“L”-evating Concrete Façade Restoration to a New Level: A Case Study with Access Challenges

by Christopher Kottra

Fig. 1: State Place Tower

The tower façade repairs completed at the State Place condominiums in Chicago, Illinois, posed multiple challenges to those involved with this project. Adjacent tracks from the local transit system limited access to an entire elevation on the building. By using a “plan for the worst, hope for the best” approach, maximizing efficiency and selecting the proper materials, the project team was able to not only complete this difficult project, but come in under budget as well.

BACKGROUND

State Place is a multi-building residential and commercial development completed in 2003. The development consists of four buildings including a 23-story high-rise building (Tower) at the north side of the development, and three 7-story mid-rise buildings to the south of the Tower (Fig. 1). The four buildings are connected at their base with a 3-story parking garage and commercial structure. The ground level consists of commercial space, entrance lobbies to each building, loading dock, mechanical/electrical rooms, engineer’s office, and a garage ramp. The second and third floors consist of commercial and residential parking respectively.

Chicago Transit Authority’s (CTA) elevated train tracks (“L”) run alongside the east elevation of the property (Fig. 2).

There are 243 residential units in the development, 159 of which are in the Tower. The Tower is a concrete frame structure with a façade consisting of cast-in-place concrete walls, and direct-applied exterior finish system (DEFS) infill panels. The Tower exterior includes several set-back and cantilevered balconies. In addition, there are four terrace areas over occupied spaces at the penthouse level and 11 low-slope roof sections with varying roofing and waterproofing systems.

EXISTING CONDITIONS

Water leakage had been reported in several Tower units, including several units on the east elevation over the "L" tracks. A building envelope evaluation was performed in 2016 to identify potential sources for the water leakage. An up-close review of the façade was performed from swing-stage scaffolding on the center section of the north and south elevations. An up-close visual review was also performed at the eastern- and western-most tiers of the south elevation using an unmanned aerial system (UAS or drone) (Fig. 3 and 4). Advanced deterioration of concrete slab edges and sealant components were identified during the up-close reviews.

PROJECT CHALLENGES

Use of a UAS was not permitted over the "L" tracks. Initial discussions with the CTA revealed that there would be significant costs involved and a great deal of red tape to have swing-stages on the east elevation. As such, it was not considered practical to pursue the up-close review of the east elevation. However, given the number of units reporting leaks on the east elevation, it was assumed that similar deterioration could be expected on this elevation. It was clear that time and cost considerations would have to be planned for well in advance of any façade repairs on the east elevation.

SCOPE OF WORK

Repairs were designed in late fall of 2017 in preparation for a 2018 construction project. The base scope of work included the following repairs:

1. Localized partial depth concrete repairs;
2. Acrylic protective coating application on vertical concrete surfaces and undersides of balcony slabs;
3. Elastomeric membrane system application on skyward facing concrete surfaces;
4. Crack repairs in DEFS panels with pre-formed silicone strips;
5. Elastomeric coating application on DEFS panels (Fig. 5);
6. Traffic-bearing membrane system application on balconies; and
7. Localized replacement of window perimeter sealant, glazing sealant, and sealant at joints between dissimilar materials (i.e., between concrete and DEFS panels).

OVERCOMING THE CHALLENGES

Many of the repairs were unit-price items with estimated total quantities extrapolated from observations during the

