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PROTECTION AND REHABILITATION OF CONCRETE

ARREGHINI®
ITALIAN PAINTS SINCE 1950

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PROTECTION AND REHABILITATION OF CONCRETE

Concrete is an artificial mix consisting of cement, aggregates (mixtures of natural or artificial mineral substances, with different grain-size characteristics) and water, integrated with additives designed to modify the properties of the concrete (setting retardants or accelerating agents, anti-freeze agents).

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THE MATERIAL

CONCRETE

The cement contained in the concrete acts as a binder and consolidation and hardening take place through a hydration reaction, with consequent transformation of the cement paste into concrete. Depending on the main property of concrete, i.e. its compressive strength, it is classified in various resistance classes which define its "quality".

REINFORCED CONCRETE

Is a composite material formed by concrete and reinforcing steel which is incorporated into the cement in the form of smooth bars or structural steel. Although the materials are different, concrete and steel have a common characteristic which enables them to be used together: they have the same thermal expansion coefficient in varying temperature conditions. Combined together, concrete provides compressive strength while steel provides tensile strength.

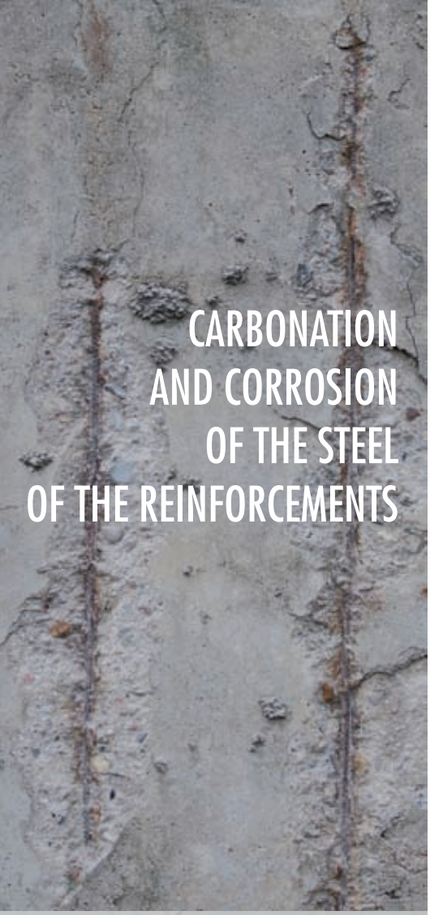
ATTACK OF CONCRETE

There have been great developments recently in architectural structures in the civil and industrial construction sectors that utilize fair-faced concrete.
It is, however, well-known that this building material is subject to acid attack due to air pollution.
This type of attack, which leads to the deterioration of the concrete, can be accelerated by a variety of causes such as:

- *failure to comply with casting regulations and methods, with the consequent formation of voids and cracks;*
- *poor covering of the steel with an insufficiently thick layer of concrete (regulations provide for a thickness of at least 15-20mm depending on the quality of the concrete, although, given the increase in pollution, this thickness tends to be increased in order to provide a margin of safety);*
- *increased aggressiveness of the atmosphere due to the acidity of the exhaust fumes from vehicles and industrial estates;*
- *absence of precautions designed to preserve the concrete (protective coating).*

CONSEQUENCES

- **PROGRESSIVE CARBONATION**
  with loss of the natural anti-corrosion protection of the reinforcing steel, following a decrease in the alkalinity of the concrete around the reinforcement bars at a pH of less than 7/8.
- **PENETRATION OF MOISTURE THROUGH PORES AND CRACKS**
- **PENETRATION OF OXYGEN**
- **PENETRATION OF THE GASES PRESENT IN THE ATMOSPHERE**
  (sulphur dioxide and carbon dioxide)
- **PENETRATION OF SALTS** *(marine environment, heavy industry, antifreeze salts on viaducts, road network tunnels)*
- **BIOLOGICAL ATTACK FROM MOULD AND ALGAE**
- **SPALLING DUE TO THE GELATION OF THE WATER**



CARBONATION AND CORROSION OF THE STEEL OF THE REINFORCEMENTS

CORROSIVE ACTION OF THE SALTS

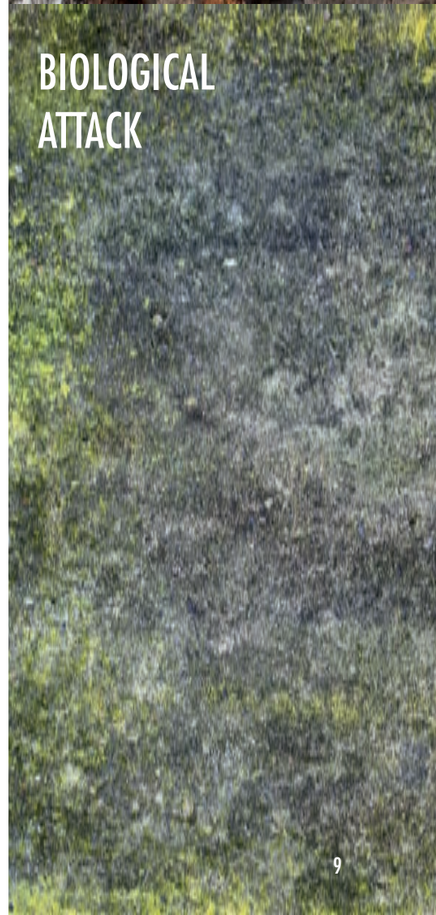
CAUSES OF DETERIORATION OF THE CONCRETE

Concrete hardens through a process called hydration. The liquid contained in the pores (a solution of calcium hydroxide) is a relatively strong base which provides the incorporated steel reinforcements with the alkaline environment they require to protect them from corrosion. This alkalinity is, however, in continuous degradation, first and foremost due to carbon dioxide which, in the presence of moisture during the carbonation process transforms calcium hydroxide into calcium carbonate. Carbonation is a natural process which, while not directly damaging the concrete, nonetheless removes from the steel the alkaline protection which prevents it from rusting.
The reaction to carbonation starts on the surface of the concrete and penetrates progressively deeper into its interior until it reaches the rebars, causing a gradual lowering of the pH. When the pH is less than 9, the moisture present in the structure combines with oxygen and causes the oxidation of the iron and the formation of rust. Since the formation of rust is accompanied by an increase in volume, a pressure is created which, as time passes, becomes so strong that it forces the concrete covering to break off.

