouts, one-coat mortars, facing mortars, special mortars, flooring mortars, additives, primers, paints, insulation and waterproofing systems.

Products and systems that are the result of a research team that works constantly to obtain new products and formulas in order to improve the properties, minimise costs, reduce environmental impact and permit easy application. All of these products have been tested in the laboratory and subjected to rigorous quality control procedures, worthy of the most important certifications and approvals both at national and international level (ETA, Eduardo Torroja Institute Certification…etc). Exceptional quality together with competitive prices allows exportation to over 40 countries.

In a national environment, the large coverage and high production flexibility guarantee a seamless, speedy distribution to any point of the territory. With a highly qualified sales network, Grupo Puma offers genuine technical advice to professionals. Work that is complemented with a continuous training programme to disseminate all the knowledge and documentation necessary for keeping up-to-date with the latest trends.

PRODUCTS FOR REPAIRING AND PROTECTING CONCRETE

All types of reinforced concrete structures, a material which up until recently was thought to be eternal, are to be found both in civil and building work.

Every concrete element is subjected to different aggressive agents, compromising its durability over time (elements such as water, sulphates, acids, carbonation, chloride corrosion, attacks by flux salts, freeze-thaw cycles, washing the surface layers with pure water...etc.) which make it necessary to protect this type of structure.

There may also be other types of mechanical or physical/chemical pathologies (erosion, wear and tear, mechanical load errors, errors in execution or project…etc.) which make repairs or reinforcing necessary on these types of structures.

GRUPO PUMA offers a range of products and systems aimed at resolving construction solutions for these pathologies, both for building and civil works, offering solutions and technical products that complement all types of solutions associated to concrete.

In this document, through a series of technical files, you can find information relating to the applications/implementation procedures for these products or systems, such as:

• Application of repair mortars.

• Cementitious mortars and polymeric liquid systems for waterproofing concrete structures such as storage tanks, swimming pools, facings and walls.

• Application of grouts for sealing and anchorage.

The attached files establish a guide for the correct procedures, products and adequate systems in compliance with the **European standard UNEEN-1504: "Products and Systems to protect and repair concrete structures".**

INTRODUCTION TO EUROPEAN STANDARD UNE - EN 1504

2

PRODUCTS AND SYSTEMS FOR THE PROTECTION AND REPAIR OF CONCRETE STRUCTURES

The standard consists of 10 documents.

These documents define the products for the protection and repair of concrete structures.

The protection and repair of concrete structures requires complex project work. This standard defines the principles for protecting and repairing concrete structures that have suffered or could suffer damage or deterioration and includes a guide for selecting the most appropriate products and systems to undertake the intervention.

UNE - EN 1504 - 1	Definitions
UNE - EN 1504 - 2	Surface protection systems
UNE - EN 1504 - 3	Structural and non-structural repair
UNE - EN 1504 - 4	Structural bonding
UNE - EN 1504 - 5	Concrete injection products and systems
UNE - EN 1504 - 6	Anchoring of steel reinforcing bars
UNE - EN 1504 - 7	Reinforcement corrosion protection
UNE - EN 1504 - 8	Quality control and evaluation of conformity
UNE - EN 1504 - 9	General principles for the use of products and systems
UNE - EN 1504 - 10	On site application of products and quality control of the works

The main phases of the repair and protection according to European Standard EN – 1504:

1. - Assessment of the conditions of the structure.

2. - Identification of the cause of the deterioration.

3. - Deciding the objectives of protection and repair together with the structure owners.

4. - Selection of the appropriate methods and principles of protection and repair.

5. - Definition of properties of the products and systems.

6 - Specification of maintenance requirements.

1- Assessment of the conditions of the structure

The correct repair of a structure starts with a correct assessment of its condition, and by identifying the causes of the deterioration.

Qualified personnel must carry out the assessment.

- To analyse:
The structure's condition.
Past, present and future exposure.

2- Identification of the cause of the deterioration

Deterioration of concrete is due to the following causes:

- **Mechanical:** overloads, movement, impact, etc.
- **Chemical:** aggressive agents, AAR reaction, etc.
- **Physical:** freeze-thaw, thermal effect, erosion, shrinkage, etc.
- **Fire damage.**
- **Corrosion due to**
  - Carbonation.
  - Chloride attack.
  - Stray currents.
- **Defects in the design of the structure.**

3- Deciding the objectives of protection and repair together with the structure owners

Possible actions to be carried out:

- To not carry out any action; do nothing.
- Recalculation of the structural capacity; to act on the aggressive source.
- To prevent or reduce the deterioration of the structure; most common situation.
- To improve, strengthen or partially or totally clean the structure; most common situation.
- Partial or total demolition of the structure; most common situation.

4- Selection of the appropriate methods and principles of protection and repair

To comply with the owner's future requirements, the appropriate principles for the repair and protection are selected, and then the best methods.

Part 3 of the standard makes a reference to structural and non-structural repair.

It covers those mortars and repair concretes that can be used together with other products:

- To restore or replace defective or contaminated concrete.

- To protect reinforcements.

Principle 3	Concrete restoration	Method 3.1	Applying mortar by hand
		Method 3.2	Recasting with concrete and mortar
		Method 3.3	Spraying concrete or mortar
Principle 4	Structural strengthening	Method 4.4	Adding mortar or concrete
Principle 7	Preserving or restoring passivity	Method 7.1	Increasing cover to reinforcement with additional cementitious mortar or concrete
		Method 7.2	Replacing contaminated concrete

Each principle incorporates various methods, and each method corresponds to the application of a material.

The methods for repairing and protecting structures are outlined in document EN 1504 - part 9 and are grouped into 11 principles.

Principles related to defects in concrete

1- Protection against environmental agents.
2- Moisture control.
3- Concrete repairs.
4- Structural strengthening.
5- Physical resistance.
6- Chemical resistance.

Principles related to defects in reinforcement.

7- Preserving or Resistance to passivity.

8- Increasing Resistivity.

9- Cathodic control.

10- Cathodic Protection.

11- Control of Anodic Areas.

5- Definition of properties of the products and systems

The selection of the Principles and Methods for the Repair and Protection of the required product features defined in Standard EN 1504 -Sections 2 to 7.

2- Surface Protection of Concrete.
3- Structural and non-structural repair.
4- Structural bonding.
5- Concrete injection.
6- Anchoring of reinforcing bars.
7- Protection against corrosion of reinforcing bars.

The conditions and limitations of application for each type of material are defined in part 10 of standard EN 1504.

6- Specification of maintenance requirements

The work of future maintenance must be defined:

- Expected shelf life and deterioration type of the repair materials.
- Inspection periods: yes / no, who and when...
- Definition of whether a corrosion control is required.

The complete registries of all materials used must be available for possible future works on each project.

DETERIORATION OF CONCRETE

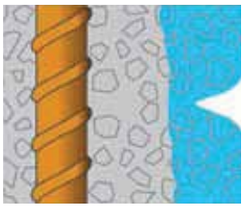
Concrete is a mixture of water, cement, aggregates and additives that modify its rheological properties and features.

Reinforced concrete has frequently been considered an “eternal” material; assuming that the high alkalinity of the concrete preserves the steel against any type of external aggression, using it for thin facings and very porous concrete, which have allowed aggressive agents to penetrate the reinforcements, leaving the steel unprotected.
The consequences are well known: the corrosion of reinforcements and high economic and social costs involved in the renovation of deteriorated structures.

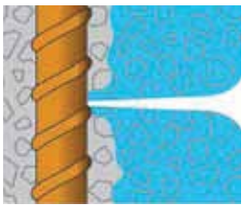
Corrosion of concrete reinforcing is due to the following factors:

a) **Concrete carbonation**; is the reaction of the atmosphere’s carbon dioxide with alkaline substances within the matrix of the pores, producing a lowering in pH causing the steel to become unprotected.

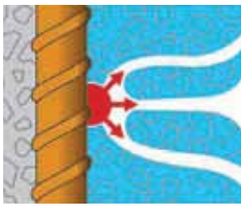
Advance of the carbonation



The carbonation has begun (blue area) but the concrete surrounding the reinforcing continues being alkaline (pH >12.5) and therefore the steel is passive.



The source of carbonation continues to advance and with increased intensity, through the cracks or capillaries that reach the reinforcing.
At this point the pH is lower than 9 and the iron is depassivated.

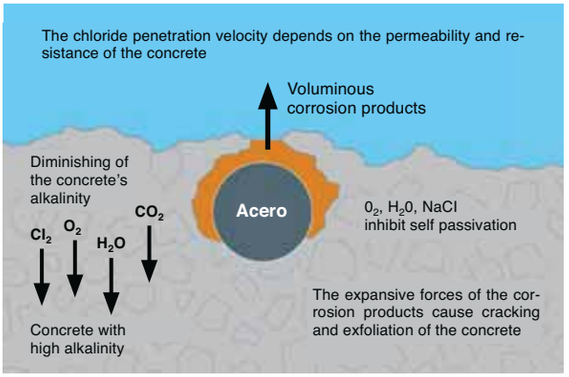


The presence of water and oxygen at this point is sufficient to reach Fe+0.
The iron expands when it oxidises and causes the concrete to beak.

Phenolphthalein test
Laboratory test exposing subject to carbonation environment.
(Coloured area: healthy concrete)

Carbonated concrete
(Coloured area: healthy concrete)

b) **Presence of depassivated ions;** essentially chlorides, surviving a critical level, necessary to locally break the passivation layers.

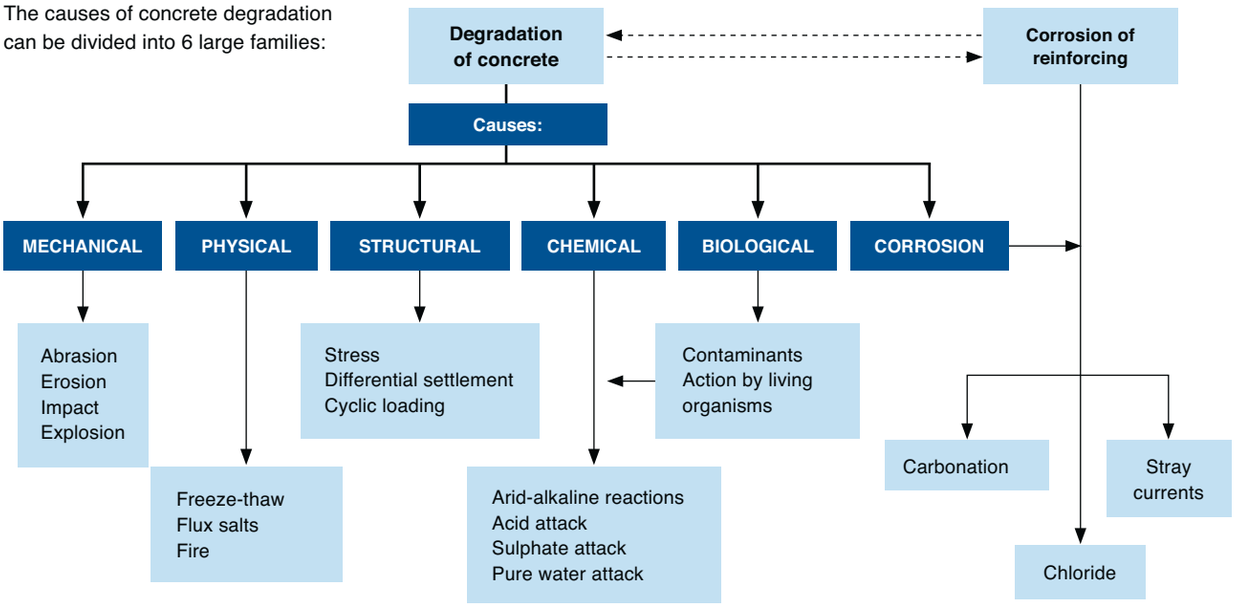


Presence of chloride ions
(Marine environments)

Marine environments

The causes of concrete degradation

The causes of concrete degradation can be divided into 6 large families:



The principles and methods for Repairing in accordance with Part 9 of EN 1504 are shown on the following tables:
1- Table relating to concrete defects.
2- Table relating to defects due to reinforcement corrosion.

