

# DCI<sup>®</sup>N

For corrosion protection of steel-reinforced concrete

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## Product Description

DCI<sup>®</sup>N Corrosion Inhibitor chemically inhibits the corrosive action of chlorides on reinforcing steel and prestressed strands in concrete. DCI<sup>®</sup>N has been specifically formulated to provide corrosion protection performance while still maintaining equivalent plastic and hardened properties of similar untreated concretes. DCI<sup>®</sup>N is a liquid added to concrete during the batching process. One litre of DCI<sup>®</sup>N weighs approximately 1.28kg ± 0.02kg and contains a minimum of 30% w/w of calcium nitrite.

## Applications

DCI<sup>®</sup>N is recommended for all steel-reinforced, post-tensioned and prestressed concrete that will come in contact with chlorides from de-icing salts or a marine environment. Examples are chloridecontaminated soil, support structures, bridge decks, prestressed members, and structures in marine environments. It may also be used in concrete where chlorides are added during concrete production.

## Facts about Steel Corrosion

Corrosion occurs in the presence of oxygen, moisture, and an electrolyte. As chlorides attack the reinforcing steel, the salt intensifies the electrolyte properties of concrete, thereby creating a corrosion cell. As the corrosion reaction occurs, rust is formed. It expands and migrates away from the reinforcing bar, leaving more iron to be corroded. This process continues and two situations develop:

- The reinforcing bars disintegrate, which reduces the flexural strength of the concrete structure.
- Iron, as it oxidises, expands to four times its original volume. This expansion results in physical disruption of the concrete. Typical results are cracks, stains, crazing, spalling and pot holes, all of which are safety hazards.

## Chemical Inhibition of Corrosion

DCI<sup>®</sup>N Corrosion Inhibitor is a system containing calcium nitrite which interacts with the embedded steel in concrete to prevent salt attack. By chemically reacting with the reinforcing, a barrier is formed which prevents chloride penetration. Corrosion initiation is delayed and corrosion rates are kept under control. Once corrosion has been inhibited, physical disruption of the concrete due to rust formation will not occur.

When added to concrete in sufficient quantity as determined by the anticipated chloride ion content of the concrete over the design life of the structure, DCI<sup>®</sup>N maintains an active corrosion-controlling system within the concrete matrix.

## Compatibility with Other Admixtures

DCI<sup>®</sup>N Corrosion Inhibitor can be used in concrete with other admixtures – including air-entraining admixtures, water reducers, superplasticisers, set-retarders, pozzolans and microsilica – without impeding their performance. Each admixture must be added separately. Individually added, each will deliver exactly the results desired.

## Concrete Set Time

DCI<sup>®</sup>N is a neutral-set corrosion inhibitor formulated not to affect concrete setting times at or below 22°C, which may also aggravate slump loss. In some cases, environmental conditions may require the addition of a retarder. In this case, Daratard<sup>®</sup>PR from GCP Applied Technologies may be added separately to the concrete mix.

## Air Entrainment

DCI<sup>®</sup>N Corrosion Inhibitor at the normal addition rates may moderately reduce the entrained air content. It may be necessary to increase the dosage of the air-entraining admixture to compensate. Project specifications for DCI<sup>®</sup>N generally will show requirements of  $6\frac{1}{2} \pm 1\frac{1}{2}\%$  in the plastic or fresh concrete.

## Preconstruction Trial Mix

It is strongly recommended that trial mixes be made several weeks before construction start up. This will allow the concrete producer an opportunity to determine the proper batching sequence and amounts of other admixtures needed in order to deliver the required concrete mix to the job site. Due to the cement response variation it is vital that set time and slump retention of the proposed mix be thoroughly tested and evaluated in the light of job requirements. GCP broad experience with this product can help the concrete producer deliver satisfactory product regardless of the mixture proportions. Contact your local GCP representative for help with trial mixes.

## Addition Rates

Recommended addition rates range from 10 to 25L / m<sup>3</sup>. The level of corrosion protection increases in proportion to the dosage. The project specification will indicate the addition rate. In the absence of a specified dosage, or where needed to offset pre-mixed chlorides, call your local GCP representative.

## Cement Compatibility

DCI<sup>®</sup>N Corrosion Inhibitor is compatible with all types of portland cement, and concretes containing pozzolans and SCM's. However, due to the significant variation between cements, there may be differences in response to DCI<sup>®</sup>N. This is especially true with respect to the effect on setting time, which also influences slump retention.

## Mix Water Reduction

Mix water adjustment is essential to account for the water in DCI<sup>®</sup>N and thus maintain the desired water-cement ratio. The mix water added at the batch plant must therefore be reduced to compensate for the addition of the corrosion inhibitor. The adjustment factor of 0.78kg of water per litre of DCI<sup>®</sup>N. A high range water reducer such as ADVA<sup>®</sup> may be used to maintain workability in low watercement ratio concrete.

## Finishing and Curing

Concrete containing DCI<sup>®</sup>N Corrosion Inhibitor finishes with standard tools and techniques. It is no different from any other air-entrained, low water-cement ratio mix in terms of finishability.

## Packaging and Availability

DCI<sup>®</sup>N Corrosion Inhibitor is available in bulk quantities by GCP metered systems, or in 208L drums.

## Dispensing Equipment

Please contact your local GCP representative for further information regarding the dispensing equipment for this product.

## Freezing Point

DCI<sup>®</sup>N freezes at approximately -15°C, but its corrosion inhibition and strength gain properties are completely restored by thawing and thorough agitation.

## Health and Safety

See DCI<sup>®</sup>N Material Safety Data Sheet or consult GCP Applied Technologies.

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