Corrosion due to water-soluble salts is one of the most frequent types. The salts, conveyed by the water, penetrate inside the concrete through the pores and/or cracks and, reacting with the compounds present in the structure, create swellings due to the expansion of the reaction compounds, causing further cracking and surface spalling. The most frequently found salts are sulphurs, which manifest themselves due to the penetration of sulphur dioxide or because they are already present in the aggregates used, and chlorides, such as the salt used for thawing roads or the salt in marine environments. Sulphurs bring about reactions with certain components existing in the concrete, such as calcium aluminate hydrates and calcium silicate hydrates. The chlorides react with the calcium present in the cement matrix. In both cases, the salts formed are of the expansive type and this creates tension with visible swelling, cracking and spalling.
Chlorides, moreover, free chloride ions which, penetrating deep into the cement-based block, come into contact with the steel, causing localized electrochemical corrosion concentrated at certain points of the reinforcements.

FREEZING OF WATER

When temperatures are low, the water that has infiltrated through the pores and/or cracks freezes, thereby causing an increase in volume, leading to spalling and disintegration of the structure.



BIOLOGICAL ATTACK

This type of degradation is mainly due to the colonization of microorganisms such as fungi and algae, which develop in the presence of certain conditions of humidity, temperature and light. These microorganisms in general cause aesthetic degradation, but without destroying the actual concrete structure it self. In the rare cases in which sulphur bacteria are involved, the concrete will be subject to damage as these bacteria have the power to transform sulphur into sulphuric acid.

The degradation process depends on the compressive strength of the concrete, on construction defects, on its design and on how it is laid.
Concrete becomes durable when it presents a compact structure, when the reinforcements are properly covered and it has received a suitable protection treatment.

REPAIR SYSTEMS FOR HIGH DURABILITY AND PROTECTION FOR REINFORCED CONCRETE STRUCTURES

The knowledge of the various types of the deterioration of concrete structures, their causes and correct methods of repair and protection are contained and regulated by the standard EN 1504 "PRODUCTS AND SYSTEMS FOR THE PROTECTION AND REPAIR OF CONCRETE STRUCTURES" which, on part 9, articulates 11 principles that allow all operations to repair and protect the potential damage that may occur in concrete structures.

Klopfer also identified in the value of the diffusion resistance to carbon dioxide equal to $SdCO_2$ > = a 50 m the requirement that a product must meet to ensure protection of concrete placed to prevent and slow down the process of carbonation that, lowering the alkalinity of the system, decreases the passive protection with possible corrosion of reinforcement. This resistance is determined according to EN 1062-7.

THE REGULATION UNI EN 1504 IS DIVIDED INTO 10 PARTS:

EN 1504 1 Definitions
EN 1504 2 Regulates the surface protection systems
EN 1504 3 Regulates systems for structural and non-structural repairs
EN 1504 4 Structural bonding
EN 1504 5 Injections into the concrete
EN 1504 6 Injections of mortar for anchoring reinforcements or to fill exterior voids
EN 1504 7 Prevention of corrosion of reinforcements
EN 1504 8 Quality control and evaluation of conformity
EN 1504 9 General principles for use of products and systems
EN 1504 10 Site application of products and systems and quality control of the works.

