



MasterProtect 8500 CI

Dual-phase Corrosion
Inhibitor for Reinforced
Concrete Structures





MasterProtect 8500 CI: Class-leading concrete protection







Reinforced concrete may be exposed to harsh environmental conditions that threaten its structural integrity. The MasterProtect and MasterEmaco product families provide a raft of solutions ranging from major repair and strengthening to prevention and preservation. MasterProtect 8500 CI is the class-leading, proven solution for corrosion inhibition.

Concrete is exposed to various types of attack

Corrosion, chloride attack and carbonation are demanding challenges for concrete structures and buildings. Protection is needed to reliably preserve the appearance of concrete and guarantee the longevity of concrete structures.

Concrete damage	mechanical	chemical	physical
Reinforcement corrosion	carbonation	chloride attacks	stray currents

Product benefits at a glance:

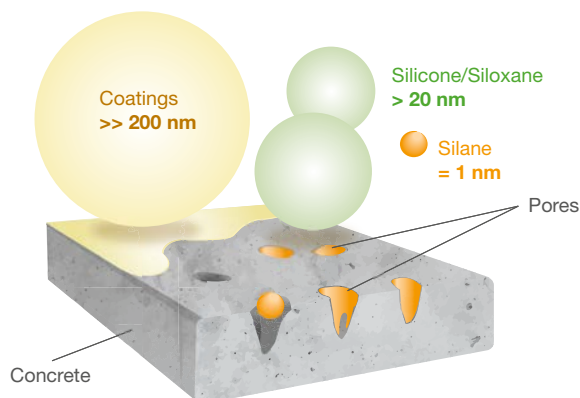
 <p>Excellent application properties Applied by spraying, roller or brush</p>	 <p>Durability Long-lasting even in harsh environments. Effective even in cracked concrete.</p>	 <p>Corrosion protection Effective inhibition of both carbonation and chloride-induced corrosion</p>
 <p>Certification, documentation and test reports Tested in accordance with international standards</p>	 <p>Time-efficient installation One-off installation cost</p>	 <p>Significantly reduces water ingress Protection against weathering effects.</p>

The MasterEmaco and MasterProtect product families include a wide range of concrete repair mortars and concrete surface protection systems for specific project requirements.



MasterProtect 8500 CI Dual-phase corrosion inhibitor

MasterProtect® 8500 CI is a clear liquid that, when applied to new or older concrete, combines the power of a 100% reactive penetrating corrosion inhibitor and a latent-phase corrosion inhibitor to mitigate electrochemical corrosion of reinforcing steel in new or older concrete.



<p>Features</p>	<ul style="list-style-type: none"> Does not form a layer on the surface and penetrates deep into the concrete Prevents anodic and cathodic corrosion reactions Latent-phase corrosion inhibitor is activated if concrete cracks, or if moisture penetrates into the concrete Significantly reduces water ingress Dual-phase protection against corrosion
<p>Advantages</p>	<ul style="list-style-type: none"> Provides superior protection even in case of post-application cracks Possible to apply protective coating for, e.g. for aesthetic reasons Surface appearance remains unchanged Delays the onset of corrosion and reduces active corrosion significantly
<p>Benefits</p>	<ul style="list-style-type: none"> Extends the service life of the structure Reduces maintenance costs and cost of operational downtime One-off installation cost only

Fully certified and proven technology



MasterProtect 8500 CI has been independently tested and certified by several research councils across the globe.



MasterProtect 8500 CI is certified in accordance with European standards.



Quick Evaluation Guide useful for initial assessment of potential corrosion.



MasterProtect 8500 CI – a more detailed explanation

How to detect corrosion at an early stage

Before corrosion results in visible damage to a concrete structure, there is an invisible corrosion process which can continue for periods between a few months and several years and even xUSE severe structural failure. Structures in extreme environments or at risk should be examined even if there are no visible signs in order to avoid the need for costly repairs.

