

# DCI<sup>®</sup>

Corrosion Inhibitor

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## Product Description

DCI<sup>®</sup> Corrosion Inhibitor chemically inhibits the corrosive action of chlorides on reinforcing steel and prestressed strands in concrete. It also promotes strength development of the concrete while meeting ASTM C 494 requirements as a Type C admixture. DCI is a ready to use liquid added to concrete during the batching process. One litre of DCI weighs 1.28kg  $\pm$  0.02kg and contains a minimum of 30% calcium nitrite.

## Applications

DCI is recommended for all steel-reinforced, post-tensioned and prestressed concrete that will come in contact with chlorides from deicing salts, soils or a marine environment. Examples are chloride contaminated soil support structures, bridge decks, pre-stressed members, and soil structures in marine environments. It may also be used in concrete where chlorides are added during manufacture.

## 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 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; and, 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 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 maintains an active corrosion-controlling system within the concrete matrix.

## Addition Rates

Recommended addition rates range from 10 to 30L/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 premixed chlorides, call your Grace admixture technical representative. DCI also increases the early strength of a concrete mixture and may have an accelerating action on setting time. These effects become more pronounced as the addition rate rises. Control of setting time can be achieved with retarding admixtures (see Set Acceleration).

## Mix Water Reduction

Mix water adjustment is essential to account for the water in DCI 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 is 0.84kg of water per litre of DCI. A highrange water reducer such as Daracem<sup>®</sup>100 or Daracem 19 may be used to maintain workability in low water-cement ratio concrete

## Compatibility with Other Admixtures

DCI 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.

## Set Acceleration

At all recommended addition rates, DCI corrosion inhibitor may accelerate concrete setting times, which may also aggravate slump loss. To extend the set time to a more normal duration, you can use the set neutralising DCI S or separately add a retarder such as DARATARD<sup>®</sup>17 or Daratard HC. In most cases, adjusting the dose of superplasticiser will be sufficient. The full accelerating action of DCI may actually be desirable during the cool months of the year.

## Air Entrainment

DCI 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 generally will show requirements of  $7\frac{1}{2} \pm 1\frac{1}{2}\%$  in the plastic or fresh concrete.



## Cement Compatibility

DCI corrosion inhibitor is compatible with all types of portland cement, and concretes containing pozzolans. However, due to the significant variation between cements, there may be differences in cement response to DCI. This is especially true with respect to the effect on setting time, which also influences slump retention.

## 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 and the strong acceleration potential of DCI, 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's 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.

## Finishing and Curing

Concrete containing DCI 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. Curing procedures must follow ACI 302 and ACI 308.

## Packaging and Availability

DCI 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 freezes at approximately  $-15^{\circ}\text{C}$ , but its corrosion inhibition and strength gain properties are completely restored by thawing and thorough agitation.

## Health and Safety

See DCI Material Safety Data Sheet or consult GCP Applied Technologies.

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