February 14, 2006

Honorable Mayor and Members of
the Hermosa Beach City Council

Regular Meeting of
February 28, 2006

PIER DECK CONCRETE COATINGS – INSTALLATION OF SURETREAT TOTAL PROTECTION SYSTEM

Recommendation:

It is recommended that the City Council:

1. Authorize the Public Works Director to obtain bids from qualified contractors to install the (sole source) Suretreat® Total Performance System on the pier concrete deck; and

2. Approve the transfer of funds required for the project from the remaining funds available in the Pier Renovation, Phase III Project.

Background:

The existing epoxy paint coatings on the reinforced concrete deck surface of the pier is exhibiting signs of severe wear from exposure to the elements. This coating was applied in 2000. Public Works Staff has identified Suretreat® as a product perfectly suited for this application that will mitigate the corrosion activity, reduce porosity, increase surface hardness and protect the pier concrete deck from chloride intrusion and other environmental contaminants.

Analysis:

Staff has evaluated several conventional products that will provide longer protection of the pier concrete deck, with reduced maintenance requirements. Staff recommends removal of all existing coatings by shot blasting and the application of Suretreat®, which is a penetrant that protects the concrete and steel reinforcement from corrosion. Attached is a list of similar projects that have successfully utilized Suretreat® for high salt environments such as the pier. Suretreat® offers a 5-year warranty for product defect (100% replacement). By providing better protection of the pier deck concrete and reinforcing, future maintenance will be reduced to re-application of coatings in lieu of the shot blasting and extensive crack, concrete and joint repairs. Currently Suretreat® has been installed on similar applications where re-application has not been required for up to 17 years to date.

The Engineer's estimate for the project is as follows:

ITEM	QUANITY	UNIT	PRICE/UNIT	EXTENSION
SURETREAT MATERIALS	24000	SF	$ 1.50	$ 36,000.00
SHOT BLASTING	24000	SF	$ 1.15	$ 27,600.00
APPLICATOIN	24000	SF	$ 0.50	$ 12,000.00
CONCRETE REPAIR, CRACK FILLING & JOINT REPAIRS	1	LS	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 90,600.00**
CONTINGENCY (15%)				$ 13,590.00
PROJECT ADMINISTRATION				$ 18,120.00
TOTAL ESTIMATED COST				**$ 122,310.00**

By comparison, other epoxy or polyurethane coating systems similar to that previously applied to the pier deck require much more frequent re-applications at an estimated cost up to 1.5 times that of the above estimate to remove the existing coatings and install the Suretreat® system. Future applications of Suretreat® would be substantially less considering fewer expected concrete and joint repairs due to enhanced deck protection and the only surface preparation required would be power washing in lieu of shot blasting.

Fiscal Impact:

Funding for this project will be transferred from the approximately $400,000 remaining in the Pier Renovation Phase III Project. (Final available amount pending completion of staff administration activities to close out the project).

Accordingly, it is recommended that Council authorize the Public Works Director to obtain bids for the application of the sole source Suretreat® products, authorize transfer of $125,000 in available funds remaining in the Pier Renovation, Phase III Project Capital Project Fund (301-8630-4201).

Attachments: Suretreat® product information and list of similar projects.

Respectfully submitted,

Dino D'Emilia, P.E.
Interim CIP Manager

Concur:

Richard D. Morgan, P.E.
Director of Public Works/City Engineer

Noted for fiscal impact:

Copeland (by wjm)
Viki Copeland,
Finance Director

Concur:

Stephen R. Burrell
City Manager

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PROJECTS

parking structures

Allright Parking, Inc./Columbus, OH, Memphis, TN & Milwaukee, WI
CSC/Austin, TX
Downtown Parking Corporation/San Francisco, CA
Farm Bureau Insurance/Indianapolis, IN
Garden State Plaza/Paramus, NJ
Holiday Inn Hotel/Pittsburgh, PA
Isaac's Parking Service/Milwaukee, WI
Mellon Bank/Pittsburgh, PA
Miller Parking Company/Chicago, IL
Select Properties/New Orleans, LA
Springfield Parking Authority/Springfield, MA
Pittsburgh Parking Authority/Pittsburgh, PA
Western Pennsylvania Hospital/Pittsburgh, PA