1- Principle no. Description of principle methods based on principle product solution

PRINCIPLE Nº	DESCRIPTION OF PRINCIPLE	METHODS BASED ON PRINCIPLE	PRODUCT SOLUTION
Principle 1 (PI)	**Protection against ingress** Reducing or preventing the ingress of adverse agents, e.g. water, other liquids, vapour, gas, chemicals and biological agents.	**1.1 Impregnation** Application of liquid products that penetrate the concrete and blocking the pores.	Not applicable
		1.2 Surface covering, with or without crack bridging capacity	**MORCEMDRY F** **MORCEMDRY SF** **MORCEMREST ANTICARBONATACIÓN**
		1.3 Locally banding cracks	**MEMBRANA ELÁSTICA H**
		1.4 Filling of cracks with injection resins	**Resinas de inyección**
		1.5 Transferring cracks into joints	**PUMALASTIC PU** **PUMALASTIC MS** **MEMBRANA ELÁSTICA H**
		1.6 Erecting external panels	Not applicable
		1.7 Applying membranes	**MORCEM ELASTIC PM**
Principle 2 (MC)	**Moisture control** Adjusting and maintaining the moisture content in the concrete within an interval of specified values.	**2.1 Hydrophobic Impregnation (water repellent)**	**IMPERMOR**
		2.2 Impregnation	**MORCEMDRY F** **MORCEMDRY SF** **MORCEMREST ANTICARBONATACIÓN**
		2.3 Coating	Not applicable
		2.4 Electrochemical treatment By applying an electric potential in the structure, moisture can be moved towards the negatively by charged cathode area. (Not for reinforced concrete without assessing the risk of inducing corrosion).	Not applicable
Principle 3 (CR)	**Concrete restoration** Restoring the original concrete of an element of the structure to the form and function originally specified.	**3.1 Hand-applied mortar**	**MORCEMREST RF 15 (R3)** **MORCEMREST EF 50 (R4)** **MORCEMREST RF 35 (R3)**
		3.2 Recasting with concrete	**MORCEMREST MH (R4)**
		3.3 Spraying concrete or mortar	**MORCEMREST RF 15 (R3)** **MORCEMREST EF 50 (R4)** **MORCEMREST RF 35 (R3)**
		3.4 Replacing concrete elements	Not applicable
Principle 4 (SS)	**Structural strengthening** Increasing or restoring the structural load capacity	**4.1 Adding or replacing embedded or external reinforcing bars**	**MORCEM GROUT 30** **MORCEM GROUT 500** **MORCEM GROUT 500 PLUS**
		4.2 Adding reinforcement anchored in pre-formed or drilled holes	**PUMAFIX TQ**
		4.3 Bonding plate reinforcement	**Epoxy resin adhesive** **SISTEMAS CARBOTEC**
		4.4 Adding mortar	**MORCEMREST RF 15 (R3)** **MORCEMREST EF 50 (R4)** **MORCEMREST MH (R4)** **MORCEMREST RF 35 (R3)**
		4.5 Injecting cracks	**Injection resin**
		4.6 Filling cracks, voids or interstices	**MORCEMREST EPOXI T**
		4.7 Pressurising – (post tensioning)	Not applicable
Principle 5 (PR)	**Physical resistance** Increased resistance to physical or mechanical attack	**5.1 Coating**	**Polymeric coatings** **Two-layer system:** **- Epoxy paints** **- Polyurethane paints** **MORCEMREST C5 (R3)**
		5.2 Impregnation	Not applicable
Principle 6 (RC)	**Chemical resistance** Increased concrete surface resistance to deterioration due to chemical attack.	**6.1 Coating**	**Polymeric coatings** **Two-layer system:** **- Epoxy paints** **- Polyurethane paints** **MORCEM ELASTIC PM** **(membrana elastomérica)**
		6.2 Impregnation	Not applicable

2- Defects caused by corrosion to the reinforcing

PRINCIPLE Nº	DESCRIPTION OF PRINCIPLE	METHODS BASED ON PRINCIPLE	PRODUCT SOLUTION
Principle 7 (RP)	**Preserving or restoring passivity** Levelling and restoring the chemical conditions of the concrete surface and profile	**7.1 Increasing cover to reinforcement with additional cementitious mortar or concrete**	**MORCEMREST RF 15 (R3)** **MORCEMREST EF 50 (R4)** **MORCEMREST MH (R4)** **MORCEMREST RF 35 (R3)**
		7.2 Replacing contaminated concrete	**MORCEMREST RF 15 (R3)** **MORCEMREST EF 50 (R4)** **MORCEMREST MH (R4)** **MORCEMREST RF 35 (R3)**
		7.3 Electrochemical realkalisation of carbonated concrete	**Applying an electrical current** **Post treatment:** **Protective coatings**
		7.4 Realkalisation of carbonated concrete by diffusion	**Application of a very alkaline coating** **Post treatment:** **Protective coatings**
		7.5 Electrochemical chloride extraction	**Applying an electrical current** **Post treatment:** **Protective coatings**
Principle 8 (IR)	**Increasing Resistivity** Increasing the electrical resistivity of the concrete	**8.1 Limiting the moisture content by surface treatment, coating or protection**	**MORCEMDRY F** **MORCEMDRY SF** **IMPERMOR** **MORCEM ELASTIC PM** **MORCEMREST ANTICARBONATACIÓN**
Principle 9 (CC)	**Cathodic control** Restricting the access of oxygen to all potentially cathodic areas of the steel reinforcement, to the point when corrosion is prevented.	**9.1 Limiting oxygen content (At the cathode) by surface saturation or surface coating**	**MORCEMREST INHIBIDORES**
Principle 10 (CP)	**Cathodic protection**	**10.1 Applying an electrical potential**	**Regeneration of volume** **MORCEMREST RF 35 (R3)** **MORCEMREST RF 15 (R3)** **MORCEMREST EF 50 (R4)** **MORCEMREST MH (R4)**
Principle 11 (CA)	**Control of anodic areas** Restricting the access of oxygen to all potentially anodic areas of the steel reinforcement, to the point when corrosion is prevented.	**11.1 Active coating of the reinforcement**	**IMPLAREST C**
		11.2 Barrier coating of the reinforcement not applicable	Not applicable
		11.3 Applying corrosion inhibitors	**MORCEMREST INHIBIDORES**

TECHNICAL FILES

3A SOLUTIONS FOR REPAIRING AND PROTECTING CONCRETE

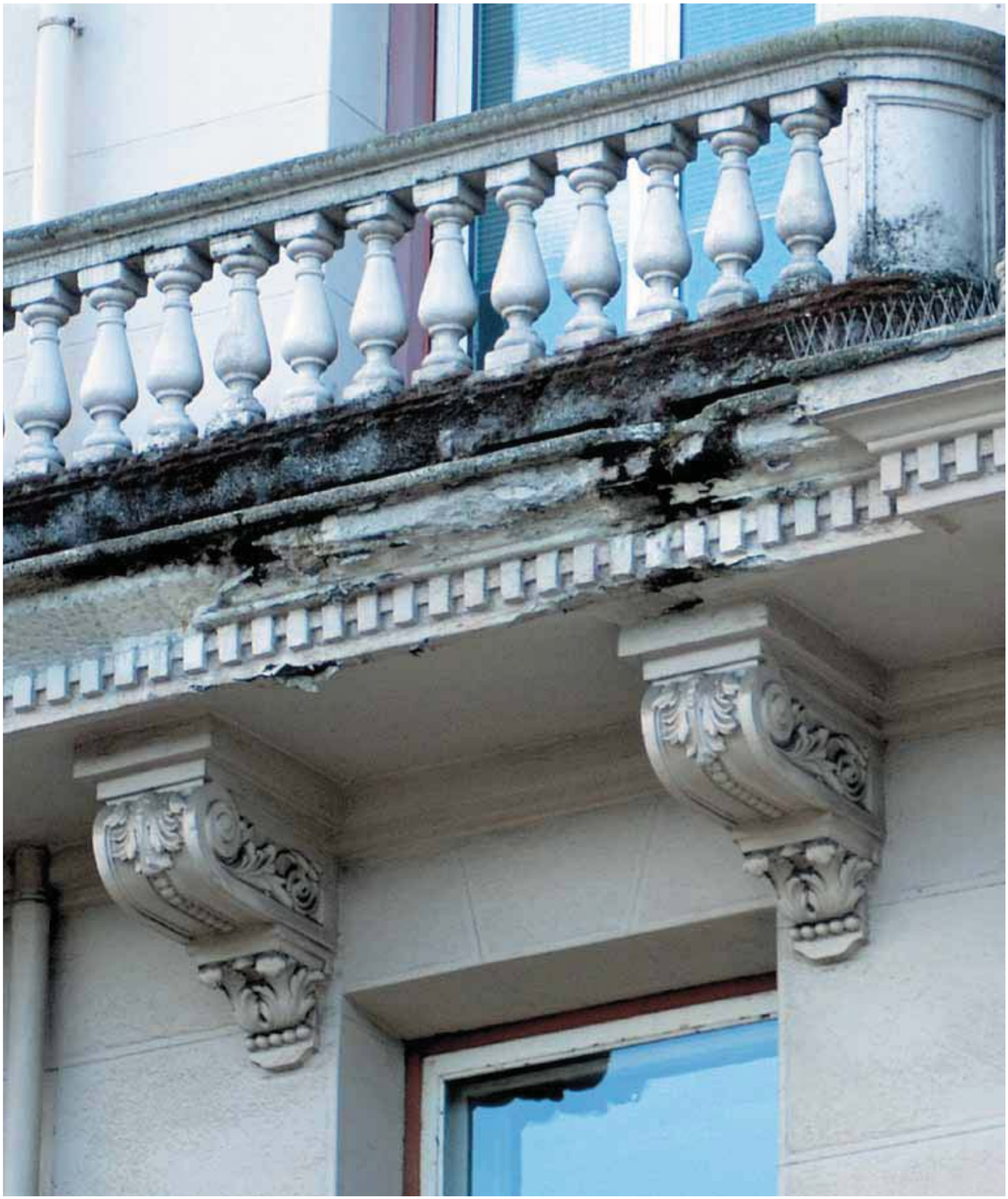
3B SOLUTIONS FOR WATERPROOFING CONCRETE

3C SYSTEMS FOR WATERPROOFING FACINGS

3D APPLICATION OF GROUT TYPE MORTARS

SOLUTIONS FOR REPAIRING AND PROTECTING CONCRETE

3A



1. DESCRIPTION

The purpose of this document is to provide recommendations for different materials and procedures to use for repairing and protecting concrete, in order to provide the most appropriate technical solution and based on the current standard EN-1504 “Products and systems for repairing and protecting concrete”.

2. FIELD OF APPLICATION

This procedure applies to concrete elements that have lost their structural integrity and/or geometry, due to physical or chemical causes (previously described in section 2. Introduction to standard EN 1504), and this prevents compliance with the role for which they were created.

That is, it will be applicable to columns, beams, slabs... that for diverse reasons (overload, chemical attack, moisture, concreting defects...) have lost part of their original characteristics.

3. OBJECTIVE

The objective of repairing concrete is to return it to its initial geometry and above all its structural capacity, removing the degraded concrete and replacing it with a repair mortar whose technical characteristics are perfectly compatible with the nature of the concrete to be repaired.