Rapid measurements by in-situ tests

The corrosion rate in a real concrete structure can be rapidly measured by in-situ tests using non-destructive handheld devices which induce galvanostatic pulses in the concrete and estimate the corrosion rate using numerical algorithms (expressed in $\mu\text{A}/\text{cm}^2$).

The degree of corrosion determines what action needs to be taken

Corrosion rate ($\mu\text{A}/\text{cm}^2$)	Corrosion level of the structure	Estimated time until visible damage
< 0.1	Negligible (passivated)	–
from 0.1 to 0.5	Low	> 10 years
from 0.5 to 1.0	Moderate	3–5 years
>1.0	High	< 2 years

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Typical causes of damage and appropriate solutions

There are two main corrosion processes: carbonation and chloride-induced corrosion. Carbonation is a process by which the natural pH of the concrete is reduced, eventually destroying the passive layer that protects the steel and allowing the steel to corrode. In chloride-induced corrosion, chloride penetrates the concrete. Once it reaches the steel, the passive layer is disturbed and corrosion pitting occurs.

Dual functionality of MasterProtect 8500 CI

MasterProtect 8500 CI is a dual-function, silane-based, surface-applied corrosion inhibitor, suitable for use as part of a corrosion prevention, protection, or inhibition strategy. It is a revolutionary blend of high-quality silanes with an additional corrosion inhibitor, which lies dormant within the concrete until activated by moisture which penetrates the surface due to cracking or aging of the concrete. MasterProtect 8500 CI has dual functionality. The silane base

provides similar benefits to water-repellent sealing compounds and the integral corrosion inhibitors are carried into the concrete along with the silane. The inhibitors remain in the concrete until the water repellency diminishes over time, or until the concrete cracks. They then become mobile, and are carried deeper into the concrete by moisture. MasterProtect 8500 CI has a surface tension roughly 1/3 that of water, and low viscosity to improve penetration into concrete. Its special blend of silanes provides a balance between drying time and penetration over a wide temperature range, as well as lower VOC content and a higher flash point than many other corrosion inhibitors.

Unique combination

This unique combination makes this product ideal for service life extension after the repair of spalled concrete and as a protective mechanism where surveys show that the structure is subject to a potential corrosion risk as a result of environmental conditions.



The degree of corrosion determines what action needs to be taken

Factors that increase corrosion potential:

- Sea water (salt)
- Carbonation (loss of passivation layer)
- De-icing agents (salts)
- Insufficient concrete cover
- Cracks and delamination
- Mechanical damage

Steel reinforcement subject to potential corrosion reaction

Penetration of concrete and prevention of corrosion with molecular technology

MasterProtect 8500 CI



Concrete cover (typical)

The effective solutions:

- **MasterProtect 8500 CI** – the liquid surface-applied corrosion inhibitor for large areas

Often in combination with

- **MasterEmaco** series repair mortars for structural and non-structural damage repair
- **MasterProtect coatings** for further anti-carbonation protection, aesthetics



Proven performance

The effectiveness of MasterProtect 8500 has been proved by several independent test programs.