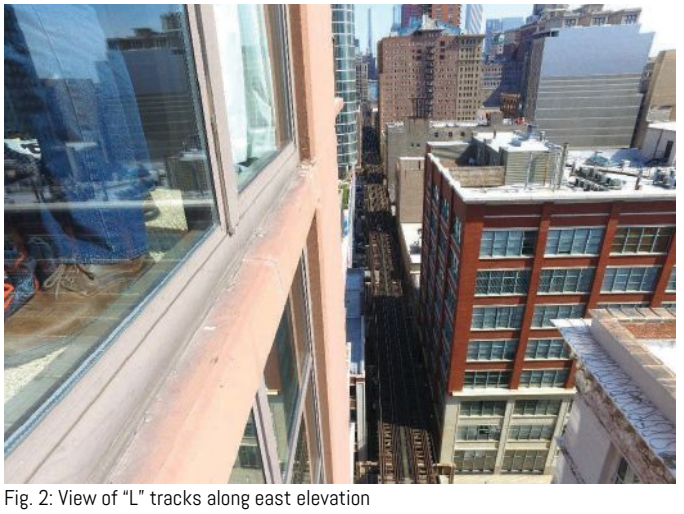

Fig. 2: View of "L" tracks along east elevation

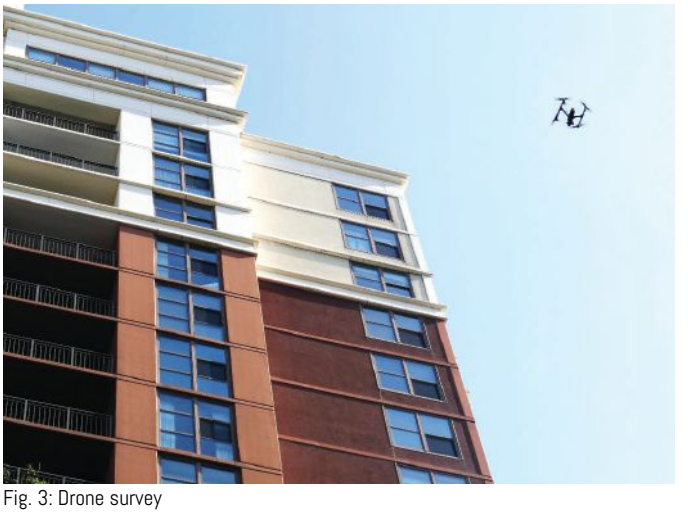

Fig. 3: Drone survey

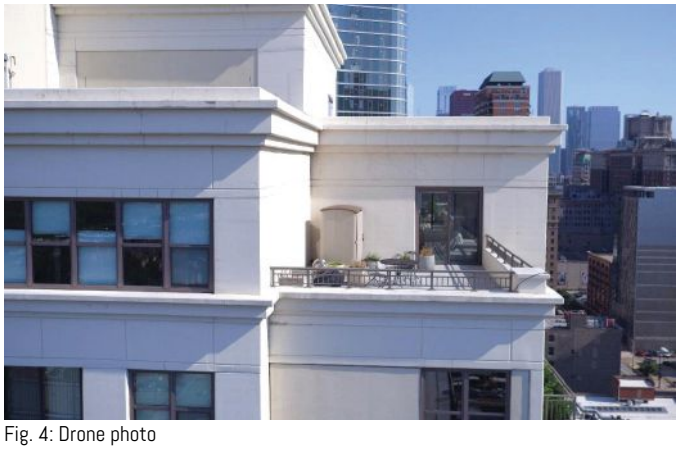

Fig. 4: Drone photo

Fig. 5: DEFS crack repair and elastomeric coating; Concrete coating

building envelope evaluation. Because most of the façade had not been reviewed up-close, there were many unknowns that could affect the overall cost of the project. In some cases, deterioration was not observed during the 2016 building envelope evaluation but could be reasonably anticipated based on experience with similarly constructed buildings. As such, the scope of work included unit price repairs to address such conditions, creating a "plan for the worst but hope for the best" approach to a comprehensive façade repair project.

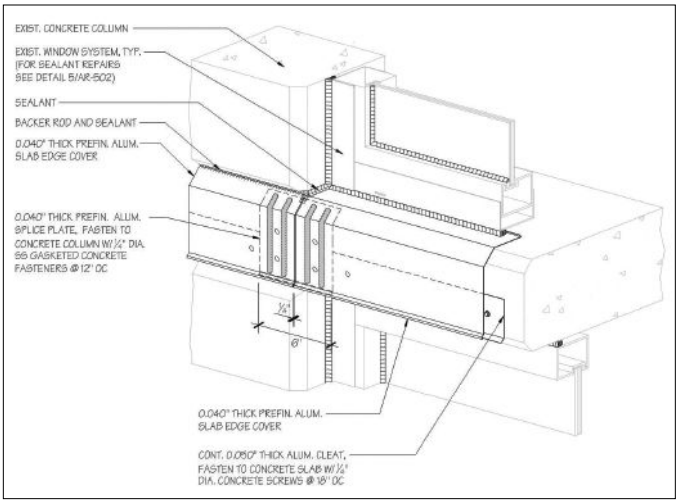

Fig. 6.: Slab edge cover detail


Fig. 7: Slab edge cover at east elevation

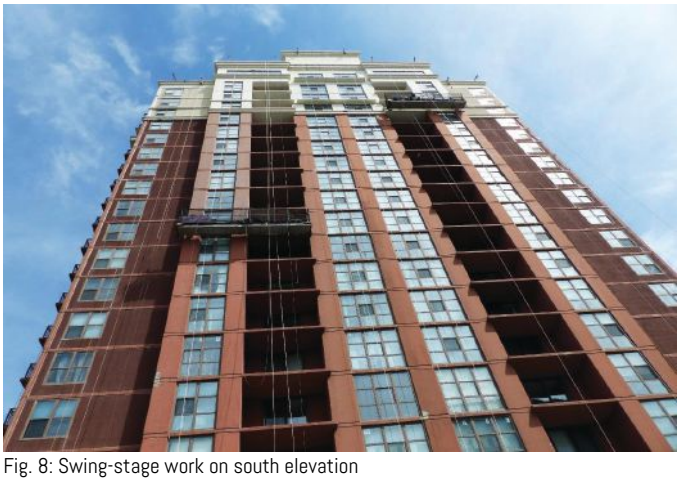
Fig. 8: Swing-stage work on south elevation