GENERAL PRINCIPLES SET OUT IN PART 9

PRINCIPLE	PRINCIPLE DEFINITION	METHODS BASED ON PRINCIPLE
Principle 1 [PI]	*Protection against ingress* *Reduction or prevention of aggressive agents, eg water, other liquids, steam, gas, chemical and biological agents.*	*1.1 Impregnation* *Application of liquid products that penetrate into the concrete and close the pore system.* *1.2 Surface coating with the ability or inability to bridge the gaps.* *1.3 Bandage local cracks[1)]* *1.4 Filling cracks* *1.5 Transformation of cracks in joints[1)]* *1.6 Construction of exterior panels[1)2)]* *1.7 Application of membranes [1)]*
Principle 2 [MC]	*Moisture Control* *Adjusting and maintaining the moisture content of the concrete within a specified value range.*	*2.1 Hydrophobic impregnation* *2.2 Surface coating* *2.3 Protection or coating[1)2)]* *2.4 Electrochemical treatment[1)2)]* *Application of a potential difference between the parts of the concrete to facilitate or impede the passage of water through the concrete (not for the reinforced concrete without any assessment of the risk of induced corrosion).*
Principle 3 [CR]	*Concrete Restoration* *Restoring the original concrete of a structural member in the form and function originally specified.* *Restoration of concrete structure by replacement of a part.*	*3.1 Hand applied mortar* *3.2 New concrete casting* *3.3 Sprayed concrete or mortar* *3.4 Substitution of elements*
Principle 4 [SS]	*Structural Strengthening* *Increase or restore the load capacity of a structural element of the concrete structure.*	*4.1 Addition or replacement of steel reinforcement bars inside or outside.* *4.2 Installation of bars embedded in preformed holes or made to drill in concrete.* *4.3 Plate bonding.* *4.4 Adding mortar or concrete.* *4.5 Injecting cracks, voids or interstices.* *4.6 Filling cracks, voids or interstices.* *4.7 Pre-compression (post-tensioning).*
Principle 5 [PR]	*Physical Resistance* *Increased resistance to physical or mechanical attacks.*	*5.1 Outer layers or coatings.* *5.2 Impregnation.*
Principle 6 [RC]	*Resistance to Chemicals* *Increased resistance of the concrete surface against deterioration from chemical attack.*	*6.1 Outer layers* *6.2 Impregnation*
Principle 7 [RP]	*Preserving or restoring passivity* *Creation of the chemical conditions in which the surface of the reinforcement is maintained or returned to a condition of passivity.*	*7.1 Increasing the concrete cover with the addition of cement mortar or concrete.* *7.2 Replacing contaminated or carbonated concrete.* *7.3 Electrochemical re-alkalinization of carbonated concrete[1)]* *7.4 Re-alkalinization of carbonated concrete by diffusion.* *7.5 Electrochemical extraction of chlorides[1)]*
Principle 8 [IR]	*Increasing Concrete Resistivity* *Increasing the electrical resistivity of the concrete.*	*8.1 Limiting the moisture content by means of surface treatments, coatings or shelters.*
Principle 9 [CC]	*Cathode control* *Creating conditions in which potentially cathodic areas of the reinforcement are unable to anodic reaction.*	*9.1 Limitation of the oxygen content (at the cathode) by saturation or surface coating[2)].*
Principle 10 [CP]	*Cathodic disbonding*	*10.1 Application of an electric potential.*
Principle 11 [CA]	*Control of anodic areas* *Creation of the conditions in which the potentially anodic reinforcement areas are unable to take part in the corrosion reaction.*	*11.1 Painting with rebar coatings containing active pigments.* *11.2 Painting with barrier coatings.* *11.3 Application of inhibitors to the concrete.*

SOLUTIONS AND TREATMENTS

CONCRETE - PRESTRESSED CONCRETE

Wait about 90 days after casting for proper carbonation and aging. In the case of the presence of release oils, it is necessary to remove them with an accurate pressure washer. In the case of exposed rods, coat them properly with one or more layers of rust.
On a dry surface apply Murisol or Murisol W.

PROTECTIVE SYSTEMS

CAP Arreghini provides products and systems developed according to the concept of durability of concrete structures and consistent with the principles described in EN EN 1504-9.
This products are:
- mortars ***400, 402****;*
- primers ***Murisol*** *o* ***Murisol W****;*
- finishing ***Beton****;*
- hydrophobic product ***Silomur****.*

PREVENTIVE PROTECTIVE SYSTEM ON NEW CONCRETE

The system is equipped with a test report showing resistance to CO_2 which guarantees its suitability as an effective protection of reinforced concrete and prestressed concrete.
The system proposed by CAP Arreghini is durable and provides an excellent barrier (against carbon dioxide, sulfur dioxide, oxygen and water), which preserves the initial alkaline environment avoiding the carbonation process and the consequent corrosion of the steel reinforcement, while preventing the chemical corrosion due to the salts. It is therefore suitable for both interior and exterior.
Restricting the entry of water, it also prevents percolation and salt efflorescence, limits the entry of chlorides (etching), provides resistance to freeze / thaw cycles and abrasion (physical attack).

PIGMENTED SYSTEM PROTECTIVE / PREVENTIVE INTERIOR / EXTERIOR FOR NEW SURFACES

Surface preparation: cleaning with pressure washing to remove all impurities such as dirt, moss, mould, cast mold release:

1. SUBSTRATE OF NEW ORDINARY OR PRECAST CONCRETE

PRIMER	DRYING	UNDERCOAT	FINISHING	COLOURS	CONSUMPTION OF THE SYSTEM ml/l	APPLICATION	PERFORMANCE
MURISOL or MURISOL W	5-8h	Not necessary	**BETON** diluted to 10-15% 2 Layers	Selection Tucano	100+250		Anticarbonation Classes EN 1062-1 ***Gloss:*** <10 - matt ***Fineness:*** <100 micron-fine ***CO_2 Permeability:*** sd>50m ***Water permeability:*** W<0.1 5kg/mq*0,5h - low ***EN 1504 1*** (PI)-1.3, 2(MC)-2.3, 8(IR)-8.3

2. CONCRETE SUPPORT RESTORED TO UNIFORM

PRIMER	DRYING	UNDERCOAT	FINISHING	COLOURS	CONSUMPTION OF THE SYSTEM ml/l	APPLICATION	PERFORMANCE
Not necessary	5-8h	UNIFIX	**BETON** diluted to 10-15% 2 Layers	Selection Tucano	100+250		Anticarbonation Classes EN 1062-1 ***Gloss:*** <10 - matt ***Fineness:*** <100 micron-fine ***CO_2 Permeability:*** sd>50m ***Water permeability:*** W<0.1 5kg/mq*0,5h - low ***EN 1504 1*** (PI)-1.3, 2(MC)-2.3, 8(IR)-8.3

In case of biological pollution from mould

- *Disinfest the surface with B1.*
- *After 4-5 hours, proceed with the protective system by applying Beton admixed with 350 ml of B25 every 14 liters of paint.*

The application of the products mentioned can be done with different methods indicated on the corresponding data sheets (available on www.caparreghini.it).
The system fulfills the requirements of the standard EN 1504 :1(PI)-1.3, 2(MC)-2.3, 8(IR)-8.3
The excellent adhesion, durability and resistance to alkalis are able to eliminate the causes of the degradation.