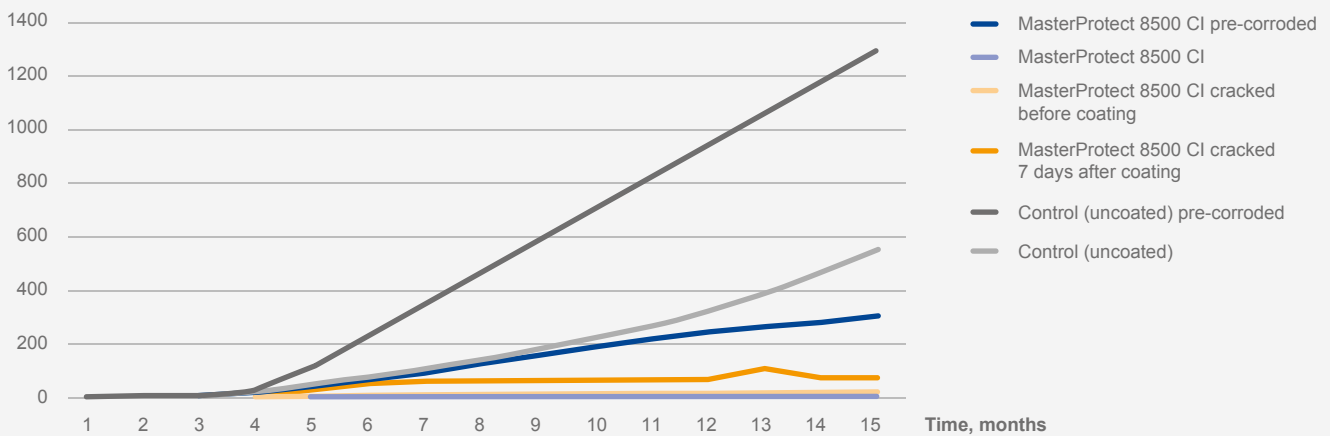
ASTM G 109

ASTM G 109 is a test method for “determining the effects of chemical admixtures on the corrosion of metals in concrete”. Modified ASTM G109 testing was carried out. The concrete specimens were made without admixtures, were abrasive, blasted to ICRI CSP 5-6 after curing and then treated with MasterProtect 8500 CI. Ponding with 3% sodium chloride

(NaCl) solution was initiated one week after treatment. When compared with untreated concrete, in accordance with ASTM G109, concrete beams treated with MasterProtect 8500 CI exhibited a dramatic reduction in corrosion rate, even when the beams had been brought to an active corrosion state prior to treatment. Further, cracked concrete beams also showed significant reductions in corrosion rate after one year of testing, whether cracking was induced prior to application, or 7 days after application of MasterProtect 8500 CI.

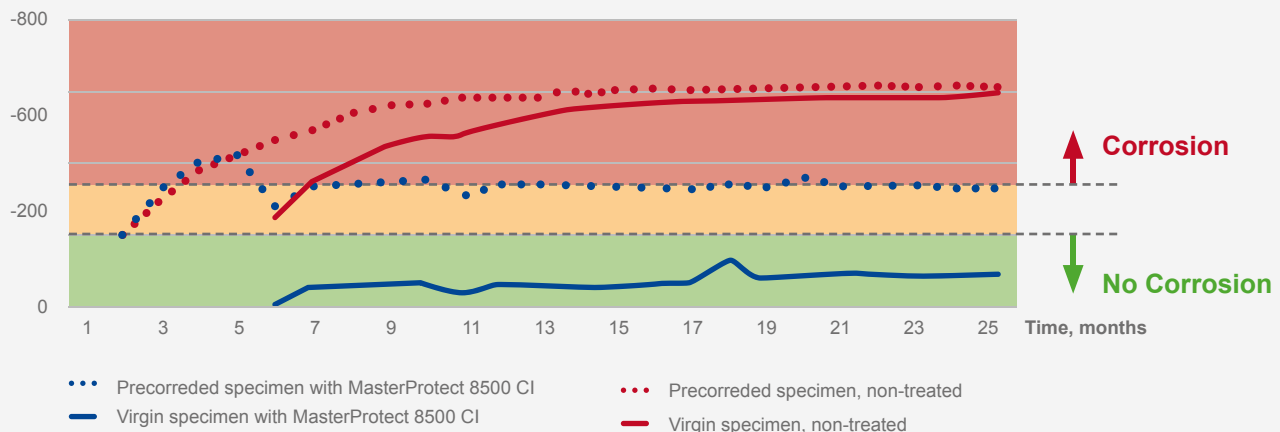
ASTM G109 – Corrosion Rate

Total Coulombs



M-82 Average Half-Cell Potential

Half-Cell Potential (mV_{CSE})





Fields of application

Typical structures with severe risk potential



1 Buildings located in coastal areas

2 Typical marine structures such as quays, jetties, bridges in direct splash zones

3 Industrial tanks, silos or pools in contact with chlorinated water or exposed to airborne salts

4 Areas exposed to heavy use of any de-icing agents (salts), e.g. parking decks, bridges, viaducts.



MasterProtect 8500 CI – saving costs in the long run

Over the past decades, there has been an unprecedented increase in the use of concrete in infrastructure and industrial facilities, as well as commercial and residential buildings. But how long do concrete structures last?

