

Parking Garage Repair: Two Case Studies

Edited by Kelly M. Page

Ohio State University Medical Center Parking Facility

Located on the Ohio State University campus in Columbus, Ohio, the Medical Center Parking Ramps “H” and “J” were constructed circa 1970 using a pan and joist design. The structures offer over 600 parking spaces for patients, staff, and students while also providing a platform for heliport medivac service.

For over 30 years, the unprotected concrete had been exposed to chlorides, freezing-and-thawing cycles, and continual heavy traffic. The result was severe delamination, spalling, and corroded reinforcing steel throughout a majority of both structures. Because of this extensive deterioration, university officials were faced with both full demolition and replacement or a major restoration.

An engineering firm was retained by the university to complete a condition survey. Results of the survey using sounding techniques, visual inspection, and analysis of core samples identified a vast amount of delaminations, failed expansion joints, and high chloride levels in the concrete. Pressure testing of the plumbing revealed many leaks and blockage.

Based on condition survey results and cost analysis, the owner decided that a major renovation of both garages better served its long-term goals.

The project was very broad in scope. In addition to the extensive parking deck repairs, the existing elevator needed updating and a new elevator needed to be installed. The helipad needed repairs. New lighting, signage, paint, railings, landscaping, plumbing, doors, hardware, architectural concrete renovation and stairway repairs were all on the schedule.

The main focus of the project was the floor slab dome removal and replacement in excess of



The parking decks, shown in the background, were large projects that took 2 years to complete



Concrete removal using hydrodemolition



Completed view of exterior of parking deck



Completed view of interior of parking deck



New reinforcing steel on pan and joist system

190,000 ft² (17,650 m²). Because of the sheer volume of demolition required, and because the deck was a pan and joist design, it was decided that hydrodemolition would be used.

Hydrodemolition was chosen for several reasons. The technology provides better quality control in regard to concrete removal, reduced use of shoring (due to the pan and joist design), flexible and predictable scheduling, and a vast reduction of airborne particles generated via the demolition process.

Minimizing the amount of airborne particles was the key to the comfort and well-being of hospital patients, as was reducing the noise generated by hydrodemolition. Installing a sound abatement system designed by the engineering firm significantly reduced decibels.

Installing a new elevator in the existing structure presented unique challenges. Portions of the existing floors were demolished so that a new elevator shaft could be installed. The elevator pit that was excavated immediately began to fill with ground water. While the pit was being de-watered, a revised waterproofing system had to be designed and installed. The methods and materials used needed to be suited for long-term performance. A three-layer system was designed consisting of shotcrete applied to the substrate, a seamless polyurea membrane applied to the shotcrete, then form and poured concrete to finish. The poured concrete also provided the pit for the new elevator. The ongoing dewatering process of the pit continued until construction of the waterproofing system was completed.

Before starting the repairs on the helipad, a temporary landing zone needed to be established. This was accomplished by coordinating efforts between the athletic department, university project personnel, traffic coordinators, contractor, flight personnel, health facility personnel, and the engineering firm. The result was no loss of medical flight service.

Incorporated in the total renovation project were many architectural improvements aimed at protecting the structures from the elements, meeting ADA requirements, and improving the overall appearance.



Full-depth slab replacement



Full-depth concrete removal

New lighting was installed throughout the structures. New paint was applied to the interior, adding a new, finished look and enhancing total illumination. Urethane traffic coatings (over 350,000 ft² [32,500 m²]) were installed throughout both garages to protect the newly replaced/repared concrete decking.

Special attention was given to the façade of the garages. The university wanted the finished structures to maintain the campus' current architectural style. The architect achieved this through a finish design that would compliment other buildings on campus. The protective coatings, masonry repairs, and landscape design used all incorporated aspects of existing structures. The result was a newly renovated parking facility that architecturally “fit in” with its local surroundings.