CAP ARREGHINI PRODUCTS INFORMATION DATA

PRIMER

MURISOL W
Waterborne masonry undercoat
Wall primer formulated with synthetic resins dispersed in water with special technology that ensures secure adhesion on different types of surfaces, it has insulating and consolidating capacities. It ensures uniformity of absorption and therefore uniform finishes and excellent adhesion for later coatings. According to the type of resin and the particular lamellar pigments contained within them, it ensures high breathability, improves colour resistance and a saves up on subsequent layers in the coating system.

MURISOL
Solventborne masonry undercoat
Consolidating pigmented solvent-based primer with special technology that ensures secure adhesion on different types of surfaces, it has insulating and consolidating capacities. It ensures uniformity of absorption, hence uniform finishes and excellent adhesion for later coatings. According to the type of resin and the particular lamellar pigments contained within them, it ensures high breathability, improves colour resistance and a saves up on subsequent layers in the coating system.

UNDERCOAT

UNIFIX FINE
Waterborne uniforming undercoat
Rough formulated wall base coat with resins in dispersion and aggregates of various sizes for indoor and outdoor use. It is suitable both to give uniformity to different surfaces, or as a base that is used to connect surfaces with old synthetic paint and silicate-based mineral paints.

UNIFIX GROSSO
Waterborne uniforming undercoat
Rough formulated wall base coat with resins in dispersion and aggregates of various sizes for indoor and outdoor use. It is suitable both to give uniformity to different surfaces, or as a base that is used to connect surfaces with old synthetic paint and silicate-based mineral paints.

FINISHING

BETON
Anticarbonation paint
Water-soluble paint for outdoor use, with high adhesion properties on different types of surfaces. It is resistant to water and CO_2, it is indicated as a specific anticarbonation paint. Thanks to the ease of application, it is ideal for professional use. Its high quality, with a high level of refinement, ensures maximum protection. Once dry, it maintains the aesthetic effect of the visible concrete with an anti dust effect, so as to allow easy cleaning.

PIGMENTED SYSTEM PROTECTIVE/CURATIVE INTERIOR/EXTERIOR FOR SURFACE WITH CRACKS

PREVENTIVE ACTION AND CRACKING <250 micron

PREPARATION	DRYING	UNDERCOAT	DRYING	1ST LAYER	DRYING	2ST LAYER	COLOURS	CONSUMPTION OF THE SYSTEM ml/l	APPLICATION	PERFORMANCE
Not necessary	3-4h	MURISOL W PRIMER ACRILFIX SPECIAL	-	**ELASTO ACTIVE** 6-7 m^2/l	12-16h	**BETON** 7-8 m^2/l	Tucano Spazio 100 Area 115	80+150+140 S1+1+1		Anticarbonation Classes EN 1062-1 ***Gloss:*** <10 - matt ***Fineness:*** <100 <300 micron-medium ***CO_2 Permeability:*** sd>50 m ***Water permeability:*** W<0.1 5kg/mq*0,5h -low (PI)1-1.3/1.4/1,5, 2(MC)-2.3, 8(IR)-8.3

CRACKS 250-500 micron

PREPARATION	DRYING	UNDERCOAT	DRYING	1ST LAYER	DRYING	2ST LAYER	COLOURS	CONSUMPTION OF THE SYSTEM ml/l	APPLICATION	PERFORMANCE
Seal with ELASTO STUCCO	3-4h	MURISOL W PRIMER ACRILFIX SPECIAL	5-6h	**ELASTO ACTIVE** 6-7 m^2/l	12-16h	**BETON** 7-8 m^2/l	Tucano Spazio 100 Area 115	80+150+140 S1+1+1		Anticarbonation Classes EN 1062-1 ***Gloss:*** <10 - matt ***Fineness:*** <100<300 micron-medium ***CO_2 Permeability:*** sd>50 m ***Water permeability:*** W<0.1 5kg/mq*0,5h - low (PI)1-1.3/1.4/1,5, 2(MC)-2.3, 8(IR)-8.3

CRACKS 500-1250 micron

PREPARATION	DRYING	UNDERCOAT	DRYING	1ST LAYER	DRYING	2ST LAYER	COLOURS	CONSUMPTION OF THE SYSTEM ml/l	APPLICATION	PERFORMANCE
Seal with ELASTO STUCCO + network mesh embedded in ELASTO STUCCO	3-4h	MURISOL W PRIMER	5-6h	**ELASTO ACTIVE** 6-7 m^2/l	12-16h	**BETON** 7-8 m^2/l	Tucano Spazio 100 Area 115	80+150+140 S1+1+1		Anticarbonation Classes EN 1062-1 ***Gloss:*** <10 - matt ***Fineness:*** <100<300 micron-medium ***CO_2 Permeability:*** sd>50m ***Water permeability:*** W<0.1 5kg/mq*0,5h-low (PI)1-1.3/1.4/1,5, 2(MC)-2.3, 8(IR)-8.3

CRACKS 1250-2500 micron

PREPARATION	DRYING	UNDERCOAT	DRYING	1ST LAYER	DRYING	2ST LAYER	COLOURS	CONSUMPTION OF THE SYSTEM ml/l	APPLICATION	PERFORMANCE
Seal with ELASTO STUCCO + network mesh embedded in ELASTO STUCCO	3-4h	MURISOL W PRIMER	5-6h	**ELASTO ACTIVE** 6-7 m^2/l	12-16h	**BETON** 7-9 m^2/l	Tucano Spazio 100 Area 115	80+150+140 S1+1+1		Anticarbonation Classes EN 1062-1 ***Gloss:*** <10 - matt ***Fineness:*** <100 <300 micron-medium ***CO_2 Permeability:*** sd>50 m ***Water permeability:*** W < 0.1 5kg/mq *0,5h -low (PI)1-1.3/1.4/1,5, 2(MC)-2.3, 8(IR)-8.3