Extending the service life of concrete structures

Growing demand for longer service lives and the need to rehabilitate and renovate existing buildings have led to calls for prevention and repair techniques that match these durability expectations. Increasingly severe climatic, environmental and service conditions are posing new challenges for structures designed for longer service lives.

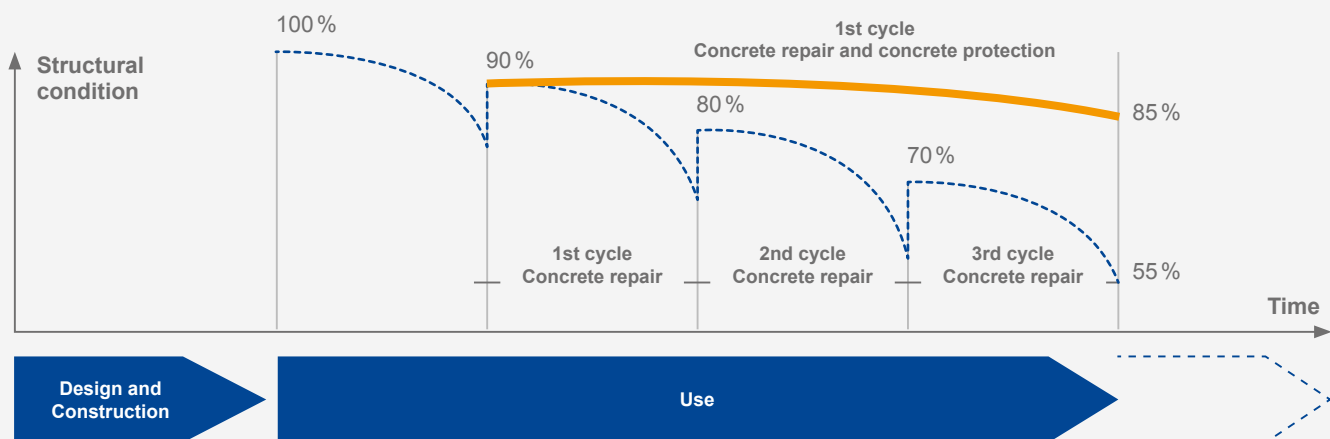
50% cost reduction

MasterProtect 8500 CI allows significant cost reduction compared with traditional concrete repair methods. Total project savings can exceed 50% depending on conditions.

Extending the service life of concrete structures with the right solutions

----- Usual method for concrete repair and protection

———— Concrete repair and protection with MasterProtect 8500 CI



Example of interaction between protection materials and repair mortar (depends on project conditions and is therefore different for each project).

Ensuring profitability with our LCCA

For owners and engineers alike, calculating the benefits of a repair and protection method over a given life cycle is crucial to selecting the most cost-effective solution.

We can prove the cost-effectiveness of our solutions

Master Builders Solutions has drawn upon expert knowledge from the industry to develop a life cycle cost analysis (LCCA) tool to assist our customers with this task.

The output of an analysis can be readily made available to the project team in the form of a report.



Life cycle cost comparison – a case study

A direct comparison of the proposed protection methods with a standard repair and maintenance approach: The case study results presented in the graphs below are based on a silo refurbishment project where crack repair using MasterInject and structural repair with MasterEmaco mortars have been simulated. As a base case only the initial repair and recurring repair works have been modelled. In contrast, repair work will no longer be required in the future with MasterProtect 330 EL anti-carbonation coating, MasterProtect H 303 standard hydrophobic treatment and most favorable MasterProtect 8500 CI corrosion inhibitor – MasterProtect 8500 CI – primarily as a result of its cost effectiveness – is the most treatment of choice in this case study.