4. IMPLEMENTATION PROCEDURE

4.1 Inspection and diagnosis

Before any type of intervention, a diagnosis must be made, consisting of analysing the current condition of the structure, prior inspection, taking and analysis of data.

In general it includes the assessment of residual capacity and action needs and urgency. In the event of damage, the nature, scope and most probable cause of this must be assessed.

The purpose of the prior inspection is to assess the work to be carried out, to make decisions in terms of the seriousness of the damage (risk of collapse, support of the structure, evacuation of occupants...) and to make some simple tests on the materials (carbonation of concrete, presence of chloride...) including taking various samples for testing in the laboratory.

For further details, it is advisable to check the “Structural Repair” terms of reference.

Inspection and diagnosis: damaged column

4.2 Prior operations: treatment of substrate and reinforcement

Prior operations is understood to be all those tasks aimed at removing the deteriorated concrete, that is, that without mechanical capacity or stability in line with the resistance the structure must support. In the same way the contact surface must be prepared for the subsequent concrete repair and/or restoration, otherwise the quality of the materials and post treatment may be impaired.

a) Preparation of the surface

Generally, all damaged or degraded material must be removed until a consistent face is obtained, which must be appropriately treated so that the combination of the repair material together with the substrate acts as a monolithic block that was initially intended to provide structural strength.

When deciding on a preparation method for the surface, the material chosen for the repair must be taken into account, the degree of roughness necessary, the possibility of creating powder or not and accessibility to mechanical or manual means... To this end there are different methods of application:

MECHANICAL CHIPPING

Mechanical chipping away using an electric or pneumatic tool. Its greatest quality is being able to select and easily determine the working areas; without it performance is low, and not suitable for hard concretes or large surfaces to be treated. Mechanical chipping creates a vibration on the reinforcing, which in many cases does not cause an increase in the cracks in the concrete facing.

Mechanical chipping

BLASTING
WITH ALUMINIUM SILICATE / SAND SILICA

Aluminium silicate or sand silica is spray blasted with a compressed air compressor with a high flow rate. Its action is abrasive, superficially sanding the surface until the desired depth is achieved. Its form of working is suitable for soft or very deteriorated concrete. It permits the joint elimination of concrete and cleaning the reinforcing. The main disadvantage is the high amount of powder generated, which can be controlled in a certain way by substituting the abrasive product used; for example choosing aluminium silica instead of silicate sand.

Water jet spraying

CHIPPING WITH HYDRODEMOLITION

Versatile for hard concrete, it permits chipping with a certain degree of precision. The main benefit of this method is the way in which it removes mortar that cannot be chipped away by “knocking”, rather by “pulling” the surface aggregates when introducing high-pressure water in to the gaps. Therefore a “pre-selection” between the weakest concrete and the strongest is carried out. Also, by not having an abrasive effect there is no possibility of weakening the reinforcing.

Hydrodemoilition chipping (manual with chipping hammer).

Exposed rebars

With regard to the depth of concrete to be removed, it is recommended that all the contaminated concrete is removed (carbonated concrete) as well as the areas where there are corrosion stains, cracks or laminations.

These operations must be done until reaching a completely healthy area and at least 50 cm or more from the corrosion mark, lengthways to the bar. The structural considerations can limit the amount of concrete to lift up and cleaning can be carried out. Potential mapping can be useful to detect any areas of corrosion.

Where reinforcing is present, the concrete is removed 2 cm behind the rebars to allow for cleaning and for the repair material to perfectly surround them.

The removal of material can be carried out mechanically (with a needle scaler) or manually.

b) Assessment and cleaning of rebars

After removing deteriorated mortar the rebars are assessed and cleaned according to standard.

"Reinforcing is cleaned mechanically or manually until all oxidation has been removed. The form of repair will vary according to the degree of oxidation and spread. If the corrosion has a significant loss of mass, an overlap of the reinforcing must be made with a single or double joint, junction joints with bars or angular junction or else by "V" or "K" butt welds.

It is essential to take into consideration the loss of mass that the reinforcing can suffer after this cleaning: in the event of substantial mass loss (from 10% in most cases), it is advisable to meet this loss with a corrugated support or replacement.

Different methods of cleaning should be used according to the reinforcement protection method. For example, when the reinforcing is protected by method 11.2 (see point 2 of this document, Introduction to the standard) it must be prepared to standard degree of cleanliness Sa21/2 ("very thorough blast cleaning"), when the reinforcing is covered by method 11.1 any of the other methods (except 11.2), this must be prepared to a degree of cleanliness Sa2 ("thorough blast cleaning").

Corroded reinforcing

Sa2 type of cleanliness

c) Protection of reinforcing

After cleaning the elements and areas to be repaired, the reinforcing is protected by a control of anodic areas, with a post treatment of the different repair mortars.

To achieve good passivity of the reinforcing and to protect the bars from future chemical attacks, the following products may be used:

PRODUCT	DEFINITION	CHARACTERISTICS	APPEARANCE	RENDIMIENTO
IMPLAREST C Protection of the reinforcing rebars with coatings that contain active pigments.	Cement and synthetic-based one-component primer.	Product with excellent corrosion-inhibiting properties	Grey powder	50 gr/m (12 mm ø)

d) Applying primer and/or bridging joint

Prior to applying the repair mortar, it is advisable to apply a coat of primer or a bridging joint to ensure optimum bonding between the existing concrete and the repair mortar.

To achieve this bonding, the following products are used:

Applying primer

PRODUCT	DEFINITION	CHARACTERISTICS	APPEARANCE	PERFORMANCE
IMPLAREST EP	Epoxy adhesive 100% solid, two-component, specially formulated for bonding new and old concrete. Once mixed a semi-fluid liquid is obtained which may be applied above 10ºC.	Suitable for all types of screeds on horizontal surfaces (floors) as well as vertical surfaces (walls) and ceilings. Joints between hardened and fresh concrete, provides monolithic joining of the two elements.	Two-component White-Beige	0.4 – 1 gr/m□ according to roughness of substrate
IMPLAREST C	Cement and synthetic-based one-component primer.	Bonding bridge between the old concrete and the repair mortar from the MORCEM-REST range.	Grey powder	1 kg/m□

4.3 Application of repair mortar

All the concrete removed throughout the repair work must be redone to recoup the original structure original and protect the reinforcing once again. The repair mortars used must have a good bonding capacity, low shrinkage, adequate resistance, elastic module and resistance to the surrounding conditions, high carbonation resistance and prevent chloride ingress.

The substrate must be in good condition, clean, free of grease, oil and badly bonded parts. It must be structurally solid and have tensile strength of between 1.2 and 1.5 N/mm□ according to standard.

According to building technique, 2 types of concrete repair mortar can be used:

THIXOTROPIC MORTARS for structural repair:
These are mortars that do not require formwork prior to application due to their consistency. They are applied with a trowel or float and are usually applied to small surfaces whose manual reconstruction is inexpensive. This type of mortar is chosen according to the thickness of the layer to be repaired, the resistance to compression necessary and the setting times.

FLUID MORTARS for structural repairs:
These are fluid, self-compacting mortars with high strength and compensated shrinkage, for pour or pump repairs in areas where an almost integrated concrete reconstruction is required or in difficult areas to reach, which cannot be repaired with thixotropic mortars.

Repairs using thixotropic mortar

Repairs using fluid mortar

The range of repair mortars, including thixotropic and fluid, is the following:

	PRODUCT	CE MARK	DEFINITION	APPLICATION METHOD	BOND STRENGTH 28 DAYS	COMPRESSIVE STRENGTH 28 DAYS	TENSILE STRENGTH 28 DAYS
TIXOTRÓPICO	**MORCEMREST EF 50**	R4	Thixotropic repair mortar reinforced with fibres.	Manually Sprayed	> 2 N/mm□	> 50 N/mm□	> 7 N/mm□
	MORCEMREST RF 15	R3	Thixotropic repair mortar reinforced with fibres	Manually Sprayed	> 1,5 N/mm□	> 35 N/mm□	> 6 N/mm□
	MORCEMREST RF 35	R3	One-component medium resistance repair mortar, reinforced with Manually Sprayed fibres	Manually Sprayed	> 2 N/mm²	> 40 N/mm²	> 7 N/mm²
	MORCEMREST C5	R3	One-component cosmetic repair mortar and surface leveller.	Manually Sprayed	≥1,5 N/mm²	≥ 25 N/mm²	≥7 N/mm²
	MORCEM RÁPIDO	R1	Fast repair mortar, for repairs to non-structural concrete and low mechanical requirements	Manual	> 0,8 N/mm□	> 25 N/mm□	> 6 N/mm□
FLUIDO	**MORCEMREST MH**	R4	High resistance self-compacting fluid, compensated shrinkage and reinforced with fibres	Pour/Pump	> 2 N/mm□	> 45 N/mm□	> 11 N/mm□

REPAIR PROCESS

1- Pathology detection

2- Uncovering the reinforcing

3- Cleaning and passivity of the reinforcing

4- Rebuilding with necessary mortars

SOME EXAMPLES OF WORKS

Prior reinforcement and screed of columns with MORCEMREST EF 50 in Elche (Alicante)

Screed column once sprayed with MORCE-MREST EF 50 in Elche (Alicante)

Application of MORCEMREST RF 15 by spraying in Elche (Alicante)

Manual application of MORCEMREST EF 50 in Alameda (Málaga)

Final manual application of MORCEMREST EF 50 in Alameda (Málaga)

Preparation of formwork for posterior application of MORCEMREST MH in Tavernes de Valldigna (Valencia)

Column rebuilt and reinforced with MORCEMREST MH applied by pouring, in Tavernes de Valldigna (Valencia)

4.4 Curing

With regard to curing recommendations, excessive drying must be avoided by covering the surface with moist burlap or plastic while curing.

Protect from rain, sun and freezing weather for the first 24 hours after applying with repair mortars.

Excessive fast drying due to high temperatures, strong winds, etc, must be avoided.

4.5 Surface Protection of Concrete.

The durability of the repair can be compromised by atmospheric agents (e.g., chloride attack, chemical agents, etc).

That's why certain works will require a surface concrete protection from external agents.

Some of the possible methods of concrete protection are: anti-carbonation paint (MORCEMREST ANTI-CARBONATION), cementitious coatings (MORCEMDRY F) or polymer coatings (MORCEM ELASTIC PM)…

For further information, please consult the terms of reference for "concrete surface protection".

5. NOTES

The products referenced in this document are:
IMPLAREST C
IMPLAREST EP
MORCEMREST EF 50
MORCEMREST RF 15
MORCEM RÁPIDO
MORCEMREST MH
MORCEMREST ANTICARBONATACIÓN (Morcemrest Anti-carbonatation)
MORCEM DRY F
MORCEM ELASTIC PM
MORCEMREST RF 35

For further information, please consult the respective product technical datasheets referenced on the website **www.grupopuma.com**, as well as **terms of reference for "Structural Repairs".**

SOLUTIONS FOR WATERPROOFING CONCRETE

3B

bbk

1. DESCRIPTION

The purpose of this document is to provide recommendations on the use of the different materials and systems to use for waterproofing and protecting concrete.

2. FIELD OF APPLICATION

This procedure applies to reinforced concrete elements, precast from concrete...as a method for both waterproofing as well as protecting the concrete surface in accordance with the standard EN 1504 – 2.

I.e., it shall be applicable to reinforced concrete vessels (e.g. swimming pools), water deposits, cisterns, tanks, elevator shafts, retaining walls, basements, etc.

3. OBJECTIVE

The purpose of the concrete waterproofing is to ensure the element's watertightness and avoid medium and long-term problems with using cement, by offering a more durable useful life.

For all this, the objective of waterproofing is to prevent water from penetrating the structure or of elements within the retaining structure from escaping.

