

# CRYSTALLINE CRACK REPAIR

## AT AL SAQRAN TOWERS, DUBAI, UAE

BY FADI FARHAT

**N**estled along the tranquil surroundings of a man-made canal, the Al Saqrان Towers project (Fig. 1) conceptually began as a spectacularly designed building, affording all the amenities one would ever need in Dubai. The initial project boasted residential/commercial aspects that were second to none, featuring luxuries to accommodate most every resident's desire with modern studio, one- and two-bedroom apartments, and top-of-the-line finishing.

During the initial construction, traditional surface-applied membranes were used to waterproof the six levels of the basement in the tower. This was certainly a risky decision insofar as the towers were located along a man-made canal (Fig. 2), which meant that the basement areas of the structure would

face high hydrostatic pressure from the soil water table. Estimates had the soil water table imparting at least 39 ft (12 m) of head pressure against the below-grade base of the Al Saqrان Towers.

### PROBLEM

Many issues resulted from the installation of the surface-applied membranes. First, a traditional external surface-applied membrane is not suitable for projects facing hydrostatic water conditions. Due to this, the membrane was not able to fully waterproof the concrete, which caused leaking through cracks and joints in the structure. There were leaks in basements three through six, of which the lowest level six faced the most hydrostatic pressure and was the most affected, with flooding rising



Fig. 1: The tower under construction while the water infiltration issues were occurring



Fig. 2: The tower located along a man-made canal

higher than could possibly be maintained as the construction team moved forward (Fig. 3).

Secondly, these leaks are extremely costly to repair and with a project of this magnitude, cause many problems. Aside from the flooded basement structures being relatively unusable, the leaks can reduce the lifespan of the structure and durability of the concrete, and even cause mold and mildew to occur. Furthermore, corrosion of reinforcing steel occurred (Fig. 4), which could eventually weaken the structural integrity of the building. Thus, fixing the leaking cracks was necessary for the project to move forward, using a suitable technology for the conditions.

To remedy the leaks that incurred through the surface-applied membrane and survive the force of the hydrostatic pressure, a polyurethane injection system was used at the cracks. This crack-repair system injects a resin into the leaking cracks and joints by drilling a hole into the concrete where the crack is located, and injecting the resin to ensure full penetration of the crack (Fig. 5).

Due to the high ground water pressure, all attempts over a long 2-year period using the polyurethane injection system failed to repair the cracks, allowing water to continue flooding the below-grade structure. The infiltration of water left the Al Saqran Tower at great risk with this crack repair technology failing to prevent the concrete from leaking.

## SOLUTION

To fix the leaks in the concrete, a repair technology more suitable to the rigors of hydrostatic pressure was needed. Thus, the decision was made to use a crystalline crack repair system to infiltrate the leaking areas.

Crystalline crack repair system technology works by interacting with the leaking water to create a non-soluble crystal formation that fills the joints, pores, and cracks within the concrete. The leaking areas were chiseled out so the source of the leak could be found and stopped with the installation of the crystalline product, instead of chasing the leaks with the injection system. The crystalline properties continue to grow in the presence of moisture, which is especially beneficial to this project where waterproofing is needed in a high ground water pressure situation. This method transforms the concrete repairs into a waterproof barrier for the life of the structure, as crystals will continue to grow and block the flow of moisture when contacted.

The Al Saqran Tower basements three through six, which were leaking for 2 years, had the crystalline concrete crack repair system applied to cracks, honeycombs, bad jointing, and cold joints to stop the flow of water. For added protection, a crystalline concrete waterproofing was topically applied to the 24,000 ft<sup>2</sup> (2230 m<sup>2</sup>) raft slab and retaining walls,



Fig. 3: The originally specified surface-applied membranes failed at below-grade levels, causing severe leakage



Fig. 4: Water infiltration reached the reinforcing steel, causing corrosion



Fig. 5: The injection method was attempted many times without success, increasing costs, and delaying the project schedule

ensuring that no leaks would occur through the basement slabs of the Al Saqran Tower for the life of the structure.

Crystalline crack repair material has many benefits over injection systems, including:

- Continues to gain strength throughout the life of the structure;
- Will not crack, tear, or wear away even with significant hydrostatic pressure;
- There are no volatile organic compounds (VOCs) used;
- Is a permanent solution and self-seals in the presence of moisture; and
- Provides protection from every direction.

## Crystalline Crack Repair

### SITE

**Al Saqran Towers**  
Dubai, UAE

### OWNER

**Al Saqran Tower Investments, LLC**

### CONTRACTOR

**Al Sahel Contracting Company, LLC**

### PROJECT ENGINEER

**Dimension Engineering Consultants**

### MATERIAL SUPPLIER

**Kryton International, Inc.**

## CONCLUSIONS

Waterproofing the concrete basement slabs in the Al Saqran Towers turned out to be an economic wasteland, with leaks in the concrete continuing for 2 years after construction without a viable solution, until the implementation of the crystalline crack repair system. As a result, the Al Saqran Tower basement slabs are continuing as specified, with the once-leaking areas now dusty dry due to the effectiveness of the crystalline crack repair system.

In addition, with hydrostatic pressure an issue from the beginning, a Permeability Resistant Admixture for Hydrostatic Conditions (PRAH) should have been considered in the concrete mixture design. By mixing directly with the concrete before placing, the project may not have experienced the leaks and resultant repairs.



**Fadi Farhat** is Regional Manager of the Middle East at Kryton International, Inc. Farhat has been responsible for driving concrete waterproofing specifications, as well as supporting new construction and remedial rehabilitation projects. With more than 10 years in the construction industry, moving from general contracting and construction chemicals into the crystalline waterproofing area, Farhat has been instrumental in changing the landscape for concrete waterproofing in the Middle East. He is a member of ICRI.