

CORROSION RESISTANCE OF PRECAST CONCRETE STRUCTURES

Corrosion of reinforcing steel in precast concrete structures is seldom a problem when compared with cast-in-place concrete construction. High quality precast concrete with compressive strengths typically between 5,000 and 6,000 psi and a low water-cement ratio of 0.40 or less is well known for preventing corrosion.



Another important factor for good corrosion resistance is providing adequate concrete cover for the reinforcing steel, which is readily accomplished in a PCI Certified plant-controlled environment. Concrete cover is the minimum clear distance from the reinforcement to the face of the concrete. The ACI 318 Building Code recommends a cover of 1 ½ inches for reinforcing steel in precast concrete vs. 2 inches for cast-in-place concrete subject to deicing salts.

Corrosion is an electrochemical process that requires an anode, or area of oxidation, and a cathode, or area of reduction. In the

case of concrete reinforcement, the anodes and cathodes are elements of steel reinforcing bars, welded wire fabric or strand. The process requires oxygen and an electrolyte, in this case, water and chloride ions, which are the major cause of premature corrosion of reinforcing steel.

Deterioration can occur in harsh climates due to freeze/thaw cycles and the corrosive effects of deicing salts. Therefore, the design criteria, for example, to be considered in the design of any parking structure should include the following:

- Concrete quality
- Proper surface drainage
- Concrete cover over reinforcing steel
- Surface sealers
- Crack prevention design
- Construction joint and control joint sealants

High quality precast concrete provides excellent corrosion protection of reinforcing steel for most weather conditions. Even in moderate to severe aggressive environments, precast concrete can provide excellent protection with proper attention to mix designs, steel stress levels and the extent of cracking under service loads, and the thickness of concrete cover. Only when these protection measures are not feasible is it necessary to consider alternate ways of protecting the reinforcing steel, such as galvanized, epoxy-coated or carbon-fiber reinforcement or calcium nitrite corrosion inhibitors in extremely severe environments. Precast concrete structures do not rust, rot or degrade when exposed to adverse weather conditions and require much less maintenance and upkeep than conventional wood or steel construction.