4. TYPES OF WATERPROOFING

4.1 DRYPOOL System

Complete system for waterproofing and coating areas permanently exposed to moisture (swimming pools, spas, saunas, showers…), comprising a waterproof mortar, a cementitious adhesive essentially formulated for applying to wet areas, and a grout. This system will guarantee a waterproof and durable finish.
What does the system offer us?

Guaranteed waterproofing to avoid leaks.

A durable finish with an anti-mould treatment and high performance adhesives.

Compatible material. By being a system, all the materials are compatible with each other and maintain coherence with their bonding and deformability properties.

Waterproofing a heated mosaic bed

Waterproofing swimming pools

Waterproofing wet areas of the bathroom

a) System components

MORCEMDRY F

Two-component waterproof mortar for waterproofing building elements. Suitable for swimming pools and wet areas. A 2 mm thickness ensures the watertightness of the swimming pool structure. Its deformability make it ideal for repairs and waterproofing elements susceptible to enduring small movements. Reinforced with mesh it serves as a “bridge” for small cracks.

PEGOLAND FLEX C2 TE S1

High performance cementitious adhesive, flexible and deformable with high bonding power. Suitable for fixing elements with any degree of absorbency. Perfect for covering swimming pools and wet areas that have been waterproofed with MORCEMDRY F.

GROUTING

We choose the appropriate mortar according to the demands of the application:

MORCEMCOLOR EPOXI RG

Two-component epoxy mortar for joints. Suitable for grouting or sealing tiles, bricks, blocks, etc under heavy chemical or mechanical stress (swimming pools, chemical and food industries, laboratories, hospitals, abattoirs, industrial kitchens, etc).

MORCEMCOLOR PLUS FLEXIBLE CG2 A W

Very fine and plastic water repellent coloured mortar. For sealing joints from 2 to 15 mm. Suitable for grouting all types of tiles. Especially suitable for grouting low porosity elements (porcelain stoneware) and swimming pools.

b) Implementation procedure

1. PREPARATION OF THE SURFACE
The surfaces to be treated must be clean and structurally solid. Cracks and damaged concrete must be repaired with repair mortars reinforced with fibres, such as MORCEMREST RF 15 / EF 50. In the event of concrete with superficial cavities, level the surface with MORCEMREST C 5.

2. APPLICATION OF MORCEMDRY F

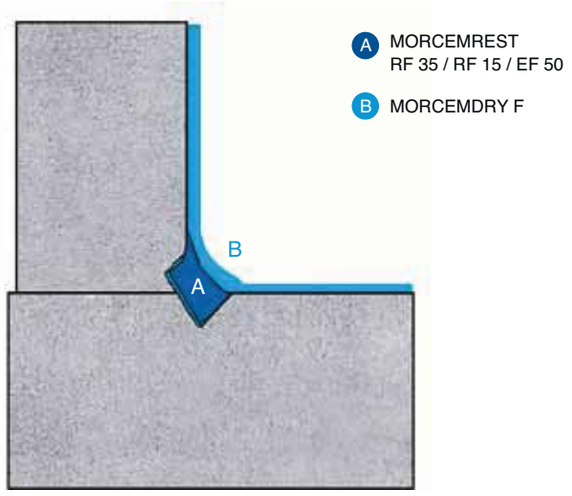
First, it is advisable to remove or smooth over the angle of application if the product is going to be applied in layers, either between wall and screed or wall and wall. For this apply precast half shells with repair mortars with fibres MORCEMREST RF 35 / RF 15 / EF 50 if they are not made from the same concrete.

The precast half shells are carried out in the following way:

Cut lengthways in square sections with a radial saw until the joint is widened by 5 mm, removing the cut material and leaving the angular cuts to enhance bonding of the repair mortar (do not cut the section in a V shape).

Wash with a high-pressure water jet to ensure the substrate is clean (i.e. free from oil, dust, grease, etc and badly bonded parts).

Next fill the half shell formed with repair mortar, reinforced with polypropylene fibre and MORCEMREST RF 15 / EF 50 shrinkage compensated mortar.



Precast concrete half shell construction detail

Once the repair mortar has dried, wet the surface first without too much excess water to apply MORCEMDRY F in two 1mm thick layers, according to technical datasheet, reinforced with mesh.

c) Treatment for singular points

Three coats of products are applied to singular points.

The first one (approximately 1 mm thick) is reinforced with 60 g/m^2 fibreglass mesh.

The second coat, also 1 mm thick, is applied once the first layer has dried sufficiently to not crush it.

Lastly a third coat is applied at an angle of 90° to the direction of the previous layer and once the last coast has dried sufficiently so as not to crush it.

The sealing of expansion joints is performed in the following way:

- A circular section, closed-cell expanded polyethylene foam backer rod is applied, whose function is to support the paste to be applied, preventing it from sticking to the bottom of the joint and helping to control its thickness and function. Next the joint is filled with PUMALASTIC PU polyurethane-based paste or MS PUMALASTIC MS polymer-based paste according to technical features required.

- Once the type of paste selected for filling the joint has cured, apply MORCEM DRY F with a stretch of fibreglass mesh at least 20 cm wide embedded perfectly in the material.

PLACING CERAMIC OR GLASS TILES:
Once the MORCEMDRY F has set, apply PEGOLAND FLEX by combing with a notched trowel. Place the ceramic or glass tiles, pressing well to ensure correct adhesion to all surfaces.

GROUTING FINAL FACINGS:
After 48 hours, grout with MORCEMCOLOR PLUS or MORCEMCOLOR EPOXY (according to technical requirements).

Waterproofing a Jacuzzi with MORCEMDRY F

4.2 Waterproofing water deposits, tanks, walls and elevator shafts…

Implementation procedure

1. PREPARATION OF THE SURFACE
The surfaces to be treated must be clean and structurally solid. Cracks and damaged concrete must be repaired with repair mortars reinforced with fibres, such as MORCEMREST RF 35 / RF 15 / EF 50. In the event of concrete with superficial cavities, level the surface with MORCEMREST C 5.

2. PRECAST HALF SHELLS
The precast half shells are positioned according to the instructions given in the previous section.

Fire Station water tanks (Las Palmas)

Wastewater treatment plant waterproofing Mazarrón (Murcia)

3. TREATMENT OF JOINTS

There are two possible construction solutions for sealing joints according to the width of the joint to be sealed:

If the joint is < 3 cm:

METHOD OF APPLICATION

• A circular section, closed-cell expanded polyethylene foam backer rod is applied, whose function is to support the paste to be applied, preventing it from sticking to the bottom of the joint and helping to control its thickness and function. Next the joint is filled with PUMALASTIC PU polyurethane paste or MS PUMALASTIC MS polymer-based paste, according to technical features required.

• Once the type of paste selected for filling the joint has cured, apply MORCEMDRY F with a stretch of fibreglass mesh at least 20 cm wide embedded perfectly in the material.

If the joint is > 3 cm: ELASTIC MEMBRANE H

This is a strip of flexible, waterproof Hypalon for sealing cracks and joints with a large degree of movement, bonded to both sides of the joint with MORCEMREST EPOXY T.

METHOD OF APPLICATION:

• Spread MORCEMREST EPOXY T to the desired area, protruding at least 2 cm on each side of the membrane. The thickness of the adhesive can vary from 1 to 2 mm depending on the substrate.

• Lay the membrane on the coat of MORCEMREST EPOXY T within 30 minutes of applying the adhesive.

• Press the membrane using pressure rollers until the adhesive protrudes through the punch-holes of the membrane anchorage which confirms that the strip has completely bonded with the adhesive over 100% of the surface.

• Finish by applying another 1 or 2 mm coat of MORCEMREST EPOXY T on the membrane (previously cleaned with the Membrane H Chemical Activator) and apply it so that it again protrudes about 2 cm beyond the sides of the ELASTIC MEMBRANE H; thus achieving a sandwich-type effect with that previously applied and the membrane in between.

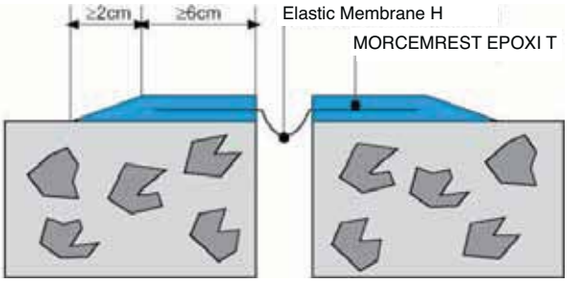
ELASTIC MEMBRANE H contains two rows of punch-holes over its entire length and 1 cm from its two edges, separated by 5 cm to improve its adhesion.

For big movements or very wide joints put part of the membrane towards the inside of the joint making a “U” shape.

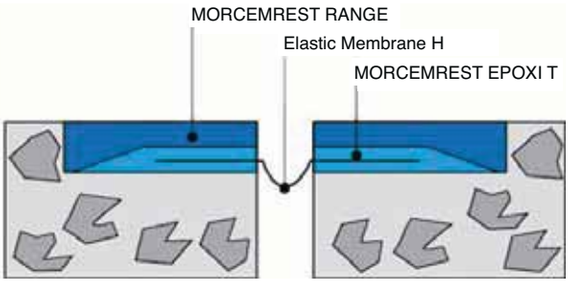
In joints where there is positive hydrostatic pressure a backer rod or sealing filler is recommended and if there is negative hydrostatic pressure (0.3 - 0.4 bar) installing a steel plate is recommended to reinforce the strip.

This method can also be used to seal 90º joints between floors and walls.

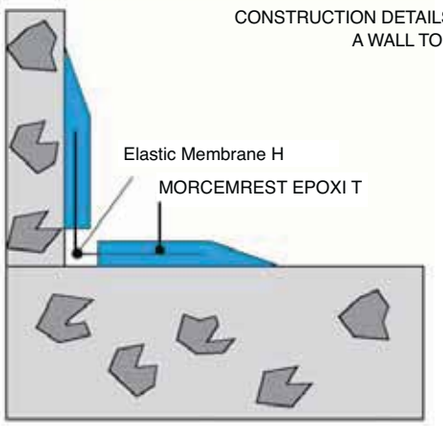
CONSTRUCTION DETAILS OF SEALING
AN EXPANSION JOINT WITH ELASTIC MEMBRANE H



CONSTRUCTION DETAILS OF SEALING
AN EXPANSION JOINT WITH JUNCTION BOX



CONSTRUCTION DETAILS OF SEALING
A WALL TO FLOOR JOINT



Waterproofing tank covers with joint treatment with ELASTIC MEMBRANE H

Close up of joint on water tank cover whose sealing has deteriorated over time.

5. NOTES

The products referenced in this document are:
MORCEM DRY F
PEGOLAND FLEX
MORCEM COLOR EPOXI
MORCEM COLOR PLUS FLEXIBLE
MEMBRANA ELÁSTICA H (Elastic Membrane H)
MORCEMREST EPOXI T

For further information other than that described here please consult the respective technical and safety datasheets, and the **Terms of Reference for "Waterproofing Water tanks" and "Concrete surface protection".**

SYSTEMS
FOR WATERPROOFING FACINGS

3c

1. DESCRIPTION

The purpose of this document is to provide recommendations on the use of the different materials and systems to use for waterproofing and protecting facings, specifically with the MORCEM COVER System.

The MORCEM COVER system is a polyurethane-based waterproofing system for applying on site, capable of providing protection to flat surfaces and facings with difficult construction geometries.

The MORCEM COVER system consists of a primer (IMPLAREST EPW) and the posterior application of the polyurethane membrane (MORCEM ELASTIC PM) reinforced with geotextiles.

The MORCEM COVER system provides effective waterproofing and a high level of resistance to the dynamic loads to which the facing is subjected to due to constant thermal changes and the typical movements of the substrate, including dynamic ones, without suffering any damage.

2. FIELD OF APPLICATION

This procedure applies to waterproofing facings, both on new builds and renovated ones.

