

PERFORMANCE SHEET

Passive Corrosion Inhibitors

Sikagard[®]-705 L / Sikagard[®]-706 Thixo

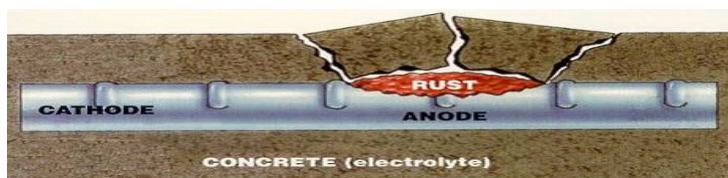
1 SCOPE

This Performance Sheet describes the performances of silane hydrophobic impregnations **Sikagard[®]-705 L & Sikagard[®]-706 Thixo** used as passive corrosion inhibitor treatment for reinforced concrete.

2 SYSTEM DESCRIPTION

Steel reinforcement in concrete starts to corrode in presence of water and humidity when the passive layer formed by the surrounding high alkaline concrete has broken down either due to carbonation or the presence of chlorides.

To initiate the electrochemical process, few elements are required to be present such as loss of passivity (due to carbonation or the presence of chlorides), humidity and oxygen.



Sikagard[®]-705 L/-706 Thixo are acting as passive corrosion inhibitor by reducing humidity around the reinforcement bars and therefore reducing the corrosion activity. Additionally, these effective hydrophobic impregnations will prevent further ingress of chloride ions into the structure.

USES

Sikagard[®]-705 L/-706 Thixo are recommended for passive corrosion inhibition of steel-reinforced concrete, pre-stressed, precast, post tensioned concrete, or concrete in marine environments or in carbonated concrete. Common applications include:

- Bridges and highways exposed to corrosive environments (sea water, de-icing salts, weathering)
- Building facades and balconies
- Parking garages
- Piers, piles, and concrete dock structures
- Vertical, horizontal, and overhead surfaces
- As part of Sika's system approach for buildings and civil engineering

- Suitable for protection against ingress (Principle 1, method 1.1 of EN 1504-9),
- Suitable for moisture control (Principle 2, method 2.1 of EN 1504-9)
- Suitable for increasing the resistivity (Principle 8, method 8.1 of EN 1504-9)

CHARACTERISTICS/ ADVANTAGES

- Significantly reduces active corrosion of reinforced steel bars – caused by chlorides and or carbonation, even in cracked concrete
- Prevent efficiently corrosion of reinforced steel bars
- Increases the resistivity of the reinforced concrete
- Enhances the durability of reinforced concrete.
- Long-term efficiency, deep penetration
- Does not require concrete removal.
- Repels - water and chloride ions.
- Environmentally sound.
- Does not contain calcium nitrite.
- Ready to use and easily applied by spray or roller.
- Adds additional benefits when used prior to protective coatings in concrete restoration systems.
- Not a vapor barrier; allows vapor diffusion.
- Proven effective in both laboratory (modified ASTM G109-07(2013)/Cracked Concrete Beam Corrosion Test) and field tests.
- Increases the resistance of concrete to freeze and thaw cycles and de-icing salts

3 CHARACTERISTICS

3.1 TYPICAL DATA

	Sikagard®-705 L	Sikagard®-706 Thixo
▪ Sealer type:	Alkylalkoxysilane	Alkylalkoxysilane
▪ Active ingredient content:	~99%	~80%
▪ Aspect:	Colourless low viscosity liquid	Cream type

3.2 PERFORMANCE DATA

	Sikagard®-705 L	Sikagard®-706 Thixo
▪ EN 1504-2	Class II penetration depth (>10 mm) Class I drying rate Pass Freeze and thaw with de-icing salt	
▪ Water repellency after heavy abrasion (Alberta B388 Type 1b)	73.1%	90.2%
▪ Water vapour transmission (Alberta B388 Type 1b):	75.3%	
▪ NCHRP 244:	Series II - absorbed chloride: 95.5% Series IV - absorbed chloride: 90.4%	Series II - absorbed chloride: 84% Series IV - absorbed chloride: 95%
▪ NT Build 515 (Filter effect >60%)	Filter effect FE ₂₅ : 0.71	Filter effect FE ₂₅ : 0.68
▪ VOC (ASTM D3960)	327 g/l	319 g/l

- Cracked Concrete Beam Test (ASTM G 109-07 (2013) modified)¹**

20 Ponding cycles: 2 weeks with 3.0% sodium chloride solution and 2 weeks drying at +23°C.

After the 20th cycle, the concentration of the sodium chloride solution was increased to 5.0%

Application before cracking – Measurement after 2.5 years of ponding		
	Macrocell current in μA	Corrosion reduction
Untreated	81.9	
Sikagard®-705 L	6.9	92%
Application after cracking – Measurement after 2.5 years of ponding		
	Macrocell current in μA	Corrosion reduction
Untreated	81.9	
Sikagard®-705 L	0.6	99%
Application after cracking and after corrosion initiation – Measurement after 2.5 years of ponding		
	Macrocell current in μA	Corrosion reduction
Untreated	81.9	
Sikagard®-705 L	10.9	87%