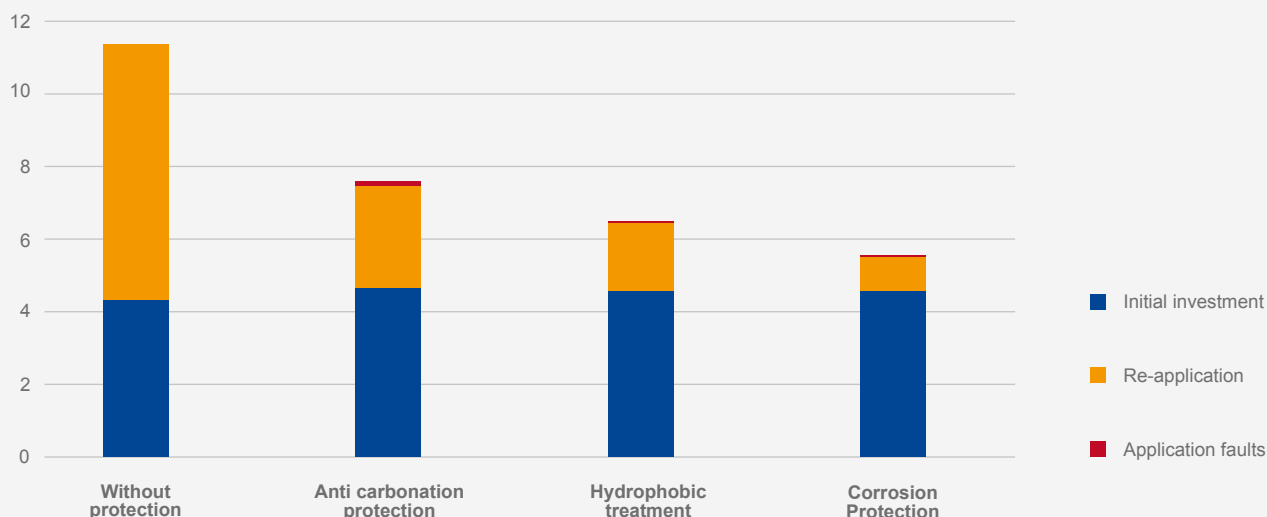
LCCA report typically includes:

- A life cycle cost comparison
- Annual cost analysis
- Cumulative net present cost (NPC) analysis
- Initial recommendation for most cost-effective solution

MasterProtect 8500 CI: Lowest overall cost

LCC comparison – cost breakdown

Net present costs (NPC)
 in million EUR





Choosing the right solution for your challenge

In order to ensure durable concrete in the field, it may not be sufficient to meet the minimum requirements of EN 206. In addition to the design of the concrete, proper placement, including the required concrete cover, are key factors in achieving a durable structure.