SPREAD CRACKS <2,5 mm

PREPARATION	DRYING	UNDERCOAT	DRYING	1° STRATO	DRYING	2ST LAYER	COLOURS	CONSUMPTION OF THE SYSTEM ml/l	APPLICATION	PERFORMANCE
RASACAP 50 + mesh 160 + RASACAP 50 smooth finish	15 days	Not necessary	-	**BETON** 7-8 m^2/l	12-16h	**BETON** 7-8 m^2/l	Tucano Spazio 100 Area 115	150 + 150 S1 + 1		***EN 1504:*** 1(PI)-1.3,1..4/1.5 - 2(MC)-2.3 - 3(RC)-3.1 classe R1/R2/R3, 5(PR)-5.3 - 6(RC)-6.3 - 7(RP)-7.1, - 8(IR)-8.3 ***EN 1504:*** 1(PI)-1.3/1.4/1.5 - 2(MC)-2.3, 3(RC)-3.1 classe R1/R2/R3, 5(PR)-5.3, 6(RC)-6.3, 7(RP)-7.1, 8(IR)-8.3

SPREAD CRACKS >2,5 mm

PREPARATION	DRYING	UNDERCOAT	DRYING	1° STRATO	DRYING	2ST LAYER	COLOURS	CONSUMPTION OF THE SYSTEM ml/l	APPLICATION	PERFORMANCE
Seal with ELASTO STUCCO RASACAP 50 + mesh 160 + RASACAP 50 smooth finish	15 days	Not necessary	-	**BETON** 7-8 m^2/l	12-16h	**BETON** 7-8 m^2/l	Tucano Spazio 100 Area 115	150 + 150 S1 + 1		***EN 1504:*** 1(PI)-1.3,1..4/1.5 - 2(MC)-2.3 - 3(RC)-3.1 classe R1/R2/R3, 5(PR)-5.3 - 6(RC)-6.3 - 7(RP)-7.1, -8(IR)-8.3 ***EN 1504:*** 1(PI)-1.3/1.4/1.5 - 2(MC)-2.3, 3(RC)-3.1 classe R1/R2/R3, 5(PR)-5.3, 6(RC)-6.3, 7(RP)-7.1, 8(IR)-8.3

The application of the products mentioned can be done with different methods indicated on the corresponding data sheets (available on www.caparreghini.it).

The system fulfills the requirements of the standard EN 1504: 1(PI)-1.3/1.4/1.5, 2(MC)-2.3,6(RC)-6.3, 7(RP)-7.1, 8(IR)-8.3

The excellent adhesion, durability and resistance to alkalis are able to eliminate the causes of the degradation.

CAP ARREGHINI PRODUCTS INFORMATION DATA

SUBSTRATE PREPARATION

ELASTO STUCCO
Elastomeric fibered putty
Filler suitable for filling holes and cracks on indoor and outdoor walls. It is a paste composed of acrylic copolymers and elastic synthetic fibres that form a coating that is resistant to micro cracking. It dries quickly and is homogeneous and does not require any pre-treatment. It maintains high elasticity over time even at temperatures below 0 ° C.

ELASTO GUAINA
Roof coating
Synthetic product in aqueous dispersion, it forms a rubbery coating that is impermeable and continuous, similar to a sheath. As it is a liquid product to be spread on the surface, it gives the possibility to obtain continuous mantles for waterproofing, without having the problem of necessary joints using prefabricated sheets.

RASACAP 50
Adhesive/plaster for exterior insulation system
This product is suitable for painting systems of indoor wood products, it is easy to apply, ideal for professional use as it is equipped with a high filling capacity, adhesion on water soluble sandblasted surfaces and on different wood species. It has fast drying times which reduces the time needed to paint. It ensures a finish with excellent uniformity and mechanical strength.

UNDERCOAT

MURISOL W
Waterborne masonry undercoat
Wall primer formulated with synthetic resins dispersed in water with special technology that ensures secure adhesion on different types of surfaces, it has insulating and consolidating capacities. It ensures uniformity of absorption and therefore uniform finishes and excellent adhesion for later coatings. According to the type of resin and the particular lamellar pigments contained within them, it ensures high breathability, improves colour resistance and a saves up on subsequent layers in the coating system.

PRIMER
Waterborne masonry undercoat
Primer for external insulation layer, formulated with an aqueous dispersion of synthetic resins, which exploit a particular technology capable of guaranteeing secure adhesion on different types of surfaces. It has insulating and consolidating capacities. It ensures homogeneity of absorptions and hence a uniform finish thereby providing a suitable condition for the successive layers of paint.

ACRILIFIX SPECIAL
Waterborne masonry primer for exteriors
This is a primer for walls, formulated with colloidal resins in water dispersion using a special technology that ensures a secure adhesion on different types of surfaces, as well as insulating and consolidating capacities. It ensures uniformity of absorption and therefore, a uniform finish and excellent adhesion for later coatings. It is mainly formulated for outdoor processing that uses acrylic systems.

FINISHING

ELASTO ACTIVE
Elastomeric anti-mould anti-algae fibered paint
Acrylic copolymer formulated paint with elastic fibres of polyethylene in aqueous dispersion, free from plasticizers, which form a suitable coating that resists micro cracking. It is waterproof and adequately breathable, it is easy to apply, ideal for professional use as it is extremely compatible and has excellent adhesion, filling power and coverage of different types of surfaces.