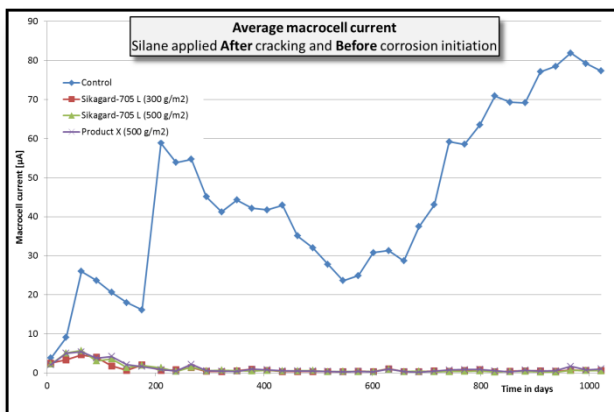


Figure 1: Corrosion measurement when passive inhibitor is applied once the cracks have appeared but before the corrosion has initiated

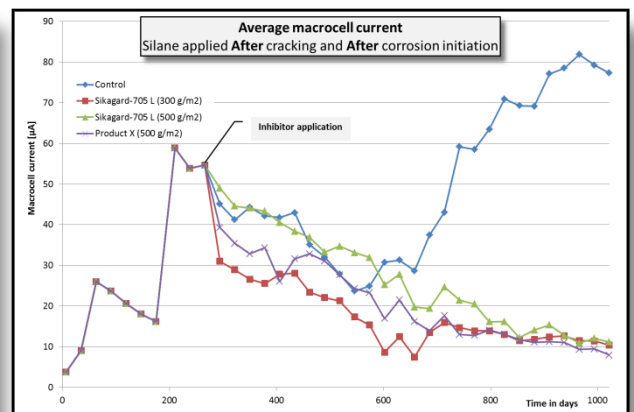


Figure 2: Corrosion measurement when passive inhibitor is applied on the cracks after the initiation of the corrosion

- Reduction of chloride ion uptake**

Compared to untreated concrete, concrete treated with the liquid passive corrosion inhibitor shows a significantly reduced chloride uptake (test carried out using various methods^{2,3}).

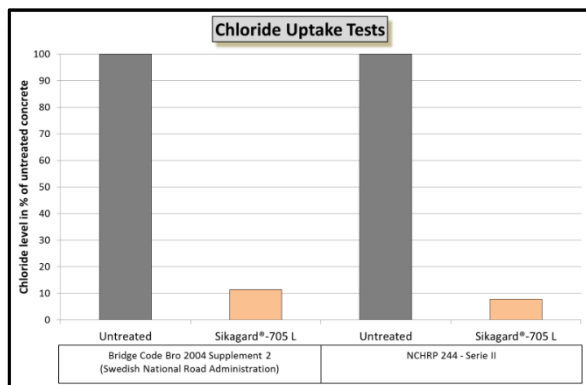


Figure 1: Chloride uptake test with liquid applied passive inhibitor

■ **Water penetration reduction**

Test performed according to the European Standard EN 13057:2002 modified (100 mm sample size).

Capillary absorption⁴ measurements were carried out after shaving 1, 5 and 7 mm of the concrete surface to assess the reduction of water absorption in the depth of the concrete surface.

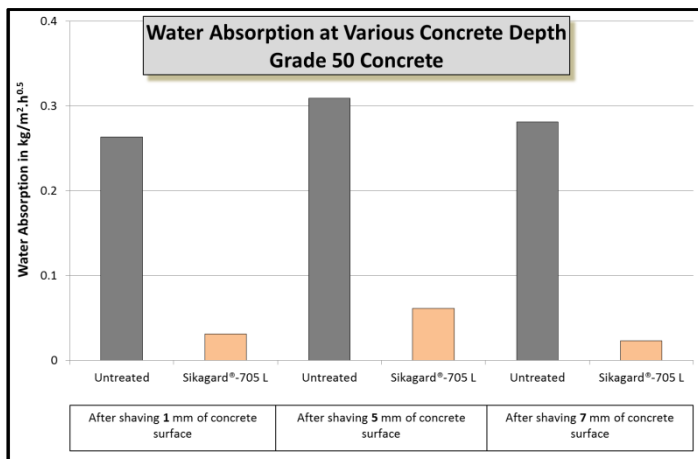


Figure 4: Water absorption at different depth in the concrete

■ **Penetration Depth^{5,6}**

Sikagard®-705 L passive corrosion inhibitor is compared to a product available in the market on two types of concrete mixes (one concrete with water cement ratio of 0.70 and the second one with 0.45).

The results clearly show a higher penetration of **Sikagard®-705 L** into the test concrete when the same consumption was applied.

Tests done on dense concrete at various ages & humidity level in the concrete show nevertheless good penetration of the cream passive corrosion inhibitor **Sikagard®-706 Thixo** regardless of the age and humidity level.

