



Recipient of the 2005 ICRI Award of Excellence,  
Historic Category!

## Product Information

Market

Historic Structure

Application

Concrete Repair and Protection

Focus

Chloride and Carbonation  
Induced Corrosion

Project: Alcatraz Cellhouse  
 Owner: National Park Service  
 Specifier: WJE Associates, Inc.  
 Contractor: Watertight Restoration, Inc.  
 Year: 2004

### The Problem

Alcatraz is one of the most famed tourist sites in the United States and welcomes nearly 1.4 million visitors annually. "The Rock" was made famous as a prison that was virtually inescapable because of its remote location in the middle of San Francisco Bay, and its notorious occupants, including Al Capone, "Machine Gun" Kelly and others. It has also been depicted by Hollywood in films such as "Escape from Alcatraz," "Birdman of Alcatraz" and "The Rock."



What most people do not realize is that the Alcatraz Cellhouse, the most visited and prominent building on Alcatraz Island, was also the largest reinforced concrete building in the world at the time of its completion in 1912. It was reinforced with "Ransome" bars, a patented square and twisted style of rebar that was sometimes used in the early 20th century concrete buildings.

It is ironic that what made Alcatraz so famous and difficult for prisoners to escape from, was also the cause of its demise. The cold salt waters of San Francisco Bay and the windy conditions of the area caused airborne chlorides to deposit themselves onto the concrete structures, and after decades of exposure and neglect, ultimately penetrate through the concrete to the steel reinforcement. In addition, atmospheric carbon dioxide also caused the concrete to become carbonated over the years, lowering its pH, and causing corrosion of the reinforcing steel. The structural degradation of the structures on Alcatraz Island, along with the high operating costs of the prison, caused Attorney General Robert F. Kennedy to shut down Alcatraz as a penal institution in 1963.

Alcatraz was occupied by various activist groups over the next decade with little attention made to maintenance or upkeep. During this time, the structures continued to degrade, and chloride induced corrosion caused the rebar to expand, cracking and ultimately spalling the concrete. It was not until 1972 that Alcatraz Island was turned over to the Golden Gate National Recreation Area. However, due to limited funds, another 30 years passed before any significant rehabilitation program took place on Alcatraz. When money finally became available, a major concrete repair and seismic strengthening program was initiated.

### The Sika Solution

Alcatraz is a contributor to the National Historic Landmarks District at Alcatraz. As such, it was crucial that the appearance of the building remain as close as possible to the original structure. Board forms were used for the repair mortars to replicate the original formwork used back in the early 20th century. In addition, a number of cells had graffiti painted on the walls. The contractor made all repairs around the graffiti in order to maintain the original appearance of the barracks.

A number of repair systems were utilized on this project, including:

- Anti-corrosion coating/bonding agent
- Hand applied, polymer-modified, anti-corrosion, cementitious repair mortar
- Low viscosity, epoxy resin for crack injection
- Fiberglass fabric (GFRP) wrapped around columns for roof support and seismic strengthening
- Carbon fiber (CFRP) fabric on roof adjacent to skylights



Case Study

**Sika**

## Sika's System approach to Concrete Repair and Protection

### Anti-Corrosion Primer and Bonding Bridge

**Sika Armatec® 110 EpoCem®** - protects rebar in areas of inadequate cover.

### High-Performance Repair Mortars

**SikaTop® PLUS** - two-component, polymer modified mortar containing Sika FerroGard 901 corrosion-inhibitor.

Sikacem mortars are machine-applied by dry-spray equipment for large scale repairs.

### Problem Joints/Cracks Sealing System

**Sikadur® Combiflex®** - a unique strip and seal system used to seal problem joints and cracks, even those undergoing extreme movement.

### Hard Wearing Epoxy Overlay

**Sikadur® 22 Lo-Mod** epoxy resin will provide decorative hard wearing, slip resistant, overlay systems for balconies not requiring a crack bridge membrane.

### Joint Sealing

**Sikaflex®, High Performance Sealants** - are premium-grade polyurethane joint sealants that are fully compatible with Sika's concrete repair systems.

### Anti-Carbonation Coatings

**Sikagard® 550W and 670W** - protect concrete facades from the damaging effects of carbon dioxide (carbonation), water and pollutants. Either crack-bridging (550W) or rigid (670W), both are high-performance protection coatings, available in a variety of decorative colors.

### Epoxy Injection and Bonding

**Sikadur®** - epoxy resins help restore structural integrity by injection into cracks and voids. The most comprehensive range of epoxy products for structural bonding and grouting.

### Structural Strengthening Systems CFRP

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

**SikaWrap®** - Carbon and Glass Fiber Fabrics wrap around concrete and masonry structures for repair and strengthening.

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Contact Sika at:  
Phone: 1-800-933-SIKA (Nationwide)  
Internet: [www.sikaconstruction.com](http://www.sikaconstruction.com)



Sika Corporation  
201 Polito Avenue  
Lyndhurst, NJ 07071  
Phone: 800-933-7452  
Fax: 201-933-7326

Sika Mexicana S.A. de C.V.  
Carretera Libre Celaya Km. 8.5  
Corregidora, Queretaro  
C.P. 76920 A.P. 136  
Phone: 52 42 25 0122  
Fax: 52 42 25 0537

Sika Canada, Inc.  
601 Delmar Avenue  
Point Claire, Quebec H9R4A9  
Phone: 514-697-2610  
Fax: 514-694-2792