industrial facilities

Army Corp of Engineers/Geneva, PA
The Boeing Company/Long Beach, CA
Exide Corporation/Reading, PA
Johnson Controls, Inc./Ft. Wayne, IN
Sears Roebuck/Reading, PA
Trane/Clarksville, TN

utilities

Dept. of Energy-Fluor Daniel Environmental/Fernald, OH
Detroit Edison Company/Detroit, MI
Duquesne Light Company/Shippingport, PA
Harrisburg Steam Works/Harrisburg, PA
Mississauga Hydro/Ontario, Canada
Passaic Valley Sewage Commissioners/Newark, NJ
Pennsylvania Power Company/Shippingport, PA
Pennsylvania State University/University Park, PA
United States Steel Group-USX Corporation/Clairton, PA
Westinghouse Materials Company/Fernald, OH

historic building restoration

New Jersey State House Annex/Trenton, NJ

coastal facilities & water front properties

Blue Lagoon Seawall/Laguna Beach, CA
Chart House Restaurant/Redondo Beach, CA
Clear Channel Communication/Richmond, CA
Doremus/Newark, NJ
Mokpo Korean Navy Base/Seoul, South Korea
Ocean City Longport/Ocean City, NJ
Oceanfront Properties/Various locations, FL
Port Authority of Allegheny County/Pittsburgh, PA
Port of Hueneme, CA
Port of Long Beach, CA
96th Street Bridge/Cape May, NJ

treatment, storage & disposal

AST/Louisville, KY
California Sulphur Company/Wilmington, CA
Essex Waste Management Services, Inc./Kingsville, MO
Laidlaw Environmental Corporation/Phoenix, AZ

highways, roads & bridges

Canadian Pacific Railway (Delaware Hudson Division)/ Hallstead, PA
Federal Highway Administration/Plumas National Forest, CA
Missouri Department of Transportation/Randolph Cnty,
MO New Jersey Turnpike/Princeton, NJ
New York State Thruway/Albany, NY
Oklahoma Dept. of Transportation/Sayre, Erick, OK
Pennsylvania Department of Transportation/Pittsburgh, PA
Pennsylvania Turnpike Commission/Reading, PA
San Luis Pass Bridge/Galveston, TX
Toronto Metropolitan Transportation/Ontario, Canada
West Virginia Department of Transportation/Charleston, WV

food processing facilities

Cargill, Inc. (Salt Division)/Hutchinson, KS
Leprino Foods/Waverly, NY

PROJECTS

property management companies

IBM Corporation/Manassas, VA

Oakridge Condominium Complex/Oakmont, PA

Oxford Development Company/Pittsburgh, PA

airports

Boeing/Long Beach, CA

NASA KSC/Cape Kennedy, FL

Logan International Airport/East Boston, MA

McConnell A.F.B./Wichita, KS

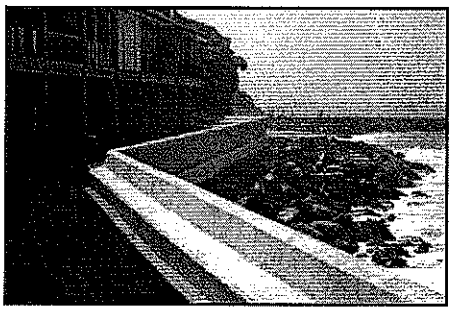
Pawtuxent Naval Base/MD

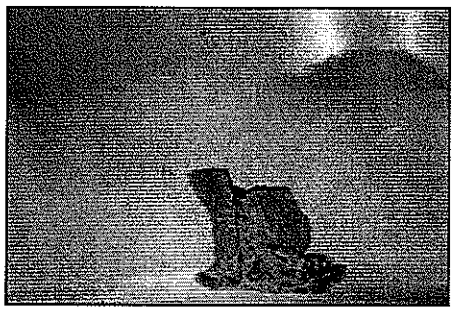
Seymour Johnson Air Force Base/Goldsboro, NC