BETON
Anticarbonation paint
Water-soluble paint for outdoor use, with high adhesion properties on different types of surfaces. It is resistant to water and CO_2, it is indicated as a specific anticarbonation paint. Thanks to the ease of application, it is ideal for professional use. Its high quality, with a high level of refinement, ensures maximum protection. Once dry, it maintains the aesthetic effect of the visible concrete with an anti dust effect, so as to allow easy cleaning.

SYSTEMS FOR THE REHABILITATION AND RESTORATION OF DETERIORATED CONCRETE STRUCTURES

In order to rehabilitate concrete structures following chemical, physical, mechanical or biological degradation, it is essential to restore the substrate using materials that are resistant to the action of the agents causing the deterioration, and then coat the structure using protective systems. This section deals with intervention systems designed to repair the cortical damage to the reinforced concrete that do not involve the need to integrate the steel reinforcements, simplifying all cases in which spalling occurs, uncovering the rebars, but without affecting the resistant structural part, including the inside of the reinforcement grid.

In order to intervene in a workmanlike manner, it is important:

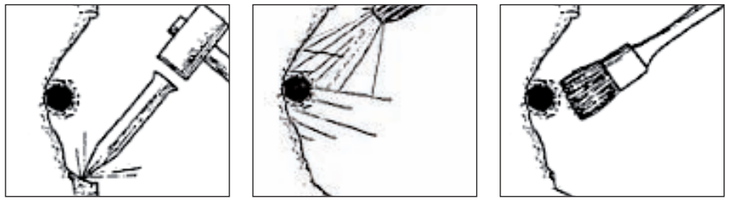
- ***to judge the state of degradation,***
- ***the depth of carbonation,***
- ***the existence of particular environmental situations of use of the structure*** *that imply the presence of a greater or lesser quantity of salts, such as a fairly unaggressive rural environment, a moderately aggressive rural industrial environment or a marine environment where specific types of attack exist.*

CAP Arreghini proposes the following systems, which are particularly effective:

- *System with concrete cover >15 mm*
- *System with concrete cover <15 mm with increased concrete cover to >15mm*
- *System with concrete cover <15 mm*

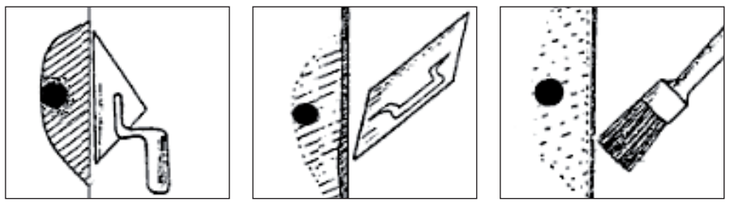
SUBSTRATE PREPARATION

A preparation phase which may simply involve the removal of the surface coating which is already coming away, either by paint-stripping or the use of mechanical and/or manual means, and manual or mechanical brushing of the slightly oxidized embedded steel reinforcements. If the carbonation phenomenon has penetrated deeper into the concrete, right down to the steel reinforcements, a more radical type of preparation is required, including demolition of a substantial number of layers of the concrete, in order to uncover the reinforcing elements, followed by water sand-blasting.



Anti-corrosion intervention on the steel reinforcements is then carried out using a cement formulation in order to restore the original alkalinity which guarantees the passivation of the steel elements and, at the same time, optimal adhesion of the repair mortar. It is advisable to avoid applying rust-inhibitors which could compromise the adhesion of the repair mortar, and to possibly consider epoxy treatments if the reinforcement covering is not likely to be thicker than 2 cm. In the case of epoxy treatments, it is important to check the compatibility of the resin with the presence of moisture in the structure.

Proceed to make the repairs using cement mortars supplemented with resins that are compatible with the material used for the passivation of the reinforcement elements. the reconstruction of the missing concrete should be carried out, taking care to avoid cracks and the mortar used must be able to guarantee good adhesion, mechanical characteristics similar to concrete, cohesion and elasticity characteristics such as to avoid the formation of microcrazing during shrinkage and, last but not least, it must have a modulus of elasticity similar to or compatible with that of concrete.



A smooth plaster finish should be applied with an anti-carbonation skim coat for the purpose of levelling off and regularizing any flaws in the structure.
The final protection is carried out using paint products tested for their high resistance to the passage of carbon dioxide, their high impermeability to water and their resistance to alkalis and UV rays.

PROTECTIVE SYSTEMS

SYSTEM WITH CONCRETE COVER >15 mm

SUBSTRATE PREPARATION	WAIT	RECOVERY	WAIT	PROTECTIVE TREATMENT
Prepare the surface by removing the incoherent material and flaking in the manner previously described. On moist surface, apply with a brush on the iron reinforcement and on the surface of the concrete concerned cement mortar Rasacap 50 or 400, prepared by adding 2 liters of water every 5 kg of Rasacap.	24h	Restore the thicknesses missing with Rasacap 50 or 400 prepared by adding 5 liters of water on any 25 kg of powder product. In the case of high carryover apply multiple layers with a maximum thickness of 3 cm, taking care to overcoat within 24 hours of the previous layer moist. The layers of carryover must be compacted very well in order to limit the porosity of the total thickness. Then apply a thin layer of Rasacap worked with a sponge float for smooth finish.	15 days	Choose the system 1 or 2 for anticarbonation finishing at page 16.

The system fulfills the requirements: 1(PI)-1.3, 2(MC)-2.3, 3(RC)-3.1 classes R1/R2/R3, 5(PR)-5.3, 6(RC)-6.3, 7(RP)-7.1, 8(IR)-8.3.