Construction spanned 2 years, during which time production schedules were often modified and adjusted as various issues presented themselves. The scope and complexity of this project cannot be underestimated; weekly production meetings were the norm.

Besides the obvious financial benefits, the owner now enjoys a parking facility that offers greatly improved aesthetics and increased pedestrian mobility—it is a structure that will provide many years of continued service.

Special acknowledgement is given to the University Project Management team led by Marjory Spangler of the Ohio State University Facilities Plan and Development Office, who held team members to the highest level of accountability, diligence, and professionalism.

Ohio State University Medical Center Parking Facility

Owner

The Ohio State University
Columbus, Ohio

Project Engineer/Designer

O & S Associates
Columbus, Ohio

Repair Contractor

Paragon Constructors, Inc.
Minneapolis, Minnesota

Material Suppliers

Lyntal International
Lake Orion, Michigan

Sika Corporation
Lyndhurst, New Jersey



Concrete marked for removal after evaluation



Removal of deteriorated concrete

Cook County Department of Corrections Parking Garage

The renovation and repair project at the Cook County Department of Corrections Parking Garage in Chicago, Illinois, was relatively ordinary in need but unique in the support and eventual implementation of the solution. The demand was to restore and protect a deteriorated concrete surface of a parking structure. The 30-year-old parking structure needed concrete restoration, joint repair, membrane waterproofing, and a decorative coating to protect the concrete, improve the aesthetics of the garage, and also enhance the level of safety for users of this structure. The solutions were not out of the ordinary; however, the level of coordination between the manufacturer, designer, and contractor was a strong blend of complete-system understanding, product knowledge, and project support.

Specifically, this 2002-2003 project consisted of 225,000 ft² (20,900 m²) of waterproofing membrane, 150 linear ft (45 linear m) of expansion joint repair, 35,000 ft² (3250 m²) of patching material, 15,000 linear ft (4570 linear m) of elastomeric joint sealant, and 170,000 ft² (15,800 m²) of light-reflective coating. Success in the installation of each of these individual systems had some reliance on the performance of another. Therefore, understanding how these products work together was a key factor in this project's success. Because one manufacturer supplied all of these products required by the designer, that manufacturer was able to supply the designer and contractor with a comprehensive understanding of the qualities and limitations of these systems relative to the structure as a whole. Ultimately, a team of construction experts, all working in sync, provided

that owner with the best possible chance of success for this difficult parking garage restoration project.

This parking structure is somewhat unique in its composition. The garage is a five-story structure with the first two stories comprised of precast concrete decks, while the remaining three stories consist of post-tensioned poured concrete. Phase 1 of this repair project included the repair and protection solutions for the top three stories. For this initial phase the concrete restoration had to be completed quickly without slowing down the deck membrane and light-reflective coating applications. The sealant installation also needed speedy application and could not have an adverse effect on the membrane or coating. In addition, the concrete restoration had to be coordinated with the expansion joint installation. All materials had their own purpose and need; however, each system had to rely on another material's proper installation and compatibility.

The quality assurance of this project was also aided by the manufacturer's inclusion in the construction team. Before the project began, the manufacturer provided testing illustrating the compatibilities of the components. In addition, at the pre-installation meeting, all parties involved were strong contributors. Finally, during the course of the project, the manufacturer provided bi-weekly progress and inspection reports. All of these products were chosen in part due to the manufacturer's ability to supply a comprehensive and single-source solution to this problematic situation. Ongoing communication among all project team members help insure this project's success.



New deck coating



Completed deck



Exterior view of deck

Cook County Department of Corrections Parking Garage

Owner

Office of Capital Planning and Policy
Chicago, Illinois

Project Engineer/Designer

Soodan & Associates
Chicago, Illinois

Repair Contractor

National Restoration Systems
Rolling Meadows, Illinois

Material Suppliers

Degussa Building Systems
Shakopee, Minnesota

Glenrock Company
Northlake, Illinois

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