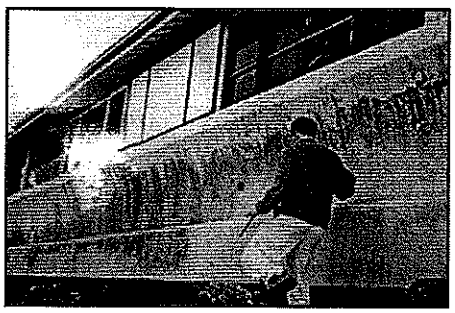
Warner Robins Air Force Base/Warner Robins, GA

PROJECT SYNOPSIS

customer	Blue Lagoon Condominiums
location	Laguna Beach, California
structure	Seawall
date performed	2003







problem

The Blue Lagoon Condominium seawall has had constant exposure to the extreme environment of the Pacific Ocean. The result of this has been the contamination of the wall by chlorides (Sea Salts) and other air/water borne contaminates. While the wall was in fairly good shape, cracks have begun to form and there was disbonding of the overlay. While the cracks were not prevalent through the entire wall they did represent a direct pathway for moisture and contaminates to infiltrate the structure and reach the reinforcing steel.

solution

Testing and analysis determined that three formulations were to be used. Firstly, before the installation of Surtreat, the wall was power washed to remove all embedded dirt, as well as any other contaminants that may have impeded the penetration of Surtreat formulations. Secondly, any loose overlay material that had disbonded was removed. The surface cracks were saw cut and filled with epoxy and the spalled areas of the seawall were patched. Lastly, the multi-coat overlay material was applied to match the existing finish of the wall, followed by a color coat to match the existing finish.

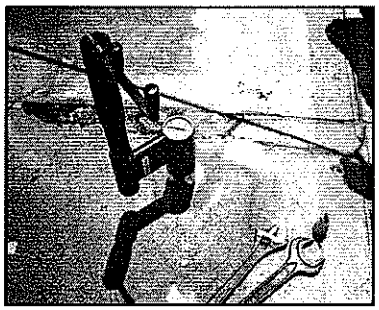
Once the seawall had been properly cleaned and repaired, the first formulation was applied. This formulation travels in a vapor phase and was applied by use of a pressure fed roller and sprayer. It was designed to reestablish the protective film at the reinforcing steel level. The second formulation was designed to penetrate the concrete anywhere from 2-4 inches penetrating and reacting with the cement paste and gel pores to decrease porosity, control pH, extract and displace chlorides and provide an additional layer of protection at the rebar level. Spray units and pressure fed rollers were used to apply the 2nd formulation.

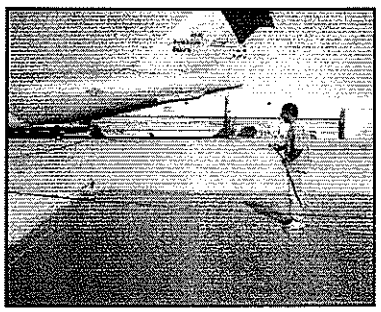
The final application consisted of a formulation that was designed to provide the greatest level of protection near the surface. This was important in providing resistance to acids and chemicals in the surrounding environment. Once again, this application was completed using spray units and pressure fed rollers.

Due to the continued extreme environment of the Pacific Ocean it is recommended to the customer that the wall be cleaned on a periodic basis to wash the surface chlorides and dirt that causes mildew to form on the wall. An annual inspection of the seawall to monitor the structure was also recommended.

PROJECT SYNOPSIS

customer	Boeing
location	Long Beach, California
structure	Ramps
date performed	2001





problem

Random fine cracks have developed on these 13 inch thick concrete assembly ramps as a result of the loading and unloading of C-17 aircraft taxiing across them over time. The cracks have enlarged, and additional small cracks have propagated from them. These cracks lead to the formation of concrete fragments, foreign object debris (FOD), which can become airborne and have the potential of being sucked into jet engines causing major damage to the aircraft.

Boeing has investigated various methods including epoxy injection for stabilizing the concrete surface to prevent fragmentation and FOD.

Surtreat was invited to conduct a demonstration of the SURTREAT® concrete protection and restoration process on a section of one of he ramps.

solution

The SURTREAT® process involved the surface application of chemical formulations, which penetrate the surface to a minimum depth of 2 inches, and react with the cement phase to increase strength, decrease porosity, and inhibit rebar corrosion and cement chemical degradation.