Selecting the right solution

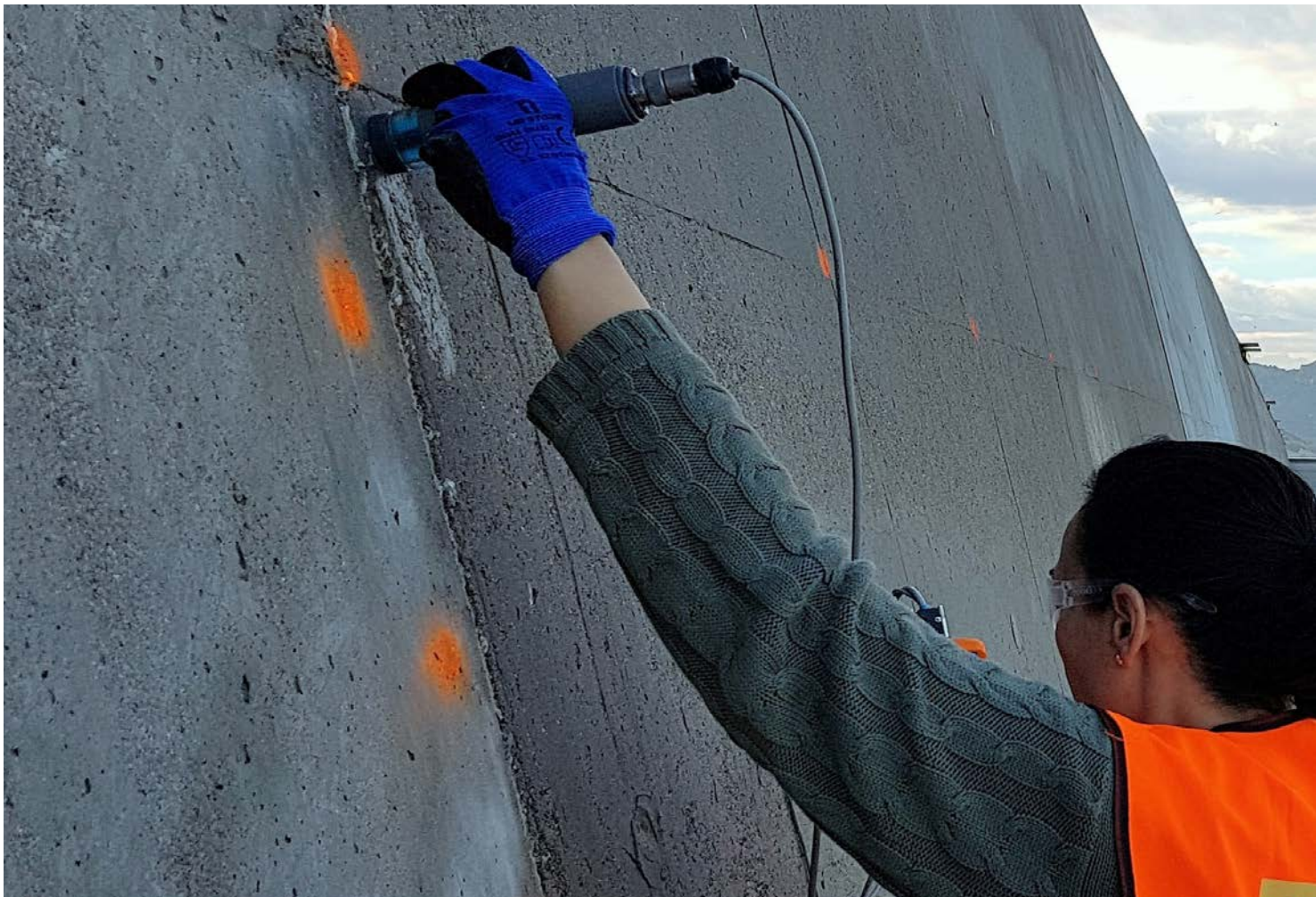
From design to curing – whenever a small deviation from the specified design and application occurs, it paves the way for concrete degradation and deterioration. Then it is only a question of time before accelerated carbonation, chemical attack and de-icing salts will start to damage the concrete

and the structure as a whole. In order to avoid this kind of concrete degradation, protection materials are used for new and refurbished structures.

