

Market

Building

Application

Structural Strengthening/ Concrete Repair and Protection

Focus

Reinforcing Steel Corrosion

Project: Harmon Hall, United States Air Force Academy
Owner: United States Air Force
Contractor: Weston Solutions
Engineer: S.A. Miro Engineering
Year: 2006

The Problem

Harmon Hall, a three story building that houses the administration offices at the United States Air Force Academy, is supported by 40 steel columns which are encased in sleeves made of brushed stainless steel.

During the course of demolition of the Plaza deck, to repair what was thought to be a minor waterproofing problem, the stainless steel sleeves had to be removed from the column supports. When the sleeves were removed, which was well into the project, an unforeseen condition was brought to the engineer's attention that the columns were corroding.

The fireproofing materials that had been applied to the columns before they were originally encased in the 1950's were wicking moisture up from under the plaza deck. This was causing anywhere from mild to severe corrosion approximately 4-5 feet up on all 40 of the columns.



Some of the columns had significant section loss and were of great concern to the engineer; therefore a solution to repair the columns was needed immediately. All other renovations to the building, interior and exterior, were halted until the engineer felt the support columns could be strengthened. Several different approaches of repair were investigated.

The Sika Solution

The engineer reviewed several options and decided on applying Sika CarboDur strips to the surface of the columns. This would provide the safety factor required in the columns and would not change the dimensions of the columns significantly. This would allow for the re-use of the existing stainless steel sleeves that were removed from the columns and save over \$200,000 in the total cost of the project, while maintaining the original look of this historic building.

After the CarboDur was applied, the columns were then coated Sikagard 62 epoxy coating to protect them from future corrosion.



Sika Galvashield sacrificial galvanic anodes, which utilize a zinc core which should corrode preferentially to the adjacent steel, were placed at the base of the columns to prevent corrosion of the embedded portion of the steel columns. The columns were then embedded with a total of 315 cubic feet of SikaQuick 2500 repair mortar that was extended with aggregate. The fast setting repair mortar was chosen over traditional concrete for its fast cure capability, which was critical in this cold weather application.

Repair Systems Utilized

Sikagard® 62 Epoxy: A 2-component, 100% solids, moisture-tolerant epoxy resin. It produces a high-build, protective, dampproofing and waterproofing vapor-barrier system.

Sika® Galvashield® XP: Embedded galvanic anodes are used in concrete rehabilitation to prevent the formation of new corrosion sites adjacent to completed patch repairs. Sika Galvashield XP consists of a sacrificial zinc core that is activated by the surrounding specially formulated cementitious mortar. The small puck-shaped anode [2.5 in. (64 mm) diameter by 1.1 in. (27 mm) high] is quickly and easily fastened to the exposed reinforcing steel. Once installed, the zinc core corrodes preferentially to the surrounding rebar, thereby providing galvanic corrosion prevention to the adjacent reinforcing steel.

Structural Strengthening Systems CFRP

Sika CarboDur®: A proven system of external strengthening using epoxy-bonded Carbon Fiber Reinforced Plastic (CFRP) laminate strips. Stronger than steel, yet lightweight and non-corrosive, this system can solve unique strengthening problems in a variety of concrete structures.

High Performance Repair Mortar

SikaQuick® 2500: A 1-component, very rapid hardening, early strength gaining, cementitious, patching material for concrete.



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