



PRODUCT DATA SHEET

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MAINTENANCE OF CONCRETE REINFORCING

Sika FerroGard®-903+

ADVANCED GENERATION, SURFACE-APPLIED AND MIGRATING CORROSION INHIBITOR IMPREGNATION FOR REINFORCED CONCRETE

Description	Sika FerroGard®-903+ is an advanced generation of corrosion inhibitor designed to penetrate the surface of concrete structures then migrate to and protect steel reinforcing bars and encased metal. It protects the reinforcing steel in reinforced concrete from corrosion by compensating for the decrease in the cementitious matrix' passivating alkalinity as the carbonation front, or a sufficient concentration of chloride ions, reaches the surface of the steel. The improved formulation serves to reduce waiting times and surface preparation before subsequent repair or coating works. Concrete that already exhibits corrosion of its reinforcing steel should also be treated with Sika FerroGard®-903+ to reduce further corrosion and extend the service life of the structure.
Where to Use	Sika FerroGard®-903+ is recommended for all steel reinforced, prestressed, precast, post-tensioned or cast in place concrete. Applications include: <ul style="list-style-type: none"> ▪ Steel reinforced concrete pavements, bridges and highways exposed to corrosive environments (de-icing salts, weathering). ▪ Steel reinforced concrete in or near a marine environment. ▪ Parking garage or bridge decks. ▪ Piers, piles, and concrete dock structures. ▪ As part of Sika's System approach for building and civil engineering structures.
Advantages	<ul style="list-style-type: none"> ▪ Sika FerroGard®-903+ offers owners, port authorities, DOTs, and engineers a new technology in corrosion inhibition that can easily be applied to existing concrete surfaces to economically extend service life of any reinforced concrete structure. ▪ Protects against the harmful effects of corrosion by penetrating the surface of even the most dense concrete and migrating to the steel to inhibit corrosion. ▪ Enhances the durability of reinforced concrete. ▪ Does not require concrete removal. ▪ Organic in nature and environmentally friendly. ▪ Does not contain calcium nitrite. ▪ Easily applied by either spray or roller to all existing reinforced concrete. ▪ Can be applied on reinforced concrete that already exhibits some corrosion. ▪ Adds additional benefits when used prior to protective coatings in concrete restoration systems. ▪ Water-based for easy handling and application. ▪ Not a vapour barrier; allows vapour diffusion. ▪ Does not change the appearance of the concrete. ▪ Allows easier and faster application of subsequent mortars, sealers and coatings. ▪ Penetration depth and reduction of corrosion currents can be measured on jobsite using Sika "Qualitative Analysis Test". ▪ Provides long term protection and durability. ▪ Protects both anodic and cathodic sites on reinforcing steel. ▪ Amino alcohols-based corrosion inhibitors have proven effective in both laboratory and field analysis as part of the Strategic Highway Research Program (SHRP-S-666).
Independent Reports	<ul style="list-style-type: none"> ▪ BRE, The use of surface applied Sika FerroGard®-903+ corrosion inhibitor to delay the onset of chloride induced corrosion in hardened concrete, BRE Client Report No. 224-346, 2005. ▪ Mott MacDonald, Evaluation of Sika FerroGard®-901 and 903+ Corrosion Inhibitors, Ref. 26'063/001 Rev A, April 1996. ▪ SAMARIS (Sustainable and Advanced Materials for Road Infrastructure) - Final Report, Deliverables D17a, D17b, D21 & D25a, Copenhagen, 2006. ▪ Mulheron, M., Nwaubani, S.O. , Corrosion Inhibitors for High Performance Reinforced Concrete Structures, University of Surrey, 1999. ▪ C-Probe Systems Ltd., Performance of Corrosion Inhibitors in Practice, 2000.

Technical Data

Packaging	18.9 L (5 US gal.) pail or 200 L (53 US gal.) drum
Colour	Transparent
Yield	2 - 3.4 m ² /L (84 - 140 ft ² /US gal.) total coverage dependent on surface profile and porosity. The number of applications necessary to achieve the required consumption rate of ~480 mL/m ² (1.5 US fl. oz/ft ²) depends on the substrate. In general it needs 1 to 2 coats for horizontal surfaces (avoiding ponding) and 2 to 3 coats for vertical surfaces. For very dense concrete surfaces consumption can be reduced to 290 mL/m ² (0.9 US fl. oz/ft ²).
Shelf Life	24 months in original, unopened packaging. Store in cool conditions, protecting from freezing. In cases of frost formation, reversible crystallisation may occur. Should this happen, allow product to warm to room temperature (15 - 25 °C [59 - 77 °F]) and stir well to re-dissolve crystals.
Application Temperatures (Substrate & air)	Minimum 5 °C (41 °F) Maximum 40 °C (104 °F)

Properties at 23 °C (73 °F) and 50 % R.H.