Safe and reliable solutions

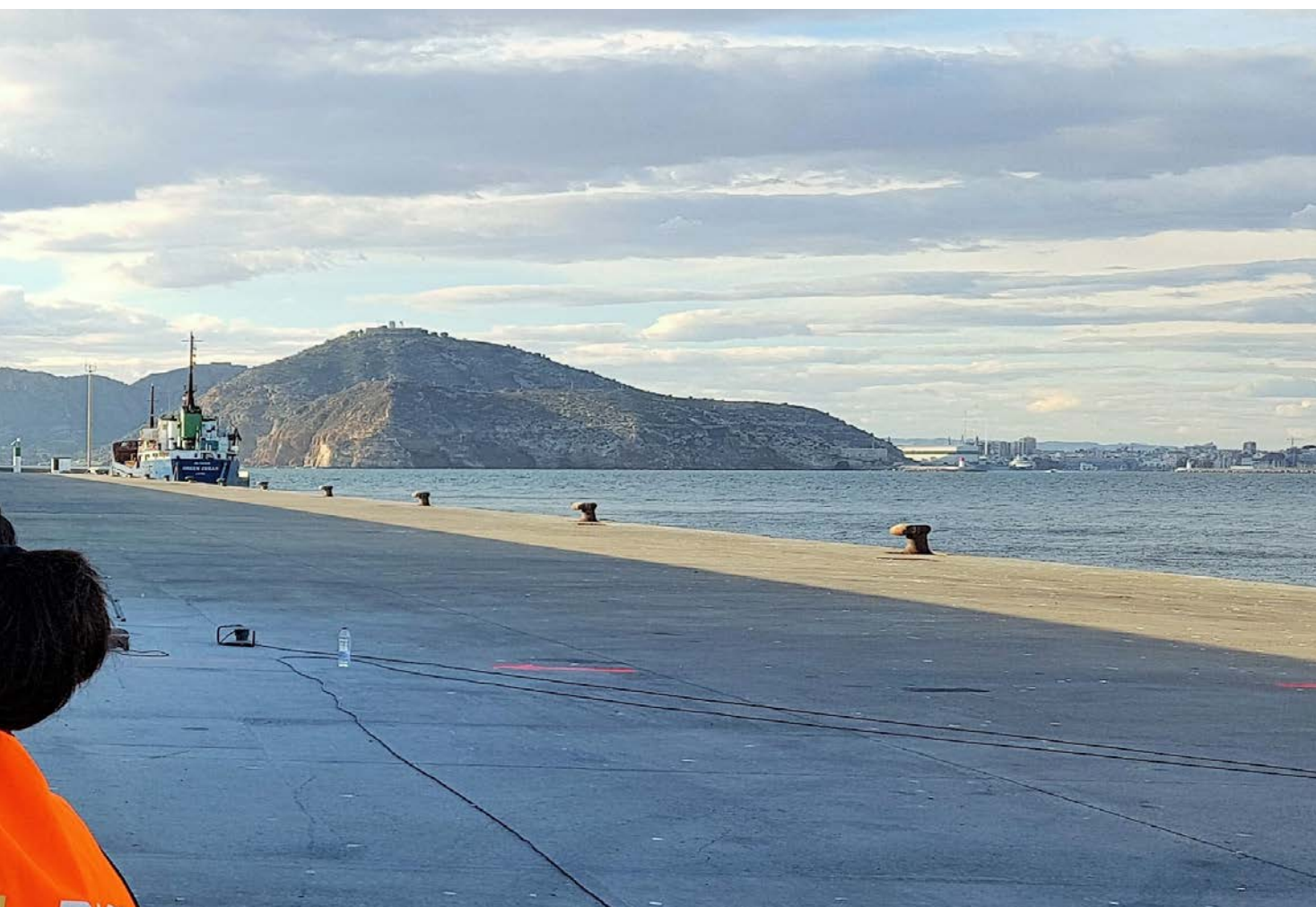
Exposure classes

The recommended surface-applied protection solution can be classified to match the major concrete exposure classes defined in EN 206-1 “Exposure Classes”.



MasterProtect Product Selector
 depending on the portfolio of the countries / regions

	Decorative paint	Acrylic coatings	Corrosion inhibitors	Hydrophobic treatment	Resin-based coatings
Environment	No risk of corrosion or attack	Carbonation-induced corrosion	Chloride-induced corrosion	Freeze/thaw attack	Aggressive chemical environment
Exposure class code	X0	XC1–XC4	XS1–XS3 XD1–XD3	XF1–XF4	XA1–XA3
Solution		MasterProtect 330 EL	MasterProtect 8500 CI	MasterProtect H 303	MasterSeal M





Access to expertise and knowledge from around the world

Our Master Builders Solutions experts are committed to providing the right information and the most cost-effective solution for your concrete protection or restoration challenge.

Enhance the value of your structure

By providing an early preliminary diagnosis and assessment of the current situation and recommending the right solutions for protection against the ingress of carbon dioxide, water and chloride ions from the start, we can significantly enhance the value and service life of your structure, and prevent further deterioration and spalling.

