



SEALANT, WATERPROOFING
& RESTORATION INSTITUTE
**TRINITY PROJECT AWARDS
PROGRAM**

SWR Institute 2016 Trinity Award Winner WATERPROOFING CATEGORY

PROJECT TITLE: Parking Garage Expansion Joint Repairs

LOCATION: 474 North Lake Shore Drive, Chicago, Illinois

PROJECT TEAM:

- Engineer: Building Technology Consultants, Inc,
- Contractor: Allied Waterproofing, Inc.
- TBM Manufacturer: Advance Polymer Technology, Inc.
- Expansion Joint Manufacturer: EMSEAL

With the 2016 Trinity Award in the Waterproofing Category to prove it, the parking garage expansion joint repairs project at the 474 North Lake Shore Drive Condominium Building in Chicago was a true collaborative effort among dedicated SWR Institute member companies. The 474 North Lake Shore Drive Condominium Building is a 61-story concrete-framed structure completed in 1990. The first 15 floors of the tower consist of a parking garage. The parking garage extends to the west of the high-rise tower in an attached 15-story structure (Photo 1). The garage has an area of approximately 255,000 square feet with 376 residential parking spaces and approximately 258 commercial spaces. The tower and parking structure are separated by a continuous expansion joint at every level. The tower side of garage consists of conventionally reinforced concrete slabs. The parking structure side of the garage consists of post-tensioned (P-T) reinforced concrete slabs. The P-T slabs are supported by corbels at expansion joints (Figure 1). The garage is not heated and is partially exposed to the environment due to precast concrete louvers that clad the exterior walls.



FIGURE 1



PHOTO 1

Building Technology Consultants, Inc. (BTC) was retained in 2011 to evaluate the condition of the garage and the need for repairs. BTC concluded that significant repairs were necessary due to deterioration of the existing expansion joint materials, pervasive water leakage below the expansion joints, unprotected slab surfaces, and the age of the building contributed to concrete

deterioration. Exposure to deicing salts and other chlorides, high humidity levels, and carbonation led to corrosion of reinforcing steel in some locations (Photos 2 and 3).

BTC was also retained to design the repairs, assist with bidding the project, and provide construction contract administration. The objectives of the repairs were to replace the expansion joint materials, repair deteriorated concrete, and to apply a traffic bearing membrane (TBM) system to improve the durability of the parking decks. The design included details for horizontal, vertical, and overhead concrete repairs. Details for post-tensioning tendon repairs were also developed in case deteriorated tendons were uncovered during the project.



PHOTO 2



PHOTO 3

Allied Waterproofing, Inc. (AWI) was ultimately awarded



A Genuine Terra Cotta façade expresses the soul of a building.

Let Gladding, McBean Terra Cotta be a part of your building's soul revival.

Project shown: restoration piece for the NYU façade located at 708 Broadway in New York.



OVER A CENTURY OF CRAFTSMANSHIP

the construction contract for the project late in 2012. AWI's experience, detailed project approach, willingness to be flexible, and competitive bid were all factors in landing the project. Prior to the start of construction, the owner, AWI, and BTC worked together to develop numerous phasing and sequencing scenarios to evaluate the most cost-effective way to complete the project. In addition to design and construction costs, costs for relocating residents' vehicles and the commercial owner's lost revenue had to be considered. Dividing the project into phases benefitted the Association and commercial owner financially. Ultimately, a three-phase schedule was agreed upon.

1. Phase I: Expansion joint replacement at the ninth through 15th floors along with localized concrete repairs near those joints

2. Phase II: Replacement of remaining expansion joints at the third through eighth floors along with localized concrete repairs near those joints
3. Phase III: Concrete repairs throughout the remainder of the garage and application of a TBM system

To achieve the goal of an expedited schedule, BTC, AWI, and material suppliers worked together to select optimum materials for all phases of the work including the expansion joints, concrete repair materials, and the TBM system.

Expansion Joint Material:

Weighing a combination of cost, movement capability, aesthetics, installation time, and other performance criteria, a pre-compressed silicone/impregnated foam expansion joint material manufactured by EMSEAL

was selected as the optimum material for replacing approximately 1,500 linear feet of expansion joints (Photos 4 and 5).

Concrete Repair Materials

Fast-curing concrete repair materials were selected to reduce the time needed between installation of repair material and application of the TBM, resulting in a compressed overall schedule. A flowable, form-and-pour material was used for horizontal and vertical repairs (Photos 6 and 7). A trowelable material was used for small overhead repairs.

