Rehabilitation of a Parking Garage in Downtown Milwaukee, WI

Location:	Milwaukee, WI
Submitted by:	Wiss, Janney, Elstner Associates, Inc.
Owner:	Northwestern Mutual
Engineer(s):	Wiss, Janney, Elstner Associates, Inc.
Contractor:	General Contractor: Structurewerks and PT Subcontractor: STRUCTURAL
PT Supplier:	VSL

Project Overview:

The structural rehabilitation of this parking garage involved extensive repairs to the slab post-tensioning system. The repair techniques used were tailored to enhance the efficiency of the repairs and durability of the repaired structure. This repair project also used external post-tensioning to strengthen beams where the beam tendons had deteriorated due to corrosion.

This project included the repair and restressing of almost 600 unbonded slab post-tensioning tendons that had failed or exhibited significant corrosion-related damage. Many of the slab tendons were found to require repair at their end anchorages, where extensive corrosion-related deterioration had occurred due to somewhat unique detailing of the slab edge and inappropriate previous repair attempts. Several other unique conditions at other locations in the garage also contributed to the tendon deterioration. As part of the slab tendon repairs, multiple methods of detensioning were used; many sections of new tendons were replaced using threading and extraction techniques; and all repaired sections of tendons were fully encapsulated, including the spliced connections to the remaining existing tendon sections and the central stressing splices.

The beams addressed as part of this project included a set of beams located at an expansion joint. An unusual condition caused by a construction deficiency allowed water to leak through the failed expansion joint seals and enter the sheathings of the beam tendons, resulting in the corrosion and failure of some of these tendons. To restore the strength of these beams, external post-tensioning was installed on the sides of the beams, which required a unique method of anchoring due to the configuration of the structure at the beam ends. In addition, tendon drying and regreasing techniques were used on these beams to help limit additional beam tendon deterioration in the future.

Jury Comments:

- The project is noteworthy because of its complexity, the variety and number of repairs, and the innovative solutions used.
- Multiple innovative repair techniques were used to address extensive distress throughout the structure.