The liquid waterproofing system MORCEM COVER remains completely bonded to the substrate (concrete, mortar, fibre cement panels, Catalan tiles…), and is suitable for waterproofing facings with a slope greater than 1%

3. OBJECTIVE

The purpose of waterproofing is to ensure the watertightness of the roof and avoid medium and long-term problems of the element, offering a much longer useful life.

The liquid waterproofing system MORCEM COVER consists of a one-component polyurethane-based elastomeric coating applied on site, which once polymerised forms a continuous membrane, completely bonded to the substrate.

The membrane can be protected or remain exposed to external weather conditions.

This system is suitable for areas exposed to severe weather conditions.

This system includes a geotextile mesh throughout and as reinforcement for singular points of the facing, as well as a primer, applied previously to the polyurethane membrane.

The thickness of the product applied must be at least 1.6 mm and the performance must be at least 1.5 kg/m^2.

4. APPLICATION PROCEDURE

4.1 Treatment of the substrate

1. CLEAN AND REPAIR
To apply the MORCEM COVER System it is essential to prepare the substrate appropriately. The substrate must be cleaned to remove any loose particles and dust. It must be stable, free of any surface grout, oil, old treatments (for example acrylic rubber) or any substance that remains bonded.

For a bricked facing, ensure that the bricks are perfectly bonded, otherwise they must be removed and replaced.

The substrate must be structurally solid and have tensile strength of between 1.2 and 1.5 N/mm□

The surface needs to have open pores in order to facilitate the joint and bonding between the different materials.

Depending on the scope of the damage to the substrate, when renovating, the preparation of the substrate can range from a simple cleaning of the surface to removing a considerable layer the concrete, otherwise the larger the extent of the damage, the more aggressive the preparation of the surfaces should be.

2. PREPARATION OF CAVITIES AND/OR CRACKS
In the event of the concrete to be treated having cracks or cavities, these must be filled with a concrete repair mortar (such as MORCEMREST RF 15 / EF 50).

Prior to repair, the concrete must be structurally solid, with a minimum tensile strength of between 1.2 and 1.5 N/mm^2., sound, clean and with an open pore surface (minimum roughness of 2 mm).

When repairing cavities, it is advisable to subject the concrete to a mechanical treatment in order to stabilise the substrate. The choice of method (jets, chipping, milling, scarifying, blasting...) shall be at the discretion of the site manager.

In all, the intention of all these sections is to achieve a completely smooth surface to apply the waterproofing system.

In the event of any cracks or cavities to the substrate, their movement must be assessed. In the case of stable, or “dead” cracks, these must be opened (cutting with a radial saw in a U shape), cleaned and repaired with MORCEMREST RF 15.

If, on the contrary there are active cracks or cracks with movement, these must be treated with PUMALASTIC PU.

3. ASSESSMENT OF JOINTS
All expansion joints and construction on the facings must be respected. In the case of renovation work, their condition is evaluated, and if negative, they are emptied and refilled.

The MORCEMREST RF 35 RANGE should be used for working joints, aesthetic joints or forming slopes.

In the case of expansion joints, the old sealing material should be removed and refilled again with PUMALASTIC PU

Facing with old treatment that should be removed.

4.2 Priming

Once the substrate has been prepared, the primer IMPLAREST EPW is applied. This product is a two-component water-based epoxy primer/ bonding bridge for preparing damp and dry surfaces. It is applied with a brush or roller. The coat following this primer must be applied 12 hours after the primer and never left longer than 24 hours.

Defective pore sealing due to lack of primer

The purpose of IMPLAREST EPW is to:

• Seal pores.
• Form a semi-barrier against vapour and avoid rising moisture penetrating the substrate and un-bonding the MORCEM COVER System from the surface.
• Possibility of working on damp substrates (not wet), up to a maximum moisture level of 20%.

Roof waterproofed with MORCEM COVER

4.3 Application of polyurethane membrane

A first coast of MORCEM ELASTIC PM is applied with a brush or roller. To this coat, a layer of nonwoven fibreglass geotextile or multidirectional polyester of 110 g/m2 should be used.

After 12 hours a second coat of MORCEM ELASTIC PM is applied at an angle of 90° to the previous layer, ensuring that all the geotextile is completely embedded in the system. If this is not the case, a third coat of MORCEM ELASTIC PM should be applied.

The geotextile must be completely bonded to the surface, avoiding bubbles to or pinholes to form.

A very important factor to consider is the dew-point, as moisture in the air can condense on the substrate, creating an interface between the last coat and the polymeric coating, impeding bonding. That's why the ambient temperature of the substrate when applying MORCEM ELASTIC PM must be 3ºC higher than the dew-point.

MEMBRANE PROPERTIES	VALUES
Tensile strength	7.00 ± 0.30 N/mm^2
Elongation	900 ± 80%
SCHORE hardness	65 ± 5
Bonding to dry concrete	> 2 N/mm^2 (concrete cracking)
Water vapour permeability	26 ± 4 g/m^2/day
Hydrostatic pressure	without leakage (1m col. water)
Reaction to Class B2 fire	Clase B2
Resistance to sparks and irradiated heat	Passed
Performance to rain after	4 hours
Suitable for light foot traffic after	12 hours
Total curing	7 days

4.4 Treatment for joints and critical points

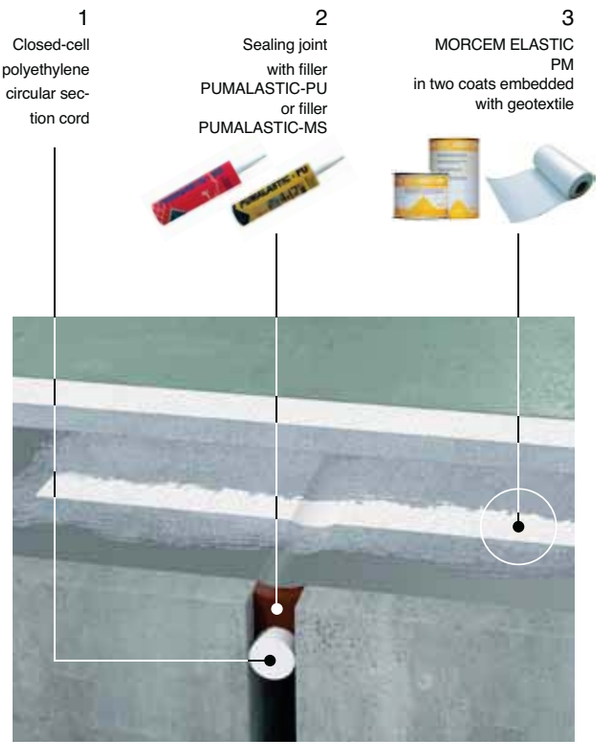
For the treatment of joints, the following procedure is recommended:

1. PLACING A CLOSED-CELL POLYETHYLENE CIRCULAR SECTION CORD
Its purpose is to support the paste applied afterwards to avoid it sticking to the bottom of the joint and helping to control the its thickness and use.

2. SEALING JOINTS
With PUMALASTIC PU polyurethane elastic filler or PUMALASTIC MS polymer-based filler, according to technical features required.

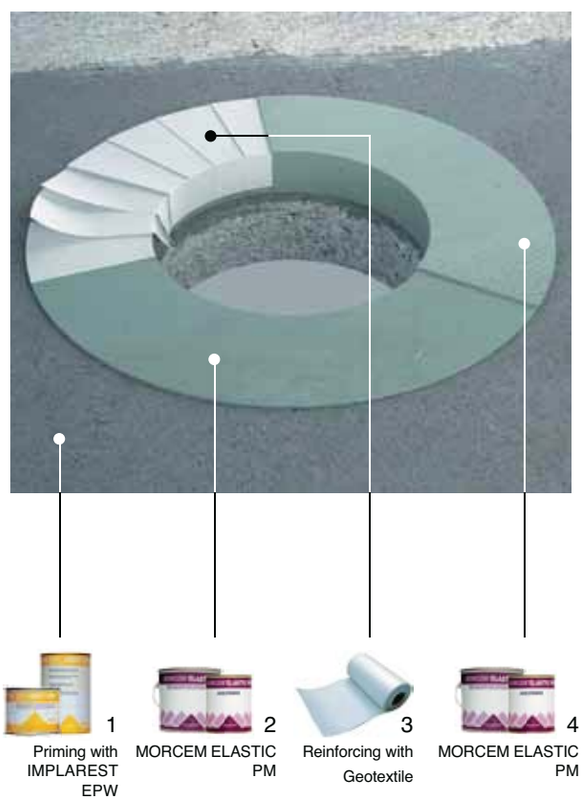
3. APPLY MORCEM ELASTIC PM
Once the chosen type of joint filler has dried, apply MORCEM ELASTIC PM in 2 coats with embedded geotextile, at 10 cm on both sides of the joint. See construction detail.

Singular points are considered: drains, precast half shells, small cracks…These types of points are recommended to be reinforced with another layer of geotextile (as well as the ones that have the membrane in them), overlapping 10 to 15 cm in the event of the elements overlapping. See attached details.



Construction detail of joint treatment

Construction details of singular points



4.5 Finishing

The system can be finished with the last coat of MORCEM ELASTIC PM if the intention is to achieve a non-trafficable or service visitable facing, as long as it is not exposed to solar rays.

If a trafficable surface is required, the possible finishes are:

- Tiled: in order to tile over the MORCEM COVER system the grip performance must be improved by applying a third coat of MORCEM ELASTIC PM and while it is still fresh, spraying with silica sand (0.4-0.6); 400 gr/m^2 approximately. Once this layer has dried, any remaining, un-bonded silica is removed, and then the bricks are fixed with PEGOLAND FLEX C2 TE S1.

- Finishing varnish: applied directly to the finishing coat. There are three types of varnish: one is to provide UV protection, another with foot traffic resistance and another to provide protection against road traffic.

- Aesthetic finishes with quartz: achieved by spraying coloured quartz over a third layer of MORCEM ELASTIC PM, with a post application of finishing varnish for protection.

MORCEM COVER SYSTEM PROCESS

4.6 Certifications

The MORCEM COVER System holds the DITE (European Technical Approval) and complies with the guide ETAG 005. For further information, please consult the aforementioned documents.

Waterproofing car park flooring with MORCEMCOVER

Finishing car park flooring with high-traffic protection varnishes.