To evaluate good, better, and best repair options, alternatives for applying an elastomeric coating or installing sheet metal slab edge covers over exposed slab edges were included in the scope of work for each elevation. Considering aesthetics, durability, anticipated future maintenance, life cycle costs, and other factors, the association's Board of Directors selected an upgrade to an elastomeric coating at exposed slab edges on the north, south, and west elevations. Sheet metal slab edge covers were selected for the east elevation (Fig. 6 and 7). Although the initial cost of the slab edge covers was significantly higher than the other options, limiting future access costs over the "L" tracks made the investment worthwhile. The Board also elected to replace 100 percent of the window perimeter sealant on the east elevation to proactively lower future access costs.

REPAIR PROGRAM:

The construction contract was awarded in March 2018. One of the contractor's first tasks was to understand what CTA's requirements would be for work to be completed on the east elevation. CTA required a deposit upfront for the full amount of anticipated labor costs to provide flaggers and supervisors during times when work would be performed on the east elevation. The section of "L" tracks affected by this work was a heavy traffic area, especially during rush hours in the morning and afternoon commutes. CTA limited the contractor's working hours on the east elevation to minimize disruption of the tracks during their heaviest traffic times. As a result, the contractor was only given between 4 and 6 hours each day to work on the east elevation. The amount of time varied each day due to the availability of CTA supervisors, weather conditions, and the extent of other construction projects elsewhere along the "L" tracks.

Construction began in spring 2018. The contractor started with the south elevation to meet the association's requirements to reopen an adjacent common pool area for the summer months (Fig. 8). Work progressed to the west and parts of the north elevation after completion of the south. The contractor saved the east elevation until after the west elevation and west side of the north elevation were complete. This was done intentionally to help ensure efficient completion of the work, and to give more notice to CTA in the hope of getting their full cooperation when needed. The contractor also created a built-in back-up plan by starting the east elevation prior to completing the north elevation or starting work on the penthouse walls. The contractor worked on other drops and penthouse walls during early mornings and late afternoons when work was not permitted on the east elevation to maximize efficiency. This flexibility proved invaluable for the contractor due to the daily uncertainty of working on the east elevation. The consulting engineer also had to be flexible and available

to review the drops initially to mark repair locations, and to review the completed work. Follow-up water testing was performed at several locations to verify the effectiveness of the repairs. With limited access availability, the water testing had to be completed efficiently without compromising the integrity of the testing.

The contractor juggled crews from multiple trades to complete the work on each swing-stage drop. The east elevation was especially challenging in this regard—not only because of the CTA limitations, but also because colder temperatures arrived earlier than normal in Chicago. With numerous temperature-sensitive materials involved in completing the repairs, monitoring environmental conditions became crucial. The contractor and engineer worked together to help ensure materials were applied during suitable environmental conditions recommended by the material manufacturers without sacrificing quality.

SUMMARY

When construction began, the project was anticipated to be complete in approximately 30 weeks. Despite changes in the scope of work, excessive weather delays, and unanticipated CTA scheduling challenges, the project was completed in 32 weeks.

In some cases, deterioration was less severe than anticipated. More significant deterioration was identified at other locations. As such, overall repair quantities did vary from the original projections. However, by planning for the worst-case scenario, the overall project finished under budget despite these variations. While future smaller-scale façade repairs are anticipated, the association took steps during this project to implement repairs that met their current budget without sacrificing future funding. By selecting the repairs with a longer anticipated service life on the east elevation, the schedule for accessing this elevation during future projects has been deferred.

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Arlington Heights, IL

CONTRACTOR
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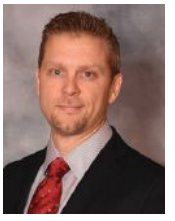
Northbrook, IL

MATERIAL MANUFACTURERS
Master Builders Solutions Construction Systems US, LLC
Shakopee, MN

Dow Silicones Corporation
Auburn, MI

Sherwin-Williams
Cleveland, OH



Christopher Kottra, PE, REWC, is a Principal at Building Technology Consultants. Mr. Kottra has over 18 years of experience with evaluation, repair, structural design, and analysis of a variety of structures. Evaluation projects include parking garages, City of Chicago critical façade examinations, and miscellaneous building enclosure or structural deficiencies. He is a licensed Professional Engineer in the State of Illinois (PE), a Registered Exterior Wall Consultant (REWC), and a Certified Construction Contract Administrator (CCCA). Christopher is currently a member of ICRI, SWR Institute, BEC, and APRA. He is a past president of the Chicago Chapter of ICRI and is currently a member of ICRI Committee 410—Masonry.