Concrete Resistance to Sulfates: the Benefit of Admixtures

Introduction

Experience has shown that chemical admixtures generally aid in making concrete more resistant to attack by sulfates. This enhancement in durability is realized through the use of air-entraining and/or water-reducing admixtures.

Benefits of Air Entrainment

The purposeful entrainment of air in concrete, using Daravair® and Darex® air-entraining agents, protects against sulfate attack in the same manner as it protects against freezing and thawing. The air voids provide microscopic expansion chambers for relief of the pressure that is built up in the concrete by the growth of the sulfate crystals. Air entrainment does not provide permanent protection, but it does delay the deterioration for a period of time depending upon factors such as the concentration of soluble sulfate and the cycles of wetting and drying, which promote the crystal growth.

Benefits of Water Reduction

Water-reducing admixtures, such as WRDA®, Daratard®, MIRA®, Daracem® or ADVA® products, produce low water/cement ratio concretes which develop greater strength and provide greater resistance to deterioration caused by the growth of salt crystals within the concrete mass. Also, properly-proportioned mixtures containing water-reducing admixtures can be better-consolidated, thus producing denser, less-permeable concrete.

Caution with Calcium Chloride

Calcium chloride or admixtures containing high quantities of calcium chloride should not be used in concrete that is to be exposed to sulfate attack. It has been shown that calcium chloride reduces sulfate resistance regardless of the type of cement used.

Conclusion

In addition to producing air-entrained concrete with a moderate water content (not more than 0.45 water/cement), it is also good practice to use Type II cement where mild sulfate attack may be encountered and Type V cement is a must where the attack may be more severe.

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