TBM System:

A two-component, solvent-free TBM system manufactured by Advanced Polymer Technology, Inc. (APT) was selected to minimize odors reaching the residential units. Most of the membrane work was performed during early spring months to meet the owner's needs. The solvent-free system was also beneficial in



PHOTO 4



PHOTO 5



PHOTO 6



PHOTO 7



PHOTO 8



PHOTO 9



PHOTO 10



PHOTO 11



PHOTO 12



PHOTO 13

accelerating the application process because of the time of year the work was performed. There are more steps involved with applying a two-component system (Photos 8 through 12). However, materials that consist of 100 percent solids are less dependent on exterior temperatures. As such, intermediate and top coats could usually be applied approximately 24 hours after the previous coat despite the lower exterior temperatures Chicago exhibits in March and April.

Project Challenges:

Throughout the design and construction phases of the project many technical and logistical challenges were encountered. Some of these challenges included the following:

1. Precast concrete louvers on the exterior walls leave the garage exposed to exterior temperatures without the benefit of warming from the sun (Photo 13). Surface temperatures had to be closely monitored during the work to ensure

proper application procedures were followed for each repair material.

2. Wall projections along expansion joints made installing the new expansion joint materials impractical. Stainless steel plates were added to create uniform joint widths and to withstand the expansive forces (Figures 2 and 3, Photo 14).
3. After a firm schedule was established for the third phase, the owner received notice that they were going

to lose arrangements for alternate parking sooner than expected. As indicated above, BTC, AWI, and the material suppliers were able to work together to condense the schedule. In order to provide further motivation, the owner agreed to a monetary incentive for on-time completion. By increasing the size of the crew, working longer hours, and establishing an aggressive sequencing plan, AWI was able to trim a full month off the schedule. The overtime costs were still less than the relocation costs.

Safety Considerations:

Some of the garage remained open during parts of the first two phases. Temporary protection was necessary to separate work areas from areas still open to vehicular traffic. The 3rd phase was performed in conjunction with a sprinkler replacement project in the garage (under separate contract). As such, AWI had to coordinate their efforts with the sprinkler contractor to ensure safe working conditions for both parties. The entire project was accident-free.

Quality Control/Field Testing:

Concrete patch repairs were hammer sounded by BTC and AWI to verify effectiveness. A representative from APT monitored TBM application process periodically and performed adhesion tests to evaluate bond.

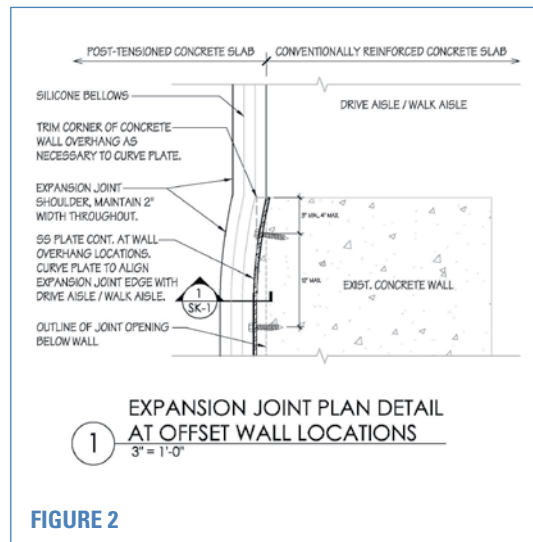


FIGURE 2

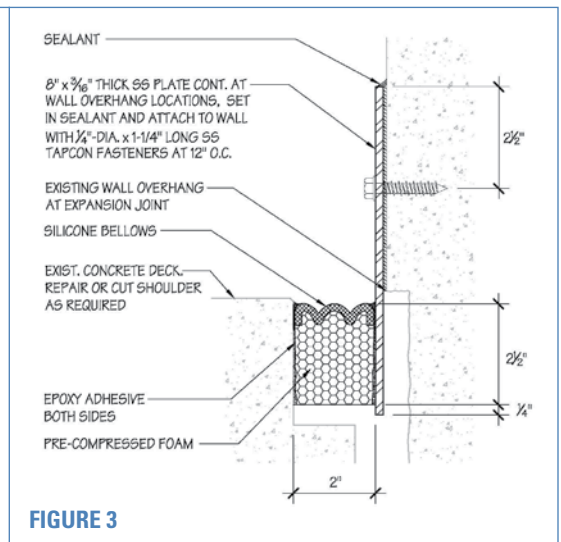


FIGURE 3

Access and Sequencing:

The scissoring figure 8 configuration of the garage created complex sequencing scenarios. AWI strategically planned their staging areas throughout the garage to maximize efficiency.

Schedule:

1. Phase one was completed in 51 calendar days in 2013.
2. Phase two was completed in 33 calendar days in 2014.
3. Phase three was completed in 79 calendar days in 2015.

Sustainment:

The primary goals of the project were to replace the expansion joint materials to minimize pervasive water leaks, repair deteriorated concrete, and apply a TBM to improve the durability of the garage. The TBM will protect the topsides of slabs from chlorides, and the expansion joints will minimize water leaks for the

foreseeable future. It was not feasible to change the high humidity levels in the garage. As such, future overhead concrete repairs are anticipated as carbonation continues and the potential for macro-cell corrosion still exists. However, these repairs will be relatively minor both in cost and magnitude because of the durability the topside repair will provide.