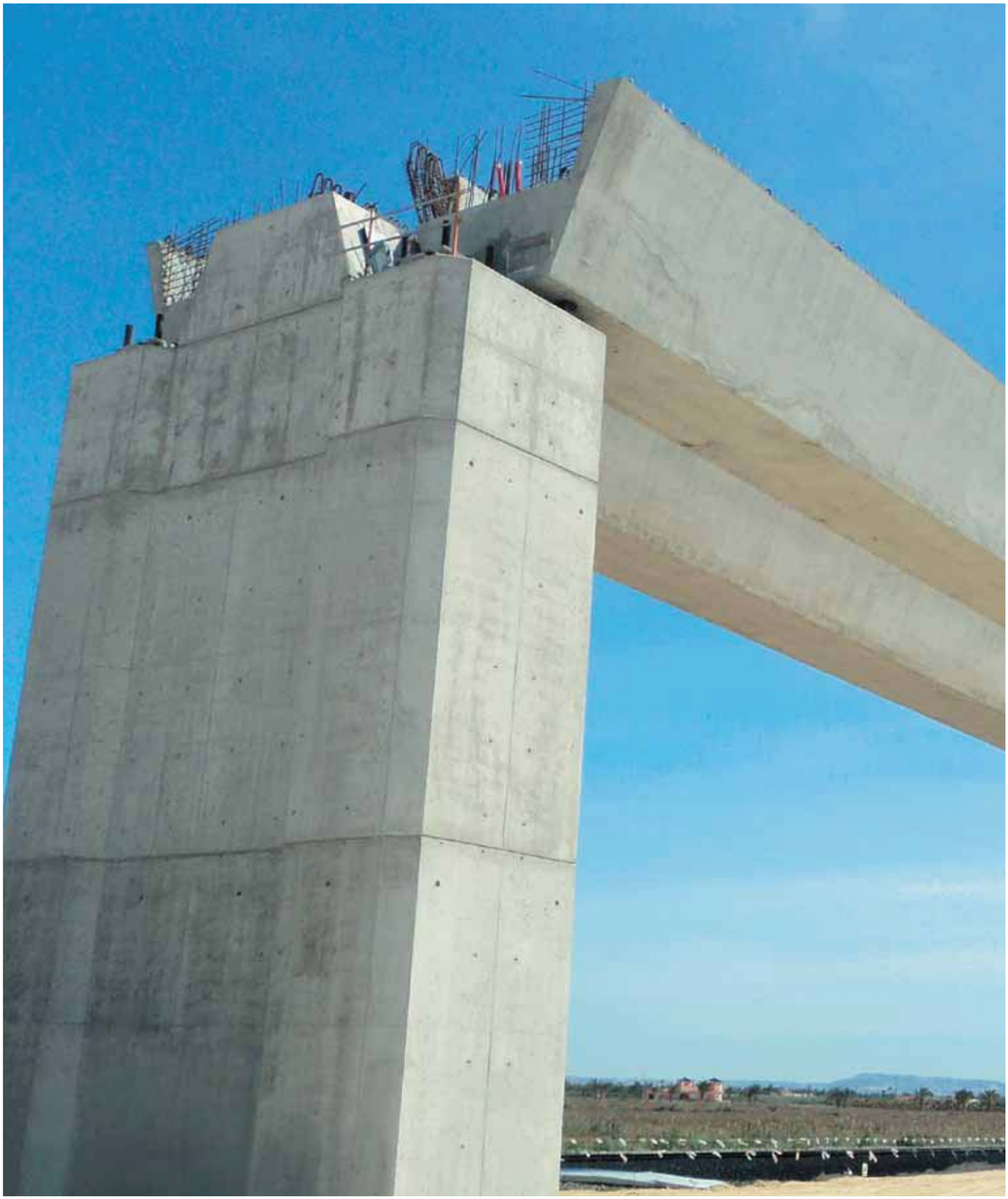
5. NOTES

The products referenced in this document are:
IMPLAREST EPW
MORCEM ELASTIC PM
MORCEMREST RF 35 / RF 15 / EF 50
PUMALASTIC PU
PUMALASTIC MS
PEGOLAND FLEX

For further information other than that described here, please consult the respective technical and safety datasheets, and the **Terms of Reference for "Waterproofing Floors".**

APPLICATION OF GROUTS

3d



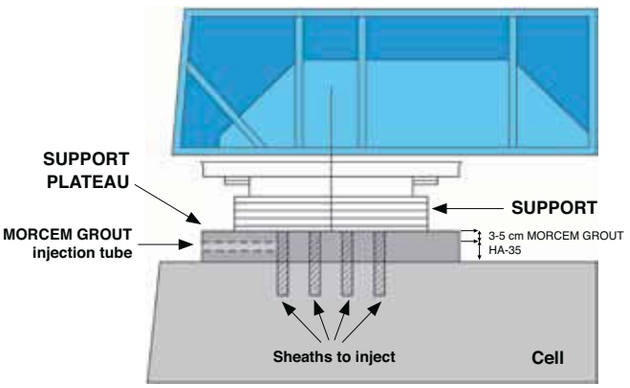
1. DESCRIPTION

The purpose of this document is to provide recommendations on the application of mortars in the MORCEM GROUT range, such as levelling fluids, self-compacting and shrinkage compensated mortars, for their most habitual uses.

2. FIELD OF APPLICATION

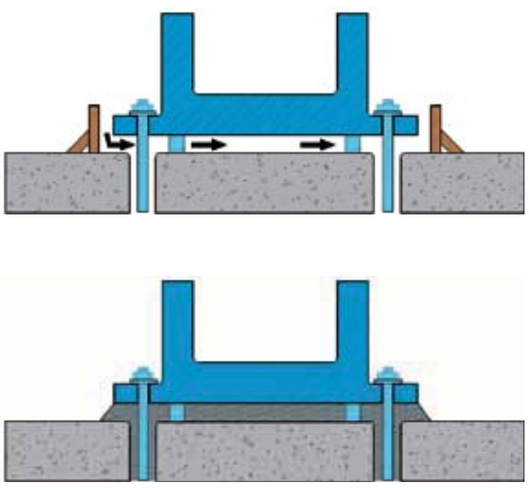
It can be applied to any engineering works where this type of levelling mortar is involved, such as:

- Levelling structural supports that support a deck, such as bridges, viaducts, level crossings.



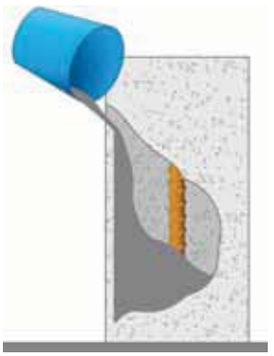
Morcem Grout 500 injection scheme in sheaths and levelling supports.

- Levelling and anchoring industrial precision machinery, such as pumps, equipment, machine platforms, bolts…
In this type of application, the grout is also known as self-levelling grout.



Levelling and machine plate bonding with MORCEM GROUT

- Repairing by sealing internal cavities in concrete piers.



Sealing by pouring into concrete pier cavities

3. OBJECTIVE

The purpose of applying a grout as a filler is ensure a uniform spread of loads.
The high fluidity of these materials, together with its compensated shrinkage and high-compression strength make it the perfect material for this type of application.

The main characteristics of MORCEM GROUT are:

FLUIDITY
The ability of MORCEM GROUT to flow and fill existing cavities is one of its principal features. Its high level of fluidity facilitates uniform contact with the entire support surface, ensuring a uniform spread of loads and preventing internal air bubbles. For this, it is essential that, even in difficult conditions (very low thicknesses, irregularities on the substrate, etc) the grout is fluid and permits very compact filling.

SHRINKAGE COMPENSATED
A loss of volume during the curing process will impede the load capacity of the grout, that's why these products must have "shrinkage-compensating" properties or allow for "slight expansion", or "compensate" for this loss of volume during the curing stage. Contact between the grout and the anchorage area must be consistent, both when the material is in a plastic state and when it has hardened.

RESISTANCE
This is one of the principal characteristics. Grouts are mortars that when they work with loads, they work principally at compression. That is why products from the MORCEM GROUT range are very high-strength, both at 28 days (compressive strength > 70 N/mm^2) as well as at 24 hours, where they achieve > 35 N/mm^2 compressive strength.

COAT THICKNESSES
The thickness of the layer to fill offers us a choice between a MORCEM GROUT or another. The limitation of the coat thickness is conditioned by the size of the aggregate, and non-compliance with this limitation may cause its separation, with the consequent lowering of the system's compressive strength. That is why a choice needs to be made between one grout or another according to coat thickness.
Grupo Puma has two types of MORCEM GROUT according to the thickness required:

Compressive strength test

• MORCEM GROUT 30: in layers between 5 – 30 mm, or for low thicknesses.

• MORCEM GROUT 500 and 500 Plus: in layers from 20 to 200 mm (and up to 500 mm in confined spaces). As can be seen, this type of grout can be used with a large range of thicknesses (it is difficult to find works that require more than 200 mm of grout thickness in an unconfined space). Those which can achieve a 200 mm coat thickness directly, in the majority of cases avoid surpassing the thickness recommended by the manufacturer and therefore a segregation of the mortar occurs.

All these characteristics allow it to cover the whole spectrum of uses for high-precision filling and anchorage work, ensuring values above those described in the standard UNE EN 1504 - Part 6:

Resistance to lifting, moving	≤ 0.6 mm at one load of 75 KN
Chloride ion content	≤ 0.05 %
Reaction to fire	Euroclass B
Compressive strength	According to grout type
Bonding to steel: Corrugated bars	> 15 N/mm^2

4. IMPLEMENTATION PROCEDURE

4.1 Preparation of the surface

• The substrate must be clean, firm, rough and free from oil, grease, paint, and release agents, dust, etc.

• The surfaces must be structurally solid, in accordance with standard UNE - EN 1504 the concrete tensile strength must be 1.2 N/mm2 y 1.5 N/mm2, with a minimum surface roughness of 2 mm to facilitate the bonding of the mortar.

• The substrate must be dampened to control suction and prevent any sudden loss of water, but without any puddles remaining on the surface.

• The substrate must have a minimum temperature of +5ºC and maximum +30ºC.

4.2 Formwork

• Formwork must be sufficiently waterproof to prevent loss of water and grout from the anchorage mortar.

• Formwork must be correctly anchored to support the pressure of the liquid mortar once applied.

Formwork must be at least 5 cm wider than the anchor plates or machinery on the sides where the grout is poured or protrudes. The formwork should be at least 2.5 cm wider on the sides that are parallel to the grout's flow direction. Maximum +30ºC.

• The height of the formwork should be at least 2.5 cm over the highest level reachable by the grout underneath the anchor plate.

Fixing formwork
Biodiesel Plant in Andujar (Jaén)

4.3 Mixing

• Add MORCEM GROUT to 2/3 parts of the water and mix, gradually adding the rest of the water. The water/powder relation should be exactly that stated on the product's technical datasheet. Do not add more water that the recommended amount.
It can be mixed manually or mechanically with a low speed mixer (300 - 600 rpm).

Mixing MORCEM GROUT 500 on site
Desalination plant in Almería

4.4 Application

• After mixing, fill the envisaged hole. Avoid the journey between the mixture and the on site work, as the transfer of the mixed mortar can cause settlement.

• For filling it is advisable to pour the material and help it with a rod.

• For filling underneath plates, an air outlet must be provided so that it can be expelled as the MORCEM GROUT is poured in.

Application by pouring MORCEM GROUT 500 at the Technological Park in Martos (Jaén)

• For large surfaces it is advisable to stir with a rod or tamp down with a wooden block.

• The application thicknesses give in the technical datasheets must be adhered to

4.5 Curing

• Once the product has been poured, it must be protected from the sun, wind, etc… It is advisable to cover it with damp burlap and leave it for 2 to 3 days. The curing operation is necessary in all cases.

• In the event of filling with MORCEM GROUT the formwork must be left for at least 24 hours before releasing the mould.

4.6 Additional information

• Do not add extra water to the mortar other than the recommended amount nor remix.

• Do not apply to substrates at temperatures lower than +5ºC nor above +30ºC

• Do not add cement, sand or other substances that could affect the material's properties.

Levelling AVE line in Crevillent (Alicante)

AVE (high-speed train) line Crevillent-San Isidro (Alicante)

5. TYPES OF MORCEM GROUT

PRODUCT	DESCRIPTION	COAT THICKNESS	COMPRESSION	BENDING TENSION	FIELD OF APPLICATION
MORCEM GROUT 30	Self-levelling mortar non-shrink, high-resistance for filling and precision anchorage in small thicknesses	5 - 30 mm	to 24 h > 35 N/mm^2 to 28 d > 60 N/mm^2	to 28 d > 8 N/mm^2	Filling machine bases with a thickness lower than 30 mm. Filling by pouring or pumping into cracks and holes with an opening larger than 5 mm, confined inside mass concrete structures. Anchors and bolts.
MORCEM GROUT 500	Controlled expansion self-levelling mortar, high strength, non-shrink. Medium and large thicknesses.	20 - 200 mm	to 24 h > 30 N/mm^2 to 28 d > 65 N/mm^2	to 28 d > 8 N/mm^2	Levelling supports on bridges and cranes. Filling by pouring underneath machinery bedplates. Filling and anchoring metal profiles and precast elements. Anchors and bolts. Filling by pouring or pumping confined spaces inside concrete structures.
MORCEM GROUT 500 PLUS	High-strength mortar for filling and anchoring machines, levelling supports, bridges, etc... Medium and large thicknesses.	20 - 200 mm	to 24 h > 35 N/mm^2 to 28 d > 70 N/mm^2	to 28 d > 8 N/mm^2	Levelling base on bridging joints. Levelling supports on bridges. Anchoring crane rails and bridge cranes Reinforcement of concrete elements by cladding. Reinforcement by pouring underneath support plates of equipment subject to heavy strain.