Surtreat applied TPS II to a section of taxiway surface on August 17, 2001. Multiple applications of TPS II were made. Concrete compressive strength was measured before and after applications of TPS II in accordance with ASTM Testing Procedure C900-01. The after application measurements were taken 84 days later on November 10th, 2001.

test results & conclusions

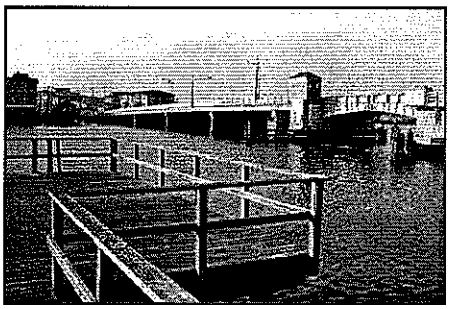
Concrete strength is determined by measuring the force in kilo-Newton's (kN) required to pull a 2 x 1 inch plug from the concrete surface. This force is also expressed in the more conventional psi compression strength scale.

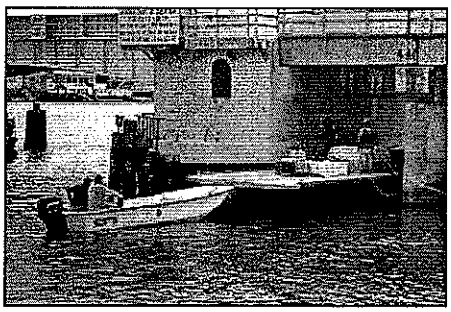
Condition	Pull Out Strength kN	Relative Compresion Strength-psi
Before Application	31	4,842
After Application	49	7,875
Change	18	3,033
Percent Change		62.6

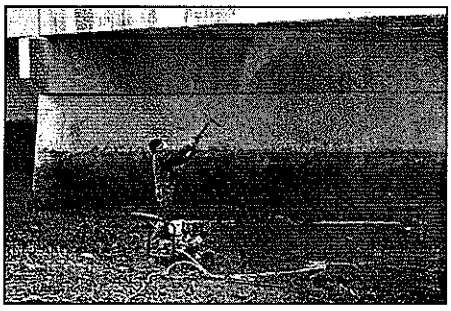
The increase in overall strength is very significant in percentage terms, and demonstrates how Surtreat formulations can increase the surface strength of concrete. It is anticipated that the increase may be even greater in areas along the crack faces, which have become weak and are prime sources of fragments and FOD. SURTREAT inhibits the formation of FOD by increasing concrete strength.

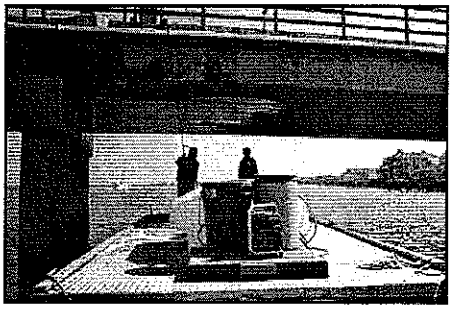
PROJECT SYNOPSIS

customer	Cape May County
location	Cape May County, New Jersey
structure	96th Street, Stone Harbor Bridge
date performed	2002









problem

Surtreat was asked to examine the 96th Street, Stone Harbor, Bridge located in the Cape May County of New Jersey. The reason for the examination was the visual display of spalls located on the underside eastern abutment of the bridge surface. Surtreat performed a variety of tests to determine contributing causes of the damage. Those tests were corrosion rate, determined by the Galva Pulse, chloride content and ph levels. A compressive strength analysis had already been established.

The Corrosion rate as measured by the Galva Pulse indicated active corrosion at the rebar level. Tests were completed at two different locations and both locations indicated corrosion rates at levels above 30 µm/yr. Readings above 30 µm/yr are considered to be of significant concern.

The chloride content was significantly high at three tested locations with readings of 1900, 2200 and 5500 parts per million (ppm). At three other tested areas the readings showed 500 + ppm. Corrosion opportunity is actively increased once the chloride ppm levels exceed 250 ppm.