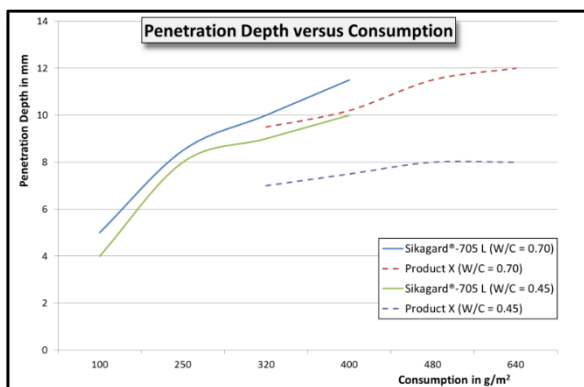


Figure 5: Penetration depth of liquid passive corrosion inhibitor at different consumption and concrete quality

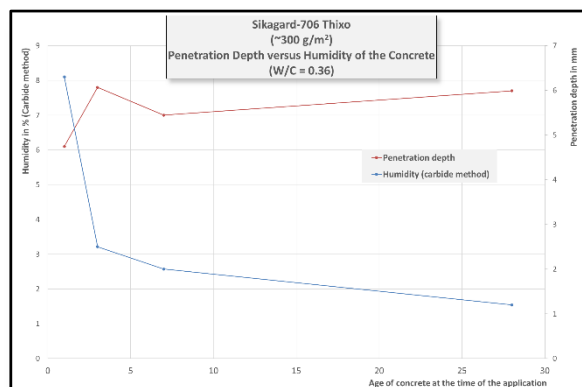


Figure 6: Penetration depth of cream corrosion passive corrosion inhibitor in function of concrete age and humidity level

- **Increase of durability**

Hydrophobic impregnation like Sikagard®-705 L or Sikagard®-706 Thixo can increase the durability of concrete mixes as studied in a thesis⁷ at the University of Cape Town, South Africa.

Sikagard-706 Thixo was used in this study to study the service life prediction of various concrete mixes design – one of them being presented in the figure 7.

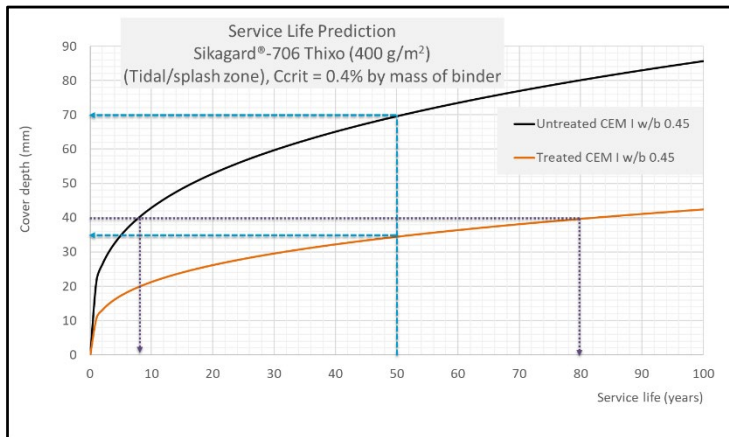


Figure 7: Service Life Prediction comparing CEM I concrete treated or not treated with cream hydrophobic impregnation.

4 LIMITATIONS

- Do not apply **Sikagard®-705 L** or **Sikagard®-706 Thixo** to wet or damp substrates (this will result in reduced penetration).
- Do not apply if rain is expected within four hours following the application, or if strong winds or other conditions prevent a proper application
- For more detailed information, refer to **Sikagard®-705 L** or **Sikagard®-706 Thixo** respective data sheet.
- For information related to application, refer to the relevant Method Statement.

5 BIBLIOGRAPHY

- 1] Internal Sika Report V2 – Corrosion tests on cracked concrete beams – Adapted from ASTM G109, July-2018
- 2] SP report (Sweden) – Testing of products for the protection of concrete structures– According to instructions in Bridge Code “Bro 2002”, 2005 May-09, Ref: F507580 B rev
- 3] TESTECH SDN. BHD. Chloride uptake reaction test as per NCHRP 244 – Series II, 2009 Feb-28
- 4] SETSCO SERVICES PTE. LTD.; Performance assessment of Sikagard-705 L, water uptake adopted from BS EN 13057; 2007 Sept-05
- 5] Curve prepared from internal non dated data
- 6] Curve extracted from data of Internal technical article – Application Optimisation– Sikagard-706 Thixo; June 2021
- 7] H. Sohawon thesis, Service life extension of reinforced concrete structures using hydrophobic impregnation, University of Cape Town, South Africa, 2018 August-26

6 LEGAL NOTE

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 in accordance with Sika's recommendations. 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 written recommendations, or from any other advice offered. The user of the product must test the products suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. 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.

Sika Sverige AB
Engineered Refurbishment
Domnarvsvägen 15
163 53, Spånga
Sverige
www.sika.se

Version given by
Sika Sverige AB
Telefon: 08-621 89 00
E-post: info@se.sika.com

Performance Sheet
Passive Corrosion Inhibitors: Sikagard®-705 L / -706
Thixo
June-2021, V-2
MDo/02-2021

Sika Sverige AB
Ver. 2022.02