General view of the principal viaduct on the MU-31 motorway (Murcia)

6. EXAMPLES OF MORCEMGROUT USES

A) LEVELLING OF BRIDGE DECKS WITH MORCEM GROUT 500 AND 500 PLUS

Detail of neoprene supports levelled with MORCEM GROUT 500 on the MU-31 (Murcia)

Detail of neoprene support on a section of the AVE in Crevillent (Alicante)

B) APPLYING MORCEM GROUT 500 FOR LEVELLING METAL STRUCTURE

Detail of levelling and filling under anchoring plates of metal structure

Detail of levelling and filling under anchoring plates of metal structure

Vessels with metal structure Arjonilla (Jaén)

C) APPLYING MORCEM GROUT 500 AND 500 PLUS
UNDER ANCHORING PLATES IN INDUSTRIAL WORK

Extension of the Repsol refinery
Cartagena (Murcia)

Extension of the Repsol refinery
Cartagena (Murcia)

Levelling Biodiesel plant with MORCEM GROUT 500
Andujar (Jaén)

Levelling with MORCEM GROUT 500
Alcázar de San Juan (Ciudad Real)

MORCEM GROUT 500 on REE electrical substation
Jarque Mosque (Teruel)

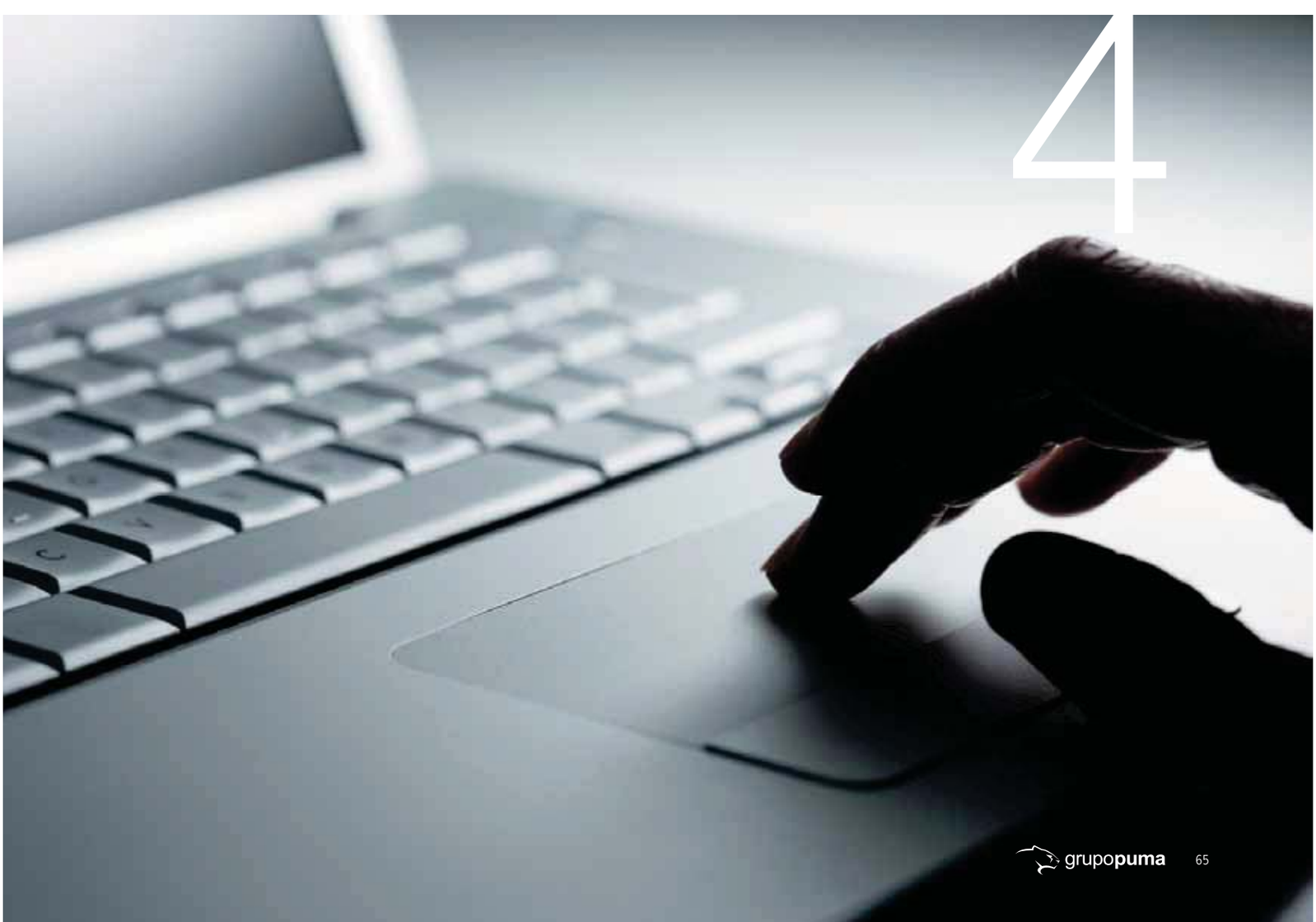
MORCEM GROUT 500 en subestación eléctrica REE
Mezquita de Jarque (Teruel)

7. NOTES

The products referenced in this document are:
MORCEM GROUT 30
MORCEM GROUT 500
MORCEM GROUT 500 PLUS

For further information other than that described here please consult the respective technical and safety datasheets of the products mentioned, as well as the Terms of Reference for “Machinery Anchorage”.

ADDITIONAL TOOLS



4

The tools at the disposal of technical specifiers for reporting and evaluation of project lines, apart from the aforementioned files, are:

- PRICE LISTS IN PRESTO FORMAT
- CYPE PRICE GENERATOR
- SPECIFIC TERMS OF REFERENCE
- TECHNICAL AND SAFETY DATASHEETS AVAILABLE TO VIEW ON THE WEBSITE **www.grupopuma.com**
- PERSONALISED TECHNICAL SUPPORT

PRODUCT GUIDE

Below are the main characteristics of the products referred to in this catalogue.

PRODUCT	DESCRIPTION	CHARACTERISTICS	
IMPLAREST C	Primer-bridging joint cement based one-component.	Excellent bonding to substrate. Protection of reinforcement against corrosion, especially in areas with little concrete coverage and with the presence of chlorides. As a bridging joint between the old concrete and repair mortars from the MORCEM-REST range.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	As a primer: 50 gr/m lineal (12 mm or) As a bridging joint: ± 1 kg/m²	1 kg tub	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
IMPLAREST EP	100% epoxy adhesive solid, two-component, especially for the joint between new and old concrete. Once mixed a semi fluid mixture is obtained which is applied above 10ºC.	For all types of screeds, both horizontal (floors) as well as vertical (walls) and ceilings. Joint between hardened and fresh concrete, providing a monolithic joint between the two elements. Good mechanical resistance of the joint. Structural reinforcing by bonding between fresh and already hardened concrete. Excellent bonding and consolidation of the substrate. Fast to apply and cure. High penetration capacity.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	0.4 – 1 gr/m according to the roughness of the substrate.	Pre-dosed sets of 5 kg. Component A: 4.2 kg Component B: 0.8 kg.	Two-component White-Beige

PRODUCT	DESCRIPTION	CHARACTERISTICS	
IMPLAREST EPW	Water-based epoxy primer-bridging joint ready for applying to wet and dry substrates.	Primer suitable for new and old substrates, prior to repairing cementitious, elastomeric or epoxy facings. Water-based. Excellent bonding and consolidation of the substrate. Fast to apply and cure. High penetration capacity.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	250 - 350 gr/m²	Sets of 5 kg: Component A 2.8 kg + Component B 2.2 kg	Transparent

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEMREST EF 50 R4	One-component repair mortar, highly-resistant, reinforced with fibre for large thicknesses of up to 50 mm.	High performance bonding and resistant to freeze and thaw cycles. Thixotropic, does not lift off, suitable for ceilings. Suitable for reinforced concrete structural repairs and prestressed-concrete that has deteriorated due to corrosion or other causes, regeneration of concrete…etc.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	2.1 kg/m² per mm of thickness.	25 kg bag	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEMREST RF 35 R3	One--component repair repair mortar with medium strengths, reinforced with fibres.	High adhesion level for bonding to concrete, medium-modulus. Thixotropic, does not lift off, suitable for ceilings. Water vapour permeable. Shrinkage compensated to minimise risk of cracking. Good resistance to chlorides. Resistant to freeze-thaw cycles. Repairs to structural elements. Levelling concrete surfaces.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	2 kg/m² per mm. of thickness.	5 and 25 kg bag	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEMREST RF 15 R3	One--component repair mortar, highly-resistant, reinforced with with fibres. Thicknesses of up to 15 mm.	High bonding level, thixotropic, does not lift off, suitable for ceilings. Suitable for structural repairs of reinforced concrete and prestressed-concrete that has deteriorated due to corrosion or other causes, sealing joints between concrete sections, precast elements.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	2 kg/m² per mm. of thickness.	25 kg bag	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEMREST MH R4	Fluid micro-concrete with high resistances and compensated shrinkage reinforced with fibres.	Repairs in difficult-to-access areas. Repairs to strongly reinforced elements, always with moulds. Excellent mechanical properties. Self-compacting. Does not require vibration. Thicknesses from 20 to 100 mm. Fast to apply. High quality finishing of the surface.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	2.1 kg/m² per mm of thickness.	25 kg bag	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEMREST C5 R3	One-component repair mortar, surface levelling up to 5 mm.	Excellent bonding, suitable for repairs and levelling damaged concrete surfaces, on structures, columns and façades. Excellent re-grading properties. Resistant to water and weather conditions. Superficial and cosmetic repairs of all types of precast elements.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	± 2 kg/m² per mm of thickness	25 kg bag	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM FAST R1	One-component repair mortar, fast curing and hardening.	High finishing qualities. Anchoring window and door frames. Small concrete repairs. Fixing covers or manhole covers, etc.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	According to use	20 kg bag	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEMREST SEALANT	Fast-drying mortar for sealing water leaks in cracks and fractures on concrete or other cement-based surfaces.	Water leak sealant for concrete and cement-based substrates, urgent repairs in water conditions, anchoring and sealing requiring a very fast turn around time. Waterproofs the surface it is applied to. Almost instant curing (even when immersed).	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	According to use	5 kg bag	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEMREST ANTICARBONATION	Smooth finish top coat, matt finish, to protect concrete structures and elements from carbonation.	Excellent bonding. Suitable for both indoor and outdoor applications. Protection of concrete structures against deterioration caused by atmospheric agents. Protection against water penetration and control. Impermeable to liquid water and freeze-thaw cycles. Increased resistivity. Permeable to water vapour. Penetration power. Resistant to UV rays. Water vapour breathability. Resistant to CO2 diffusion.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	± 6 - 10 m²/1 L	15 L	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM GROUT 30	Mortar for precision sealing and anchoring. Thickness up to 30 mm	Self-levelling mortar, high strength, non-shrink. Resistant to water, oils, grease and petroleum derivatives. Free from substances that are aggressive to concrete and steel. Suitable for sealing machinery platforms and anchors, columns, and precast elements, levelling supports and bridges, anchors and bolts, etc.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	± 2 kg/m² per mm of thickness.	25 kg bag	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM GROUT 500	Mortar for precision sealing and anchoring. Thickness up to 500 mm	High strength mortar. Resistant to water, oils, grease and petroleum derivatives. Free from substances that are aggressive to concrete and steel. Suitable for sealing machinery platforms and anchors, columns and precast elements, levelling supports and bridges, anchors and bolts, etc.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	± 2 kg/m² per mm of thickness.	25 kg bag	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM GROUT 500 PLUS	Very high strength mortar for precision sealing and anchoring. Thickness up to 500 mm	Very high strength mortar. Resistant to water, oils and all types of petroleum derivatives. Free from substances that are aggressive to concrete and steel. Suitable for sealing platforms of large machinery, reinforcing concrete elements (columns and beams), anchoring crane rails and bridge cranes, levelling supports and bridges, etc.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	± 2 kg/m² per mm of thickness.	25 kg bag	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM ELASTIC PM MEMBRANE	Elastomeric membrane for waterproofing facings.	Easy to apply: liquid application (one-component liquid polyurethane). Suitable for crack bridging. Elastomeric membrane system without joints. High performance on large surfaces. Requires IMPLAREST EPW primer.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	1.5 Kg/m² to 2 Kg/m² (thickness 1.1 to 2 mm).	6 - 25 kg containers	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM ELASTIC PM ACCELERATOR	Curing accelerator	Accelerator for polyurethane elastic membrane MORCEM ELASTIC PM	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	6 kg membrane: 240 gr 25 kg membrane: 1 kg	240 gr - 1 kg containers	Transparent