The ph of the concrete was 12. This is not unusual for a bridge of this age.

The compressive strength was 5500 psi per Andrew Foden of Parsons Brinckerhoff. This is consistent with bridges of this age.

solution

Surtreat was asked to provide a turnkey solution that would inhibit corrosion throughout the entire underside of the bridge deck and abate further concrete deterioration caused by the penetration of water, chlorides and other contaminants. Through use of proprietary technology and site-specific solutions, Surtreat supplied a certified application of Surtreat formulations to protect existing and repaired concrete by inhibiting corrosion. Surtreat is unique in the industry because of our ability to cost effectively attack the causes of concrete corrosion and deterioration on many levels.

Once the patch work and repairs to the spalled areas was complete, the scope of work called for Surtreat's certified applicators to clean the concrete surfaces to remove surface chlorides, grime and debris. This was done with a high pressured power washer. Once cleaned the application of Surtreat formulations began. The work was completed in five days.

With the use of an 11 x 35 foot barge and by working with high and low tides two Surtreat formulations were applied using mechanical sprayers from underneath the bridge.

The first formulation, TPS XII, was applied by means of a mechanical sprayer. TPS XII is a vapor phase corrosion inhibitor that migrates through the concrete pores and cracks to the reinforcing steel. Once it reaches the steel, it will establish a protective or passivating film on the steel's surface, abating future corrosion activity.

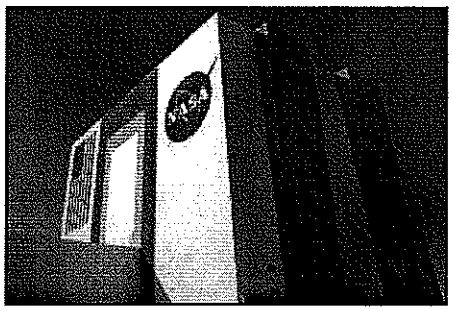
The second formulation, TPS II, was also applied using a mechanical sprayer. TPS II is a liquid phase migratory corrosion inhibitor that will absorb through the cracks and concrete pores. TPS II will also establish a passivating film on the surface of the reinforcing steel. Additionally it will reduce the porosity of the smaller pores -typically 2 to 3 inches below the deck's surface. TPS II will also chemically encapsulate chloride contaminants, increase the compressive strength, and increase concrete's surface hardness.

Through the application of Surtreat formulations, we achieved post application corrosion rate readings that had an average of 11 µm/yr, well under the 30µm/yr threshold for active corrosion.

All work was completed in five days and testing will be completed annually to substantiate the passive level of corrosion rate.

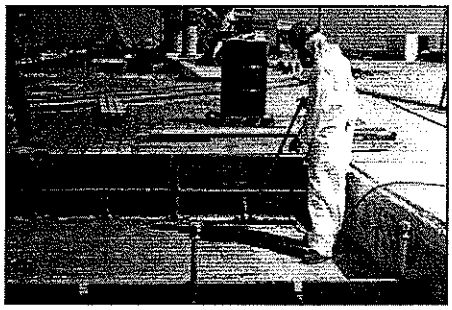
PROJECT SYNOPSIS

customer	NASA
location	Kennedy Space Center - Cape Canaveral, Florida
structure	Rocker Panel Base, Launch Pad 39A
date performed	1999



the problem

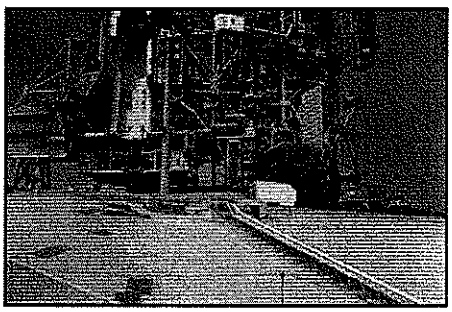
The Rocker panel base of Launch Pad 39A was experiencing severe concrete deterioration from exposure to a combination of corrosive atmospheric chlorides and fuel emission potassium percolate producing hydrochloric acid effluent from the shuttles rocket combustion system. Surface deterioration combined with wearing and cracking was allowing water to leak though the panel base to a tunnel below. Also, advanced corrosion of the imbedded steel in the structure and chloride contamination was contributing to the demise of the structure.



