

TB-0802 — Non corrosive properties of POLARSET® Non-Chloride Accelerator

Technical Bulletin

/ concrete / mix design

Introduction

POLARSET® Accelerator is an ASTM C494, Type C, non-chloride, noncorrosive, accelerating admixture for concrete. It was developed as an alternative to calcium chloride based accelerators to promote early set time and strength gain in cold weather. Calcium chloride is recognized as the most efficient and economical concrete accelerator available, but the tendency of chloride ions in concrete to increase corrosion of embedded metals requires that its use be limited when concrete is exposed to moisture and other chlorides, such as those found in deicing salts.

This technical bulletin describes tests performed on concrete containing POLARSET® to determine its effect on corrosion of embedded metals. The test procedures include cyclic polarization and potentiostatic polarization methods using mortar cylinder with embedded steel. Each test was performed with and without admixed chlorides in order to simulate both non-chloride environments and marine and deicing salt environments.

Cyclic Polarization

Cyclic Polarization testing screens the pitting tendency of steel. Table 1 data shows that both reference and POLARSET® admixed solutions did not induce pitting in the absence of chloride. However, column 3 indicates POLARSET® shows a marked improvement in resistance to pitting in the presence of chlorides, when compared to the control. These test results are expected since a major constituent in POLARSET® is calcium nitrite, known as an excellent corrosion inhibitor for protection of embedded rebar in concrete.

Table 1: Cyclic Polarization Test Results

POLARSET® DOSAGE RATE, ML/100 KG (OZ/100 LBS)	EP, ¹ (MV), SATURATED CALCIUM HYDROXIDE SOLUTION	EP, (MV), SATURATED CALCIUM HYDROXIDE SOLUTION, 0.5 M SODIUM CHLORIDE ²
0 (0)	no pitting	-548
980 (15)	no pitting	-280
5220 (80)	no pitting	-105

Notes:

1. Ep is protection potential. In general, the more positive Ep is versus a saturated calomel electrode (SCE), the less likely pitting will occur in concrete.
2. A solution dosage rate of 0.5 M sodium chloride is equivalent to 3 kg/m³ (5 lbs/yd³) chloride in concrete.

Potentiostatic Polarization

Constant potential polarizations were carried out in a 0.5 water/cement ratio mortar using an ASTM C150, Type V cement. The test is based upon a method commonly used in Europe to determine the harmlessness of chemical admixtures. It has also been shown that this test method provides information as to whether or not admixtures are beneficial in the presence of chloride by admixing chloride into the mortar. The Potentiostatic Polarization test procedure states that an admixture is generally considered to be harmless if the average current over 24 hours is within a factor of 2 of the control specimen or under 1 $\mu\text{A}/\text{cm}^2$.

Referring to Table 2, potentiostatic data depicts both control mortar and mortar admixed with POLARSET® is noncorrosive as expected in the absence of chloride. Column 3 of Table 2 reveals that control mortar is very corrosive in the presence of 3 kg/m^3 (5 lbs/yd^3) sodium chloride, with average current densities of 264 $\mu\text{A}/\text{cm}^2$. The inclusion of POLARSET® significantly lowered current values, nearly to levels equivalent to those without chloride (down to 2.0 and 3.0 $\mu\text{A}/\text{cm}^2$, nearly two magnitudes lower than the control).

Table 2: Potentiostatic Polarization Test Results

POLARSET® DOSAGE RATE, ML/100 KG (OZ/100 LBS)	CURRENT DENSITY, MA/CM ² NO SODIUM CHLORIDE	CURRENT DENSITY, MA/CM ² 3 KG/M ³ (5 LBS/YD ³) SODIUM CHLORIDE
0 (0)	0.54	264
980 (15)	0.56	2.0
5220 (80)	0.36	3.0

gcpat.com | North America Customer Service: +1 (877) 423 6491

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for consideration, investigation and verification by the user, but we do not warrant the results to be obtained. Please read all statements, recommendations and suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation, or suggestion is intended for any use that would infringe any patent, copyright, or other third party right.

POLARSET is a trademark, which may be registered in the United States and/or other countries, of GCP Applied Technologies Inc. This trademark list has been compiled using available published information as of the publication date and may not accurately reflect current trademark ownership or status.

© Copyright 2018 GCP Applied Technologies Inc. All rights reserved.

In Canada, 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

GCP Applied Technologies Inc., 2325 Lakeview Parkway, Suite 475, Alpharetta, GA 30009, USA

GCP Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6

This document is only current as of the last updated date stated below and is valid only for use in the United States. It is important that you always refer to the currently available information at the URL below to provide the most current product information at the time of use. Additional literature such as Contractor Manuals, Technical Bulletins, Detail Drawings and detailing recommendations and other relevant documents are also available on www.gcpat.com. Information found on other websites must not be relied upon, as they may not be up-to-date or applicable to the conditions in your location and we do not accept any responsibility for their content. If there are any conflicts or if you need more information, please contact GCP Customer Service.

Last Updated: 2024-06-21

[gcpat.com/solutions/products/force-10000-d-silica-fume/tb-0802-non-corrosive-properties-polarset-non-chloride](https://www.gcpat.com/solutions/products/force-10000-d-silica-fume/tb-0802-non-corrosive-properties-polarset-non-chloride)