Corrosion rate measurements by Master Builders Solutions technical experts

- Early detection of corrosion potential is key to effective protection and repair solutions.
- Please contact your local sales consultant or adviser, depending on what you normally use to assist with an early assessment of your project.



Find your local contact:
www.master-builders-solutions.com



Master Builders Solutions expert talking to the customer on a project site



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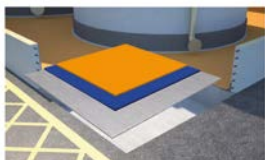
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Solunaut

Solunaut is a tool designed for all professionals in the construction industry. It provides an overview of our solutions by application in the food and beverage, chemical and waste-water industry, including TDS and the possibility of contacting us directly if there are any questions.

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BIM

With more than 200 BIM objects, and soon more than 400 Revit models, the Master Builders Solutions BIM portfolio is the largest in the construction chemicals industry. It covers thirteen construction industry segments, such as Waterproofing Systems, Performance Flooring, Concrete Repair or Protective Coatings, as well as Expansion Control Systems and Wall Systems.

bimobject.com/en-us/product?brand=mbcc-group



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Master Builders Solutions





Master Builders Solutions

The Master Builders Solutions brand brings all of our expertise together to create chemical solutions for new construction, maintenance, repair and renovation of structures. Master Builders Solutions is built on the experience gained from more than a century in the construction industry. The know-how and experience of a global community of construction experts form the core of Master Builders Solutions.

We combine the right elements from our portfolio to solve your specific construction challenges. We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide. We leverage global technologies, as well as our in-depth knowledge of local building needs, to develop innovations that help make you more successful and drive sustainable construction.

The comprehensive portfolio under the Master Builders Solutions brand encompasses concrete admixtures, cement additives, solutions for underground construction, waterproofing solutions, sealants, concrete repair & protection solutions, performance grouts, performance flooring solutions and solutions for on- and offshore wind energy.

Our comprehensive portfolio

- Concrete admixtures
- Cement additives
- Chemical solutions for underground construction
- Waterproofing solutions
- Sealants
- Concrete repair and protection solutions
- Performance grouts
- Wind turbine grouts
- Performance flooring solutions

Please do not hesitate to contact us for more specific information!





Master Builders Solutions for the Construction Industry

MasterAir

Complete solutions for air entrained concrete

MasterBrace

Solutions for concrete strengthening

MasterCast

Solutions for the manufactured concrete product industry

MasterCem

Solutions for cement manufacture

MasterEase

Low viscosity for high performance concrete

MasterEmaco

Solutions for concrete repair

MasterFinish

Solutions for formwork treatment and surface improvement

MasterFlow

Solutions for precision grouting

MasterFiber

Comprehensive solutions for fiber reinforced concrete

MasterGlenium

Solutions for high performance concrete

MasterInject

Solutions for concrete injection

MasterKure

Solutions for concrete curing

MasterLife

Solutions for enhanced durability

MasterMatrix

Advanced rheology control for concrete

MasterPel

Solutions for hydrophobization, anti-efflorescence and surface protection

MasterPolyheed

Solutions for mid-range concrete

MasterPozzolith

Solutions for water-reduced concrete

MasterProtect

Solutions for concrete protection

MasterRheobuild

Solutions for high strength concrete

MasterRoc

Solutions for underground construction

MasterSeal

Solutions for waterproofing and sealing

MasterSet

Solutions for set control

MasterSphere

Solutions for guaranteed freeze-thaw resistance

MasterSuna

Solutions for sand and gravel in concrete

MasterSure

Solutions for extraordinary workability retention

MasterTop

Solutions for industrial and commercial floors

Master X-Seed

Advanced accelerator solutions for concrete

Ucrete

Flooring solutions for harsh environments



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Let the numbers do the talking: We have portrayed some of our most eco-efficient product solutions for concrete and precast production, construction, civil engineering, and flooring.

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