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Corrosion Inhibitors for Reinforced Concrete

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CORROSION INHIBITORS FOR REINFORCED CONCRETE

THE NEED

Steel corrosion in reinforced concrete structures has been a major problem across the U.S. Steel-reinforced concrete structures are continually subject to attack by corrosion brought on by naturally occurring environmental conditions such as carbonation and the introduction of chlorides from sources such as salt water, deicing salts, and accelerating admixtures.

THE TECHNOLOGY

FerroGard, a corrosion inhibitor, developed by Sika Corporation, penetrates hardened concrete to dramatically reduce corrosion by 65% and extend the structure's service life. Steel in concrete is naturally protected by the high pH level in the concrete. Over time the pH drops due to environmental conditions. Once corrosion occurs an electrochemical corrosion cell forms on the concrete rebar, with an anode (+) area and a cathode (-) area. Rust starts to form expanding the volume of the steel and causing cracks and spalls. FerroGard penetrates the concrete via diffusion and features a dual action providing a protective layer on both the anode and cathode parts of the steel. This protective layer further acts to displace chlorides from the steel. The product can be used as an admixture in the placement of new concrete or topically applied to existing structures (see Figure 1).

FIGURE 1 PRINCIPLE OF CORROSION INHIBITORS FOR REINFORCED CONCRETE

THE BENEFITS

The product is easily added to ready-mix concrete or to the surface of existing concrete. Dramatically delays the initiation of corrosion and greatly reduces the overall corrosion activity (65% reduction). Provides corrosion inhibition in the presence of varying chloride concentrations, even high concentration of deicing or marine salts. The time of penetration is very fast, penetrating concrete to a depth of at least 3 inches in 28 days. Causes no harm to the environment. It extends the service life of concrete structures and reduces maintenance costs. If it is used in concrete restoration its application does not require concrete removal. It can be applied to concrete that already exhibits corrosion. All the concrete properties and appearance remains unchanged (It does not affect the plastic properties of concrete). No changes in mix design or placement operations are required. The product does not affect the properties of hardened concrete, such as compressive strengths, permeability, etc.

STATUS

ASTM tests show that FerroGard reduces corrosion currents by as much as 65%. It has been implemented in several DOT projects and was also selected for use in an extensive Federal Highway Administration research project. FerroGard comes in two types; FerroGard 901 which is used as an admixture in the placement of new concrete or FerroGard 903 that is topically applied to existing structures.

BARRIERS

The product is able to reduce corrosion but not to stop it. A combination of this product with other protective systems is required if the level of durability of the concrete structure needs to more than double.

POINTS OF CONTACT

Sika Corporation, Gemite Products, Inc.

Tel: (630) 924-7900 or (800) 933-SIKA

REFERENCES

1. 'The Sika Edge', Issue No. 1, July 1997, Page 4.
2. Sika FerroGard 'Corrosion Inhibitors for Reinforced Concrete', Sika Catalog 1997

REVIEWERS

Peer reviewed as an emerging construction technology

DISCLAIMER

Purdue University does not endorse this technology or represents that the information presented can be relied upon without further investigation.

PUBLISHER

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