ELEMENTS
QUÍMICA APLICADA

5 CO I

Corrosion inhibitor – calcium nitrite base

e⁵ CO I

Description

e⁵ CO I is a liquid inhibitor of, chloride induced, steel corrosion in reinforced concrete. **e⁵ CO I** contains calcium nitrite, which is an anodic corrosion inhibitor.

It acts in two ways. It helps as a catalyst, in the passivating reaction of steel, and by rising the chloride threshold for the beginning of corrosion. It improves the durability of structural concrete by providing high corrosion resistance in the most severe exposure conditions.

e⁵ CO I is recommended for concretes exposed to chlorides, whether external, throughout the life of the structure, or internal as part of the composition of the concrete itself.

Concrete can have an internal source of chlorides if, for example, unwashed marine sands and gravels are used. The use of **e⁵ CO I** can avoid costly expenses related to washing, purifying and transportation of these materials. **e⁵ CO I** is also a set and hardening accelerator. It Works as an antifreeze, that is, it reduces the setting time, favoring early strength development, that is maintained through time. This allows the concrete to develop strength in freezing conditions, even down to -5 °C.

Calcium nitrate contributions

High quality concrete has a high pH environment. This helps to maintain the natural iron oxide coating over the reinforcing steel.

This iron oxide coating, known as passive layer (specifically ferric oxide), protects the reinforcing steel against oxidation. The ferric oxide protective layer, over the steel surface, has ferrous oxide microscopic defects. The chloride ions, that reach the steel, give rise to a localized puncture on the steel in these defects. It is on these punctures that the rusting process begins.

The formation of corrosion products can stain, crack and peel the concrete. The calcium nitrite prevents the chloride ions from reacting with the ferrous ion defects of the ferric oxide, thus protecting the steel in the concrete.

Applications

e⁵ CO I is used in steel reinforced concrete for exterior applications, conventional and structural concretes, pavements, prefab elements, prestressed and post-tensioned elements, parking garages and decks exposed to environments that promote corrosion damage.

Technical information and benefits

- It chemically inhibits the corrosion process.
- Decreases the need to use accelerating admixtures in cold climates.
- The dosage is directly associated with the expected concentration of chlorides.
- Increases the protection for concrete reinforcement.
- It improves the durability of structures.

PHYSICAL DESCRIPTION of e⁵ CO I	
Appearance	Brown color liquid
Concentration	
pH	12.0 ± 0.5
Density	1.23 kg/L ± 0.02
Freezing point	-10 ° C (14 ° F)

Effect on setting

e5 CO I can change the setting times at all recommended dosages. In such cases, and if it is desirable to offset this acceleration, the recommendation is to use a compatible-base **ELEMENT5** admixture. Consult with your **ELEMENT5 Quimica Aplicada S.A. de C.V. Technical Advisor.**

Entrained air

e5 CO I can slightly decrease the concrete´s air content. It might be necessary to increase the dose of the air entraining admixture to compensate for this. If required, **e5 CONTROL AIR** is an acceptable air entrainer. Both admixtures must be added separately to the concrete mix.

Slump

e5 CO I has a very light effect on the concrete´s initial slump. However, before delivering concrete to the job, we recommend performing lab tests, as with any other product. This will allow the ready mix producer to determine the proper mixing sequence and the required dosage, of other necessary admixtures, to deliver the specified mix on the job site. If workability retention is required, consult with your **ELEMENT5 Química Aplicada S.A. de C.V. Technical Advisor** to adjust the mix design with an adequate admixture system.

Directions for use

e5 CO I can be added with the concrete mix water. It should not be mixed with any other admixture before placing in the concrete mixer. Our technical department will provide you with the mix design and will give you the most adequate recommended order of admixture addition. Nitrite to chloride ratio is important. Project specifications will indicate or specify the necessary amount of protection against chloride ions.

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A main advantage in the use of **e5 Co I** is that the designing engineer can use rational proceedures. These can be based on historical chloride exposure data, concrete quality, thickness of concrete cover over reinforcing steel, chloride ion permeability test results, and the **e5 CO I** dosage for a useful-life design, based on the expected chloride rate.

Water reduction of the mix: It is necessary to adjust the mix water and to consider the water available in **e5 CO I**. Decrease three (3) liters of water for each four (4) liters of **e5 CO I**. Wash tools and equipment with water before concrete hardens.

e5 CO I is compatible with all types of portland cements, concretes, and concretes with puzzolanic additions. It can be used in concrete mixes with other admixtures, including air entrainers, water reducers, retardants, super plasticizers, permeability reducers through cementitious crystallization, silica fume or microsílica, and slag. Each addition must be separately incorporated into the mix.

Additional protection can be achieved using high range water reducing admixtures to reduce the water/cementitious materials ratio. Likewise, a microsílica based admixture or a permeability reducer, through cementitious crystallization, can be used to reduce the concrete´s permeability.

e5 CO I

Dosage / yield

When the protection level for chloride ions is not specified, you can consult a dosage-base, such as the following:

e5 CO I L/m3 to chlorides (Cl -) kg/m3 ratio
9.90 to 3.60
12.70 to 4.80
14.80 to 5.90
17.30 to 6.90
19.80 to 7.70

Table 1. **e5 CO I** dosage vs chloride protection

Technical information

200 L drum, 18 kg pail and bulk

Useful life / storage

Useful life: 1 yr in its original closed container

Store at temperatures above -10 ° C (14 ° F)

The corrosion inhibiting potential of **e5 CO I**, if frozen, is fully recovered upon thawing and mixing. Avoid contact of this admixture and fire. Keep the container well closed and in a fresh and dry place. Store this product in the range of -10 ° C and 30 ° C, with protection from direct sunlight. Handle with gloves and eye protection. In case of accidental contact with skin and eyes, immediately wash thoroughly with abundant water. If discomfort persists consult with a specialist.

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