Viscosity	~ 24 cps
Relative Density	1.04 kg/L (8.7 lb/US gal.)
pH	~10

Significant Proof of Performance

Features	Performance Level	Test Methods/Institutes
Corrosion inhibition	Sika FerroGard®-903+ corrosion inhibitor delays the onset of corrosion and reduces the corrosion rate by 65 % vs control specimen after 1 year.	1
Penetration in hardened concrete	Sika FerroGard®-903+ penetrates independently of orientation (horizontal, vertical, overhead), from 2.5 - 20 mm (0.10 - 3/4 in) per day, depending on the concrete density.	2
Depth of penetration	Sika FerroGard®-903+ penetrates up to 76 mm (3 in) in 28 days.	2
Protective layer on steel	Sika FerroGard®-903+ forms a protective layer on the reinforcing steel of high integrity measured at as much as 100 Å in thickness.	3
Displacement of chlorides from steel surface	Sika FerroGard®-903+ forms a continuous film on the reinforcing steel and displaces chlorides ions from the steel surface.	3
Corrosion rate field monitoring	Reduction of corrosion rates in excess of 65 %.	4

Test Methods/Institutes:

- 1. Cracked Concrete Beam Test (adapted from ASTM G109)
- 2. Secondary Neutron Mass Spectroscopy (SNMS)/Institute for Radiochemistry Karlsruhe (Germany), Prof. Dr. J. Goschnick.
- 3. X-ray Photon Spectroscopy (XPS) and Secondary Ion Mass Spectroscopy (SIMS)/Brundel and associates, San Jose, CA and University Heidelberg (Germany), Prof. M. Grunze.
- 4. Performance of Corrosion Inhibitors in Practice, Graeme Jones, C-Probe Technologies Ltd., 2000

VOC Content 519 g/L

Chemical Resistance Consult Sika Canada

Product properties are typically averages, obtained under laboratory conditions. Reasonable variations can be expected on-site due to local factors, including environment, preparation, application, curing and test methods.

HOW TO USE

Surface

Preparation

Before applying Sika FerroGard®-903+, be sure the surface is clean and sound. Remove all laitance, dirt, dust, oil, grease, curing compounds, efflorescence or existing coatings and treatments, which would reduce or prevent penetration of the inhibitor, by water- or light- sandblasting.

For uncoated concrete or concrete to be further treated with hydrophobic impregnations or overcoated, water blast the concrete surface with pressure (up to 18 MPa [2600 psi]).

For concrete surfaces due to receive cementitious materials, such as levelling or parging mortars, roughen the surface using suitable abrasive blast cleaning techniques or high pressure waterblasting (up to 60 MPa [8700 psi]).

The resultant surface profile shall be sufficient to provide the required adhesion.

Delaminated, weak, damaged and deteriorated concrete shall be repaired using Sika MonoTop® or SikaTop® mortars.

For optimum penetration the substrate shall be allowed to dry out prior to the application of Sika FerroGard®-903+. The drier the surface, the better the penetration and effectiveness.

System Structure

Sika FerroGard®-903+ is part of the Sika® Concrete Repair & Protection Systems:

Repair system: Sika MonoTop® or SikaTop®

Reinforcement corrosion control: Sika FerroGard®-903+

Concrete protection: Sikagard® water repellents or coatings, Sikafloor® or Sikalastic® deck coatings

Mixing

Sika FerroGard®-903+ is supplied ready for use and must not be diluted. Do not agitate/shake the material prior to use.