the solution

To arrest further deterioration and corrosion, Surtreat formulations were applied to improve the chemical and physical properties of the concrete. The formulations that were chosen for this project inhibit deterioration; improve durability and longevity of the structure by:

- Substantially reduces porosity
- Elevates and controls pH
- Reacts with concrete to purge and stabilize contaminants (chlorides)
- Increases compressive strength
- Increases hardness
- Increases surface adhesion
- Converts ferrous oxide (rust) into hard inert shell
- Re-passivates white steel to half further corrosion
- Resists attack and penetration by acids, salts, and other contaminants



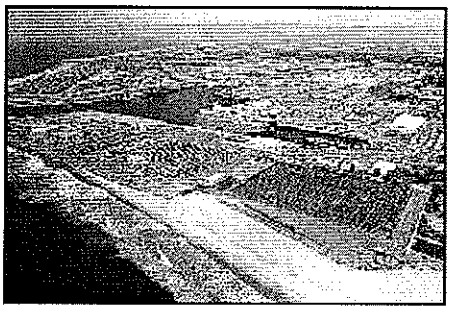
Demolition and removal of spalled and delaminated concrete took place before the application. Once the area was cleaned, application of Surtreat TPS II and TPS IV commenced. A special formulation was also used in designated repair areas to convert the ferrous oxide (rust) into a hard inert shell.

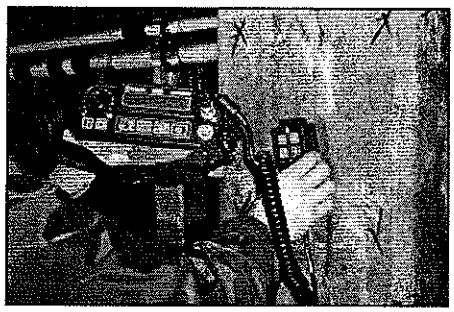
Once the first application was completed, repairs to the spalled areas were made and a final application of formulations was made to the newly placed repairs.

The specified results of the project were met and the project was completed on time.

PROJECT SYNOPSIS

customer	Port of Hueneme
location	Port Hueneme, California
structure	Pier Piles
date performed	April, 2004





problem

Built in the 1960's, several of the 61 piles supporting the main dock at the Port of Hueneme in Oxnard, CA were showing signs of deterioration and corrosion. Due to the 40 plus years in the harsh Pacific Ocean environment, the piles were in need of a combination of concrete repair, fiber reinforcement and corrosion inhibition by way of using Surtreat's proprietary corrosion inhibition formulations.

As with most Surtreat projects', on-site testing was performed. Diagnostics were run on two of the piles to gather base-line data. This data was used to help determine which combination of formulations to use as well as confirm the success of our application. The testing was performed on Pile 37B and Pile 38B at and above the waterline.

solution

Surtreat prescribed three formulations which were applied to 61 piles from the underside of the deck. The application took 3 days due to the tide schedule and was completed on April 21st, 2004. Our Total Performance System first included one application of TPS XII. TPS XII is an anodic vapor phase corrosion inhibitor designed to migrate to the reinforcing steel and form a passivating film around the steel surface. Subsequently, two applications of TPS II, a mixed use corrosion inhibitor, were applied. This formulation will also mitigate corrosion but additionally it will reduce porosity, buffer pH, increase strength and reduce water-soluble chlorides. Finally, a single application of TPS IV was applied to further reduce surface porosity and increase surface hardness.

performance verification

Validation testing was conducted approximately 100 days later. The testing was conducted on piles 37B and 38B in the same locations where diagnostic testing was performed initially. Below is a look at before and after corrosion rates and water permeability results:

The following table summarizes the results of the water permeability testing:

Test Location	BAR Pressure	Flux Rate Mm/sec x 10^{-3} Before Application	Flux Rate Mm/sec x 10^{-3} After Application	% Change
Port of Hueneme				
Pile 37B	1.0	24.0 x 10^{-3}	1.05 x 10^{-3}	-96%
Pile 38B	1.0	119.7 x 10^{-3}	0.30 x 10^{-3}	-99%

Following the Surtreat application the Flux Rate significantly reduced. In other words, the porosity of the concrete has been reduced thus reducing the amount of potential contaminants that can penetrate to the steel level.