Project Statistics:

- 1,500 linear feet of expansion joints
- 1,100 square feet of overhead concrete repairs
- 900 square feet of top-side horizontal concrete repairs
- 200 square feet of vertical concrete repairs
- 11,000 linear feet of crack repairs
- Initial Contract Sum: \$2.8 Million
- Approximate Final Cost: \$1.7 Million



PHOTO 14

SWR Institute's Trinity Award. "Trinity" was chosen as the name of this awards program because it defines the key submittal components. That is, it has three projects types (Sealant/Waterproofing/Restoration) and three member classifications (Contractor/Manufacturer/Associate). What sets this program apart from other awards programs is the collaborative partnership requirement. All submitted projects must have been a collaborative effort between an SWR Institute contractor, manufacturer and associate member. The Institute feels this combination represents the 'best in class' for our industry.

All entries that meet the stated criteria will then be judged by a three person panel of SWR Institute peers. (Members of the panel will include a contractor, manufacturer and an associate member). Awards are presented annually at the SWR Institute's Winter Technical Meeting.

Rethink Sealant

Preformed Watertight Precompressed Foam Expansion Joints and Sealants

You think you know sealants. What they are, how to install, and the problems to expect afterwards. With EMSEAL preformed sealants you can choose from a wide range of application-specific products. Each offers rapid and easy installation. And you can forget about the problems afterwards because EMSEAL sealants and expansion joints remain watertight for years after you're done. Guaranteed.

Our preformed coated-foam sealants have redefined "sealant". The precompressed foam expands and conforms to substrate irregularities ensuring a watertight seal. The back-pressure of the foam holds it in place allowing for a simple installation that doesn't harm or pierce structural mounting surfaces. Ideal for new or retrofit construction, EMSEAL sealants are watertight, thermal insulating and sound attenuating. In addition EMSEAL also offers the Emshield line of all-in-one UL/ULC-certified fire-rated expansion joints.

Watertight Joint Sealants



Seismic Colorseal

Silicone-coated, precompressed, watertight primary seal for high-movement joints. Ideally suited for vertical wall, structural, seismic and abutment joints. Available in 26 standard colors. For joints up to 10-inches.



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Silicone-coated, precompressed, primary seal for small joints in vertical and horizontal planes. This cost-effective alternative to liquid sealants ships on 10-ft reels for easy handling and rapid installation into joints from 1/2 to 1 1/4-inches wide. Available in 26 standard colors.



DSM System

The DSM System is a traffic durable, joint-face adhered, precompressed high movement primary seal. Factory pre-coated with highway grade silicone, it readily replaces failed caulk, compression seals, inflated seal, and closed-cell joint fillers.



Horizontal Colorseal

A high-movement silicone bellows system for deck and horizontal applications used as a primary seal typically in non-traffic areas such as perimeters in decks or roofs. Available in 26 standard colors. For joints up to 8-inches.

Patented UL/ULC Fire-Rated



Emshield WFR*

A watertight, UL/ULC-certified 2 or 3-hour fire rated single-unit expansion joint for wall and vertical applications. One install does it all. Available in 26 standard colors. For joints up to 6-inches.



Emshield SecuritySeal SSW*

When security demands a pick-resistant surface. Watertight, UL/ULC-certified 2-hour fire rated all-in-one expansion joint for wall and vertical applications. One install does it all. For joints up to 6-inches.



Emshield DFR*

A watertight, trafficable UL/ULC-certified 2 or 3-hour fire rated all-in-one expansion joint for deck and horizontal applications. For joints up to 4-inches. Eliminates the need for fire blankets. One install does it all.



Emshield SecuritySeal SSF*

A watertight UL/ULC-certified 2 or 3-hour fire rated expansion joint. Pick-resistant surface. For floor and deck applications in joints up to 4-inches. Eliminates the need for fire blankets. One install does it all.

EMSEAL is proud that the United States Patent and Trademark Office has confirmed our previously patented innovations and continues to award new patent protection thereby reaffirming EMSEAL's rights to exclusively manufacture and license the technology. EMSEAL's inventions have profoundly changed the way buildings are waterproofed and fire rated. The benefits extend to architects and engineers, general contractors, subcontractors, distributors and sales reps and ultimately to property owners who wisely make the decision to choose EMSEAL sealants and expansion joints.

* US Patents awarded for products appearing in this ad.

WFR2, SSW2, DFR2, SSF2: 9,670,666 9,644,368 9,637,915 9,528,262 9,068,297 8,739,495 C1 Patent Pending
WFR3, DFR3, SSF3: 9,670,666 9,644,368 9,637,915 9,528,262 9,068,297 8,365,495 8,739,495 C1 Patent Pending