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM ELASTIC PM Transparent membrane 	One-component polyurethane aliphatic transparent membrane, highly elastic with high content of solids for long-lasting waterproofing of surfaces.	UVA stable, does not yellow, weather proof, resistant to alkaline, remains transparent and elastic over time. Protects and waterproofs mineral surfaces against water penetration, ice, residue and acid rain. Waterproofs damaged glass surfaces and protects the glass fragments in the event of breakage. Uses a unique drying system, and unlike other systems, it does not react to humidity or crate bubbles.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	0,8 - 1,2 Kg. /m□	Containers of 20 and 5 kg	Transparent

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM ELASTIC PM Transparent matt varnish 	Aliphatic polyurethane, varnish, semi-hard, matt finish, applied over MORCEM ELASTIC PM TRANSPARENT.	UVA stable, does not yellow, resistant to abrasion and alkaline and chemical products. Provides a matt finish.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	150 – 200 gr. /m^2 in one coat.	10 kg	Transparent

PRODUCT	DESCRIPTION	CHARACTERISTICS	
GEOTEXTIL PU 	Nonwoven polyester fibre of 100/50 grams, developed with “H20 technology”, used to reinforce the “MORCEM COVER” systems.	Easy to apply. Highly resistant. Resistant to UVA rays. Increases the cohesion of the Morcem Elastic PM membrane. Maintains elasticity in the Morcem Elastic PM membrane. It is used as a reinforcement fabric combined with the waterproof liquidly applied Morcem Elastic PM membranes.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	According to use	Rolls of (1 x 100) m (0.5 x 100) m. (0.2 x 100) m.	White

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM ELASTIC PM UV VARNISH	One-component aliphatic pigmented varnish	UVA resistant, highly elastic, applied and dried cold, used to protect polyurethane membranes. Dried by its reaction with the ground and humidity. Effective protection, especially if given a dark finish. Applied over Morcem Elastic PM, on surfaces with light foot traffic that require a shiny finish, stable colour without yellowing.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	120-250 gr. /m^2 in one or two coats.	10 kg containers	White, grey, red and green. Other colours By request.

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM ELASTIC PM VARNISH TR	Polyurethane membrane one--component.	Pigmented, coloured, semi-hard, resistance to UVA rays, applied and dried cold, used to protect the other waterproof membranes exposed to the weather. Dried by its reaction to the ground and moisture in the air. Applied over Morcem Elastic PM, on surfaces with heavy traffic and surfaces with light vehicle traffic.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	400-600 gr /m^2 in two coats	20 kg containers	White, grey, red and green. Other colours By request.

PRODUCT	DESCRIPTION	CHARACTERISTICS	
ELASTIC MEMBRANE H	System for sealing expansion Joints (MORCEMRaEST EPOXY T+ ELASTIC MEMBRANE H)	Membrane for waterproofing and sealing joints, expansion joints, repairing joints between buildings. Applications on purification stations, swimming pools, water tanks, joints with a high degree of movement. High elasticity. Free movement in all directions. Bonded with MORCEMREST EPOXY T.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	According to use	20 m roll	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEMREST EPOXI T	Two-component thixtropic epoxy multiuse adhesive.	Multiuse adhesive. High chemical resistance. Excellent bonding properties to different construction materials. Sealing smalls dead cracks and surface cavities.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	According to use	Sets of 5 kg: Component A 0.75 kg + Component B 0.25 kg	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS
PUMALASTIC-MS	One-component high performance elastic paste, based on hybrid polymers.	Sealing perimeter joints, expansion joints, working joints...Contains fungicides: used for sanitary joints. Excellent resistance to UV rays: does not yellow. Does not lose rigidity with time. High elasticity. Excellent bonding with a large variety of materials (construction materials, wood, PVC, glass, aluminium...) Cures in wet conditions (even under water).

PERFORMANCE	PACKAGING	COLOUR
According to use	290 ml cartridges, ready to use, suitable for application with manual cartridge guns.	Blanco, Gris, Terracota, Negro, Beige The colours depicted are for guidance purposes only.

PRODUCT	DESCRIPTION	CHARACTERISTICS	
PUMAFIX TQV	Two-component vinylester injection resin, fast curing.	Chemical bonding of horizontal and vertical anchors. Suitable for wet and dry substrates. Interior and exterior. Suitable for solid and hollow substrates. Anchoring machinery, bars, bolts, rods, couplings... etc. Excellent mechanical resistance. Fast curing. Thixotropic, for both vertical and horizontal use.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	According to use	Two-component cartridges of 380 ml. (applied with special gun) and 280 ml. (applied with one-component product guns).	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
PUMAFIX TQV	Injection resin for anchors, two-component and fast curing, polyester resin based.	Chemical bonding of horizontal and vertical anchors. Suitable for solid and hollow substrates. Styrene-free; low odour. Easy extrusion and injection. Thixotropic, can be applied either horizontally or vertically. Fast curing. Applied with conventional guns. For use on concrete, bricks and concrete masonry blocks in a wide range of applications: bonding doors, railings, balustrades, Persian blinds, awnings, aerials, signs, cable tray channelling, industrial machinery	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	According to use	Two-component cartridges of 280 ml. (applied with one-component product guns).	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS
PUMALASTIC-PU	Polyurethane-based filler for sealing or bonding joints.	Sealing perimeter joints, expansion joints, working joints... Bonds without primer on regular substrates. Flexibility. For bonding porous construction materials.
PERFORMANCE	**PACKAGING**	**COLOUR**
According to use	Cartridges of 310 and 600 ml, ready to use, suitable for applying with manual gun.	Blanco, Gris, Terracota, Negro, Beige The colours depicted are for guidance purposes only.

PRODUCT	DESCRIPTION	CHARACTERISTICS	
MORCEM DRY F	Two-component flexible mortar for waterproofing.	Does not alter the potability of the water. Permanent flexibility. Suitable for waterproofing water deposits, tanks, swimming pools, fountains, basements, underground car parks, lift shafts, tunnels, etc. Exterior waterproofing on foundation walls. Repairs and protection on surfaces exposed to ice/thaw cycles, surfaces susceptible to movement, with positive and negative hydrostatic pressure...etc.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	± 1.5 kg/m²/mm (total powder+liquid)	23 kg bag (powder) + 9 kg container (liquid)	Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS	
PEGOLAND FLEX C2 TE S1	Cementituous adhesive made of mixed deformable bonding agents.	For fixing floors and facings, interior and exterior use. Especially suitable for fixing façades, large areas of flooring with intense traffic and floors with underfloor heating. For bonding all types of ceramic elements, highly recommended for large format tiles. Suitable for interior Pladur plasterboard.	
	PERFORMANCE	**PACKAGING**	**COLOUR**
	4 Kg/m²	25 kg bag	White / Grey

PRODUCT	DESCRIPTION	CHARACTERISTICS
MORCEMCOLOR PLUS FLEXIBLE CG2 A W	Grout, additive and coloured. Anti-mould and water-repellent for joints from 2 to 15 mm.	Suitable for both indoor and outdoor applications. For sealing joints from 2 to 15 mm. Very fine textured, especially suitable for joining elements with low porosity (porcelain stoneware) and areas where there is a risk of bacteria growing. Especially suitable for grouting in wet areas, swimming pools, bathrooms, kitchens, etc.

PERFORMANCE

kg/m² (calculated for a tile thickness of 6 mm)

Tile format (cm)	Joint width (mm)				
	2	5	8	10	15
15 x 15	0.27	0.68	1.09	1.36	2.04
15 x 20	0.24	0.60	0.95	1.19	1.79
20 x 20	0.14	0.51	0.82	1.02	1.63
25 x 33	0.13	0.36	0.57	0.72	1.08
30 x 40	0.12	0.30	0.48	0.60	0.89
40 x 60	0.09	0.21	0.34	0.43	0.64
45 x 80	0.07	0.18	0.28	0.35	0.53

$$\frac{A+B}{A \times B} \times C \times D \times 0.17 = kg/m^2$$

Where:
A= tile width (cm)
B= tile length (cm)
C= tile thickness (mm)
D= joint width (mm))

Bioactive Technology anti-mould and anti-algae .

Aquastop effect that prevents an accumulation of moisture and creates a "pearl" effect.

Improves hygiene where it is applied.

PACKAGING

20 kg and 5 kg bags

COLOUR

Range of colours

Blanco P1154
Amarillo P1150
Flora P1175
Hueso P1183
Albero P1174
Zafiro P1152
Beige P1172
Salmón P1162
Plomo P1186
Madera P1182
Naranja P1185
Gris Macael P1157
Chocolate P1164
Rubí P1161
Gris P1156
Terracota P1163
Rojo P1160
Negro Antracita P1181
Wengé P1184
Esmeralda P1166

The colours depicted are for guidance purposes only.

PRODUCT	DESCRIPTION	CHARACTERISTICS
MORCEMCOLOR EPOXI RG	One-component epoxy grout for joints from 2 to 15 mm.	Suitable for both indoor and outdoor applications. For sealing joints from 2 to 15 mm, on all types ceramic facings. Especially for grouting tiles, bricks, panels, etc. that need to support high-pressure chemical or mechanical loads (abattoirs, laboratories, industrial kitchens, etc.)

PERFORMANCE

kg/m² (calculated for a tile thickness of 6 mm)

Tile format (cm)	Joint width (mm)				
	2	5	8	10	15
15 x 15	0.24	0.60	0.96	1.20	1.80
15 x 20	0.21	0.53	0.84	1.05	1.58
20 x 20	0.18	0.45	0.72	0.90	1.35
25 x 33	0.13	0.32	0.51	0.63	0.95
30 x 40	0.11	0.26	0.42	0.53	0.79
40 x 60	0.08	0.19	0.30	0.38	0.56
45 x 80	0.06	0.16	0.25	0.31	0.47

$$\frac{A+B}{A \times B} \times C \times D \times 0.15 = kg/m^2$$

Where:
A= tile width (cm)
B= tile length (cm)
C= tile thickness (mm)
D= joint width (mm))

PACKAGING

4 kg container

COLOUR

Range of colours

Blanco 154
Gris 156

The colours depicted are for guidance purposes only.

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We work with:

Arquitectos Sin Fronteras

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Rev. 01/15