The following table summarizes the results of the corrosion testing:

Test Location	Micro meters per year (µM/yr) Before Application	Micro meters per year (µM/yr) After Application	% Change
Port of Hueneme			
Pile 37B	12.6092	11.2242	-11%
Pile 38B	33.9068	12.2919	-64%

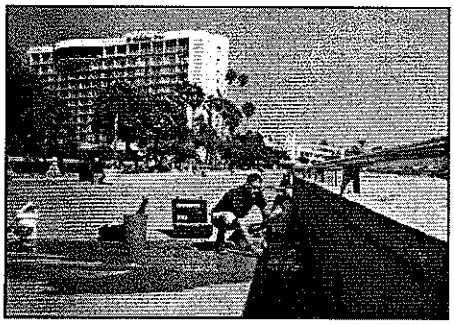
Note: Less than 30 Micro meters per year is considered inactive corrosion

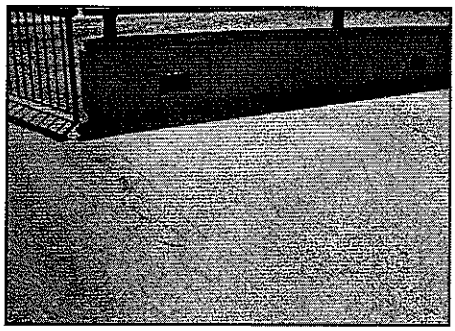
Following the application of Surtreat, corrosion rates in both piles were reduced. A structure with a corrosion rate above 30 micro meters per year is considered to be actively corroding. A structure with a corrosion rate below 30 micro meters is said to be in the passive state of corrosion. It should be noted that in Pile 38B we achieved a 64% reduction in corrosion rates bringing the pile from an active state corrosion to a passive state of corrosion.

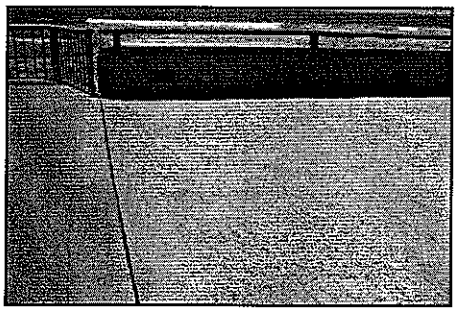
Surtreat's Total Performance System as demonstrated on Piles 37B and 38B is significant. Performance verification demonstrated positive results in critical areas - reducing corrosion rates, decreasing porosity and increasing concrete strength.

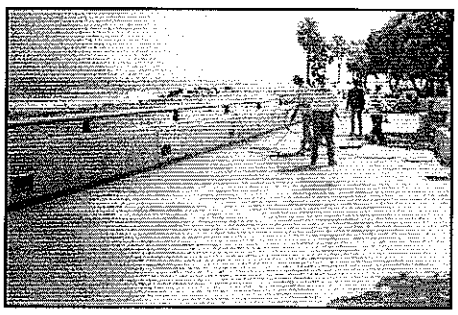
PROJECT SYNOPSIS

customer	City of San Buenaventura
location	San Buenaventura, CA
structure	Promenade
date performed	June, 2005









the problem

- Exposure to airborne chloride contamination and the natural aging process has caused extensive spalling and delaminations as a result of corroding rebar
- Total failure of certain features of the exterior walls
- Safety concerns for all pedestrians who use the promenade for walking, biking and jogging

the solution

- In-situ testing using Galva Pulse technology to measure corrosion activity
- Concrete repair to the respective areas
- Surface prep using power washer
- Topically applied Surtreat TPS formulations II & IV

the results

- Reduced the active corrosion 58% from 107 to 44 µM/yr
- Reduced surface chloride content (top ½ inch) by 44%
- Reduced the porosity
- Increase the surface hardness

the benefits

- Tripping hazards eliminated providing a safe environment for pedestrians
- Extended service life of existing concrete by significantly reducing corrosion rate
- Aesthetically pleasing end result