SYSTEM WITH CONCRETE COVER <15 mm WITH INCREASED CONCRETE COVER TO >15 mm

SUBSTRATE PREPARATION	WAIT	RECOVERY	WAIT	PROTECTIVE TREATMENT
Prepare the surface by removing the incoherent material and flaking in the manner previously described. On moist surface, apply with a brush on the iron reinforcement and on the surface of the concrete concerned cement mortar Rasacap 50 or 400, prepared by adding 2 liters of water every 5 kg of Rasacap.	24h	Restore the thicknesses missing with Rasacap 50 or 400 prepared by adding 5 liters of water on any 25 kg of powder product. In the case of high carryover apply multiple layers with a maximum thickness of 3 cm, taking care to overcoat within 24 hours of the previous layer moist until reaching a thickness of 15 mm concrete cover. The layers of carryover must be compacted very well in order to limit the porosity of the total thickness. Then apply a thin layer of Rasacap worked with a sponge float for smooth finish.	15 days	Choose the system 1 or 2 for anticarbonation finishing at page 16.

The system fulfills the requirements: 1(PI)-1.3, 2(MC)-2.3, 3(RC)-3.1 classes R1/R2/R3, 5(PR)-5.3, 6(RC)-6.3, 7(RP)-7.1, 8(IR)-8.3.

SYSTEM WITH CONCRETE COVER <15 mm

SUBSTRATE PREPARATION	WAIT	RECOVERY	WAIT	PROTECTIVE TREATMENT
Prepare the surface by removing loose surface coatings through stripping or by the use of mechanical and / or manual tools, manual or mechanical brushing of the reinforcement rods slightly oxidized. In the case of a deep carbonation over the reinforcing bars, a most radical preparation is needed, with demolition of layers of concrete with stripping of reinforcement and subsequent sandblasting. Perform a passivation of the reinforcement with epoxy coating containing anti-corrosive pigments, in two layers. On the second layer still wet sprinkle some sand.	24h	Restore the thicknesses missing with Rasacap 50 or 400 prepared by adding 5 liters of water on any 25 kg of powder product. In the case of high carryover apply multiple layers with a maximum thickness of 3 cm, taking care to overcoat within 24 hours of the previous layer moist. The layers of carryover must be compacted very well in order to limit the porosity of the total thickness. Then apply a thin layer of Rasacap worked with a sponge float for smooth finish.	15 days	Choose the system 1 or 2 for anticarbonation finishing at page 16.

The system fulfills the requirements: 1(PI)-1.3, 2(MC)-2.3, 3(RC)-3.1 classes R1/R2/R3, 5(PR)-5.3, 6(RC)-6.3, 8(IR)-8.3. 11(CA)-11.1.

CAP ARREGHINI PRODUCTS INFORMATION DATA

SURFACE PREPARATION AND RESTORATION

RASACAP 50
Adhesive/plaster for exterior insulation system

This product is suitable for painting systems of indoor wood products, it is easy to apply, ideal for professional use as it is equipped with a high filling capacity, adhesion on water soluble sandblasted surfaces and on different wood species. It has fast drying times which reduces the time needed to paint. It ensures a finish with excellent uniformity and mechanical strength.

RASACAP 400
Repair mortar

Non-structural universal mortar, to be used indoors and outdoors on concrete surfaces, but also on masonry, plaster and compo mortar. It is suitable for reconstitution of deteriorated surfaces such as risers, balconies and frames. It is a technical mortar with a compensated shrinkage and is suitable for applications up to 5 cm of thickness. It is suitable for levelling out thin layers, manageable with a trowel.

RASACAP 402
Skim coat

Premixed skim plaster with high performance and ready to use, it is white in colour, and Portland cement based, with selected aggregates and special additives. It is suitable for levelling out, reinforced cement with a "civil" finishing, both for indoor and outdoor use. It is equally suitable for plastic, reinforced concrete, concrete castings and different old and new plaster coatings. After drying it may be coated with various types of finishes.

DAMAGE CAUSED BY WATER

STAINS AND INFILTRATION

Due to the different capillary absorption capacities of the building materials and which give facades an irregular appearance after rain and which, in the more serious cases, may also be seen on interior walls.

SALT EFFLORESCENCE AND LIME BLOOM

If there are water soluble salts present in the building material, which are dissolved by the water and brought towards the surface during the drying process. The crystallization of these salts is visible in the form of a white or coloured patina and, since it occurs due to an increase of volume, the most serious cases can actually destroy the structure of the material.

GROWTH OF MOSS AND FORMATION OF DIRTY AREAS

Microorganisms, such as moss or mould, will only grow on the facades if the substrates involved are damp. In addition to ruining the appearance of the structure, in the most serious cases, they gradually destroy the surface of the building materials;

DAMAGE CAUSED BY FREEZING

Water, increasing its volume by approx. 10% creates an extremely strong pressure on the structure of the pores which can destroy the structure of the building material. Often the upper layer of the material breaks off and, also in this case, a treatment cycle with Silomur eliminates the formation of "spider's web" cracks on the concrete.

LOSS OF INSULATION

The question of thermal insulation is an extremely important factor when selecting a building material. A cement-based material impregnated with water, in fact, loses approx. 40-50% of its sealing power. It therefore needs to be protected from moisture by Silomur, in order to maintain its initial insulation values.

CHEMICAL CORROSION

Acidic gases present in the atmosphere become damaging for the building material as, in the presence of moisture, they transform into acids which corrode the material itself. Thanks to its high water repellence, Silomur prevents the building material from absorbing water.

