

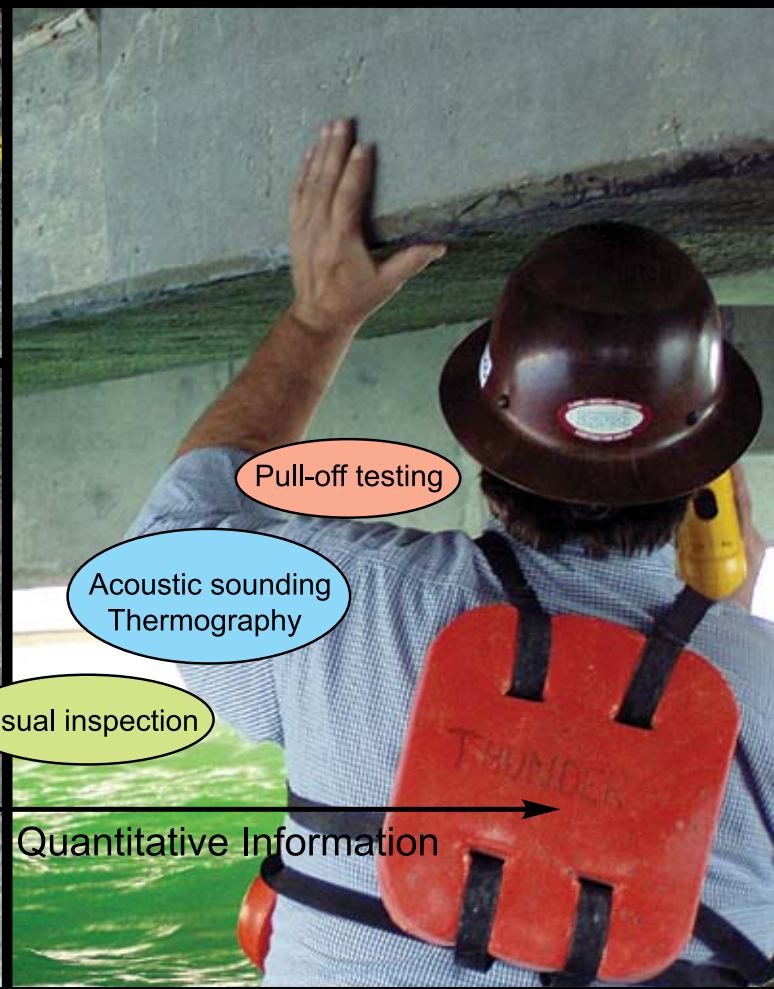
BULLETIN

A Bimonthly Publication of the International Concrete Repair Institute

NDE & STRUCTURAL HEALTH MONITORING



Time and Materials Cost



Pull-off testing

Acoustic sounding
Thermography

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INTERNATIONAL
CONCRETE REPAIR
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THE BREAKERS PLAZA CONDOMINIUM COMPLEX

BY JOHN WEISBARTH

Located on the tropical tip of Texas, South Padre Island is bordered by the Gulf of Mexico and the Laguna Madre. Beautiful beaches, warm Gulf waters, fishing, boating, bird-watching, shopping, and a diversity of year-round activities await every visitor. While the setting may be beautiful for visitors, it is one of the most corrosive environments in the country. The 34 mile (55 km) long barrier reef is quite narrow, about 0.5 miles (0.8 km) at its widest point.

The Plaza Complex faces the Gulf of Mexico. The Laguna Madre is very shallow and takes very little time to heat. The combination of heat, chlorides, and wind is extremely harsh on concrete. These coastal conditions are prime areas for steel corrosion.

The Breakers Plaza Condominium Complex had several structures in need of repair: a three-story low-rise condominium building, a one-story parking garage with sports courts on the roof, and an 18-story condominium high-rise.

The first challenge issued to the repair contractor was to completely restore the three structures in 9 months. It seemed like an easy task at the beginning of the fast-track project. A structural engineer conducted chloride ion testing and generated a project scope to repair the chloride-infected areas. Then, an already difficult project became even tougher. As is the case with many concrete repair projects, once concrete removal got underway, all kinds of additional work was revealed. The scope quickly changed to an 18-month duration.