Application	<p>Sika FerroGard®-903+ is applied to saturation by brush, roller or low-pressure or airless- spray equipment. The total consumption must be 480 mL/m² (1.5 US fl. oz/ft²) or for very dense concrete with low permeability, the rate of consumption can be reduced but must not be lower than 290 mL/m² (0.9 US fl. oz/ft²).</p> <p>The number of coats is dependent on the porosity and moisture content of the substrate and the weather conditions.</p> <p>On vertical surfaces, normally, 2 to 3 coats are necessary to achieve the required consumption. In case of dense concrete, additional coats may be required.</p> <p>On horizontal surfaces, saturate the substrate in 1 to 2 coats, taking care to avoid ponding.</p> <p>Waiting times between coats will be dependent on the porosity of the concrete and the weather conditions, however, 1 to 6 hours is usually sufficient for the material to be absorbed and the surface to dry to a matte damp appearance (no sheen) before subsequent applications.</p> <p>After the application of the last coat and as soon as the treated surface has become matte in appearance (no sheen), carry out a low-pressure cleaning (using clean water from a hose).</p> <p>The day after the last application, treated surfaces shall be cleaned by pressure washing (~10 MPa [~1,500 psi]).</p>
Over-Coating	<p>Where the application is carried out as per Application described above, no further treatment is required before over-coating with Sikagard® hydrophobic impregnations, Sikagard® facade coatings or Sikafloor® products (Refer to appropriate Product Data Sheet for application details).</p> <p>If non-Sika coatings are to be applied, please contact the manufacturer's technical department for confirmation of compatibility with Sika FerroGard®-903+ or undertake compatibility and adhesion site trials.</p> <p>When Sika FerroGard®-903+ is used within a patch repair process or before a cementitious overlay, Sika® repair or overlay systems can be used. Standard preparation (pre-wetting) shall then apply.</p> <p>When using a levelling/parging mortar over surfaces treated with Sika FerroGard®-903+ products such as SikaTop®-121, Sikagard®-75 EpoCem^{CA}®, SikaTop® Seal-107 or Sika MonoTop®, can be used.</p> <p>Cementitious levelling mortars shall only be used if there is a well-prepared, open-textured surface that is completely cleaned of inhibitor residue.</p> <p>If other Sika or non-Sika products are to be used, site trials are recommended to confirm compatibility and preparation. Contact Sika Canada or the technical department of the manufacturer for guidance and undertake compatibility and adhesion site trials.</p>
Curing	<p>Sika FerroGard®-903+ does not require any special curing but must be protected from rain for at least four (4) hours.</p>
Clean Up	<p>Collect and contain spills with absorbent materials. Dispose of in accordance with current applicable local, provincial and federal regulations. Clean tools and equipment with water. Wash soiled hands and skin thoroughly in hot soapy water or use Sika® Hand Cleaner towels.</p>
Limitations	<ul style="list-style-type: none"> ▪ Not suitable for tidal zones or substrates saturated with water. ▪ Do not use in contact with potable water, use Sika FerroGard®-903 (special order grade). ▪ Minimum/maximum substrate and air temperatures: 5 °C / 40 °C (41 °F / 104 °F). ▪ Do not apply when rain or frost is expected. ▪ Substrate should be as dry as possible prior to application as this will reduce application, penetration and overcoating times. ▪ Visible concrete defects (spalling, cracks etc) must be repaired using conventional repair methods (removal of delaminating or loose concrete, treatment of reinforcement, reprofiling etc.). Sika FerroGard®-903+ can be applied after repair works (but not overlay) has been carried out (after hardening of the repair material) – freshly repaired area might not need to be treated with the inhibitor. Nevertheless, if this is done, lower diffusion should be expected at the zones that were repaired. ▪ Protect glass, marble, natural stone, brick, galvanized steel, copper and aluminum during the application. ▪ Do not apply in direct sun and/or wind and/or rain. ▪ Typical maximum chloride content of concrete 3.5 kg/m³ (6 lb/yd³) [1 % of free chloride ions by weight of cement (corresponding to 1.7 % of sodium chloride) measured at the level of the reinforcing steel]. Above this limit, depending on site conditions and the level of corrosion activity, increased consumption can be considered. Trials and corrosion rate monitoring to confirm consumption and effectiveness shall be undertaken. Consult Sika Canada. ▪ To provide efficient protection, concentration of Sika FerroGard®-903+ at rebar must be at least 100 ppm when measured by ionic chromatography. ▪ Depending on substrate conditions, the application of Sika FerroGard®-903+ may lead to a slight darkening of the surface. Proceed with preliminary testing if treated surfaces are to remain visible through hydrophobic impregnations or clear coatings.



Health and Safety Information

For information and advice on the safe handling, storage and disposal of chemical products, users should refer to the most recent SAFETY DATA SHEET containing physical, ecological, toxicological and other safety-related data.

KEEP OUT OF REACH OF CHILDREN
FOR INDUSTRIAL USE ONLY

The Information, and in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions, within their shelflife. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any recommendations, or from any other advice offered. The information contained herein does not relieve the user of the products from testing them for the intended application and purpose. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request or may be downloaded from our website at: www.sika.ca

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