WATERPROOF SYSTEM FOR EXPOSED CONCRETE

In the construction industry, there are many architectural models that use "fair faced" materials and this type of building is found to be frequently subject to attack by acids found in air pollution and biological attack attributable to bacteria, fungi and algae. The main vehicle of penetration, dissolution and corrosion of the aforementioned structures is water.
So a barrier has to be created to prevent moisture from penetrating the building material; this is achieved by applying a treatment with non film-forming products that do not change the appearance and colour of the layer underneath. This barrier is therefore formed by impregnating the wall surfaces with Silomur.
This is a water-repellent containing a solution of siloxanes, stable to the alkalinity of the substrate, which make the surfaces treated water repellent. Since it is not film-forming, it protects the walls from moisture while allowing them to breathe and without altering the original appearance of the surface treated. It is important to point out, however, that non film-forming products do not provide resistance to carbonation.

SUBSTRATE	PRODUCT	QUANTITY
Different materials including concrete	**SILOMUR**	300 ml/m^2

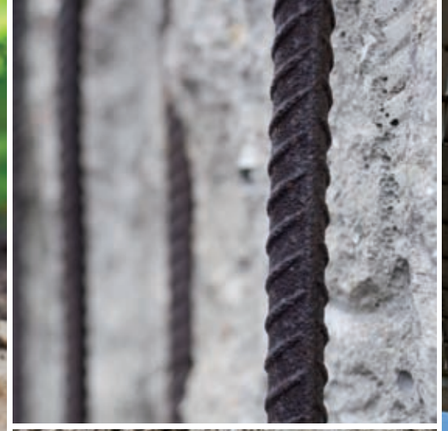
The impregnation with 300 ml/m^2 of Silomur satisfy the principles: 1 (PI) - 1.1, 2 (MC) - 2.1, 8 (IR) - 8.1 and eliminates a lot of damage to buildings.

CAP ARREGHINI PRODUCTS INFORMATION DATA

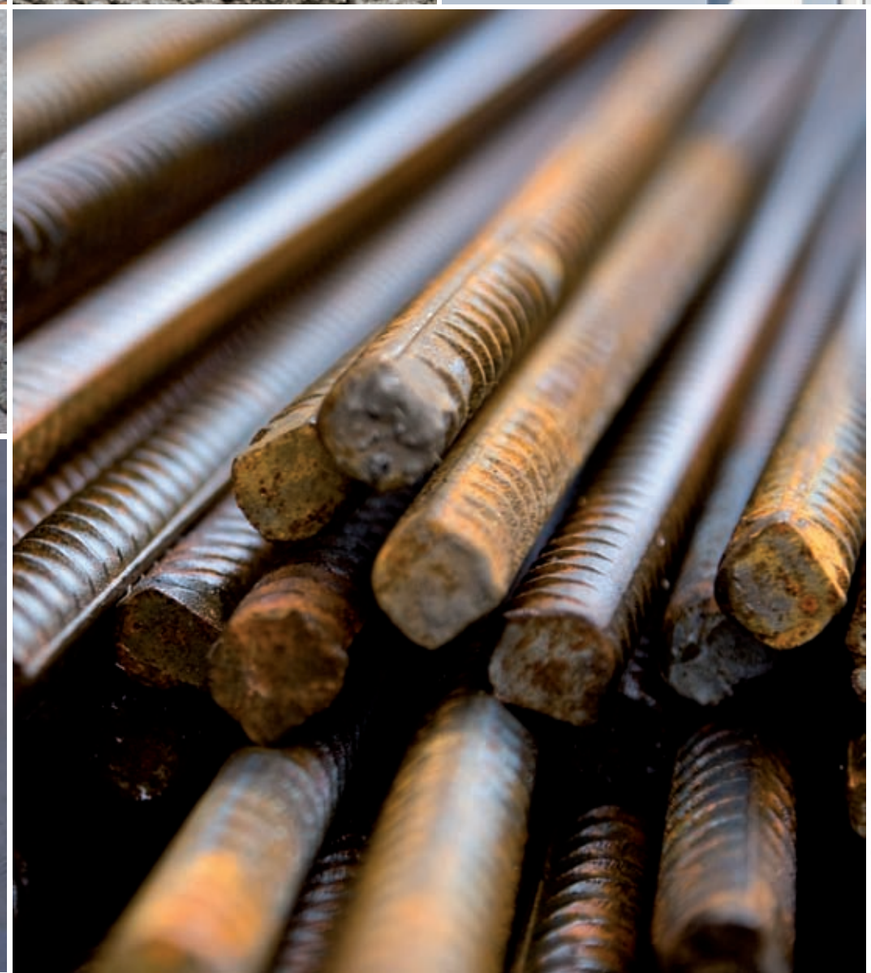
PROTECTION OF THE SUBSTRATE

SILOMUR
Water repellent siloxane
Hydrophobic solution in mineral siloxane spirits chemically stable alkalinity that makes the painted surfaces waterproof. Silomur is not film-forming and protects the walls from moisture, leaving them transpiring without changing the appearance and colour below. Thanks to its waterproof effect which contributes to maintaining the treated surface clean for a long time.







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MOULD AND ALGAE

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THERMAL INSULATION WITH THERMOCAP THICK COATING SYSTEM

TREATMENT OF DAMP WALLS

TREATMENT OF METALS

TREATMENT OF WOOD

CAP ARREGHINI SpA - ITALIAN PAINTS SINCE 1950
V.le Pordenone, 80 - 30026 PORTOGRUARO (VE) - Tel. +39 0421 278111 - Fax +39 0421 75498
info@caparreghini.it - www.caparreghini.it - *Azienda con Sistema Certificato UNI EN ISO 9001*

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