The contractor for the project was selected based on prior experience with fast-track work. This experience was put to the test on this project, as there were several changes to the project scope midstream. The weather in this area presented another set of challenges during the project, including two hurricanes, a tropical storm, and a deep freeze. The condominium units were also occupied by tenants during the restoration.

DETERIORATION

All three structures had visible signs of distress and rust stains. Chloride ion testing was done to evaluate the current condition of the concrete in the structures. High chloride contents were discovered—not surprising in a coastal zone. During demolition of the tile on 72 balconies, it was discovered that

almost all of the post-tensioned anchors were corroded. Many of the balcony edges had cracking.

Both directions of the two-way post-tensioned slab had deterioration. Care needed to be taken when replacing the metal balcony railings so the post-tensioned cables would not be damaged.

REPAIR METHOD

Work was conducted from 40 ft (12 m) swing stages. Because of the proximity to the Gulf,



Corroded post-tensioned anchors



Deteriorated balcony slabs

“Chloride ion testing was done to evaluate the current condition of the concrete in the structures. High chloride contents were discovered—not surprising in a coastal zone.”



Concrete being removed from balconies

windy conditions were common. From the combination of the heat and moisture, storms developed very quickly. Weather reports were monitored closely to allow ample time for workers to safely

lower the swing stages before excessive winds were encountered.

ICRI surface preparation guidelines were followed. All the deteriorated concrete was removed until sound concrete was exposed. Surface preparation was done with concrete saw cutting and chipping hammers. Plywood was placed on the swing stage beneath the balcony to catch the small fragments. The deteriorated concrete was gathered by hand and placed into empty buckets on the swing stage, then lowered to the ground for disposal.

Once the deteriorated concrete was removed, the contractor treated or replaced any damaged reinforcing steel. Most of the balcony edge steel that was situated in the post-tensioned anchor zone needed to be replaced. Special custom-made forms and clamps were used to reduce the time required to erect shoring for each balcony.

MATERIALS

All of the exposed steel was treated with a corrosion inhibitor to protect the steel and also act as a bonding agent for the form-and-pour repair material. Anodes were used in strategic locations to provide additional cathodic protection in the high-chloride environment.



Repair work accomplished using swing stages

Overhead repairs were made to the underside of every balcony where reinforcing steel support chairs had rusted.

The repair material was mixed on the swing stage using an electric mixer. A fluid repair material was selected for the formed horizontal work. The material chosen had an acceptable ohm value so it did not interfere with the current of the cathodic anode. A trowel-applied material was selected for vertical and overhead applications. A liquid, film-forming curing compound was used immediately after the forms were removed to help minimize the effects of the hot weather.

Two coats of a waterproofing coating were placed on the balconies, terminating on the bottom of the slab drip edge. An elastomeric coating was applied to the vertical surfaces for aesthetic purposes. Fog commonly caused delays during the application of both types of coatings. On several occasions, it took until mid-afternoon for the extremely moist fog to be burned off by the sun and conditions to become dry enough for the coating to be applied.

The final details of the project involved applying ceramic tiles on the balconies and installing side-mount railings, which were necessary because the specified cored-in-place railing mounts could have damaged the post-tensioned strands.

PROJECT SUCCESS

The contractor for this project showed extreme adaptability to the many changes that occurred during the project. Job-site conditions, such as a limited number of swing stages due to limited roof tiedowns, had to be managed. The scope of work continued to change, as unforeseen damage was continuously revealed during surface preparation. The contractor needed to be aware of the rapidly changing weather conditions. It cannot be stressed enough how prior experience on similar projects in the past helped manage these conditions. It is remarkable that the contractor was able to complete the 18-story high-rise building, three-story low-rise building, swimming pool, and parking garage repairs in 14 months, managing project logistics through two hurricanes, a tropical storm, and a deep freeze—all while the condominiums were occupied.

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Balcony ready for repair material



An extensive amount of concrete repairs were required for the balcony edges and soffits



Completed project