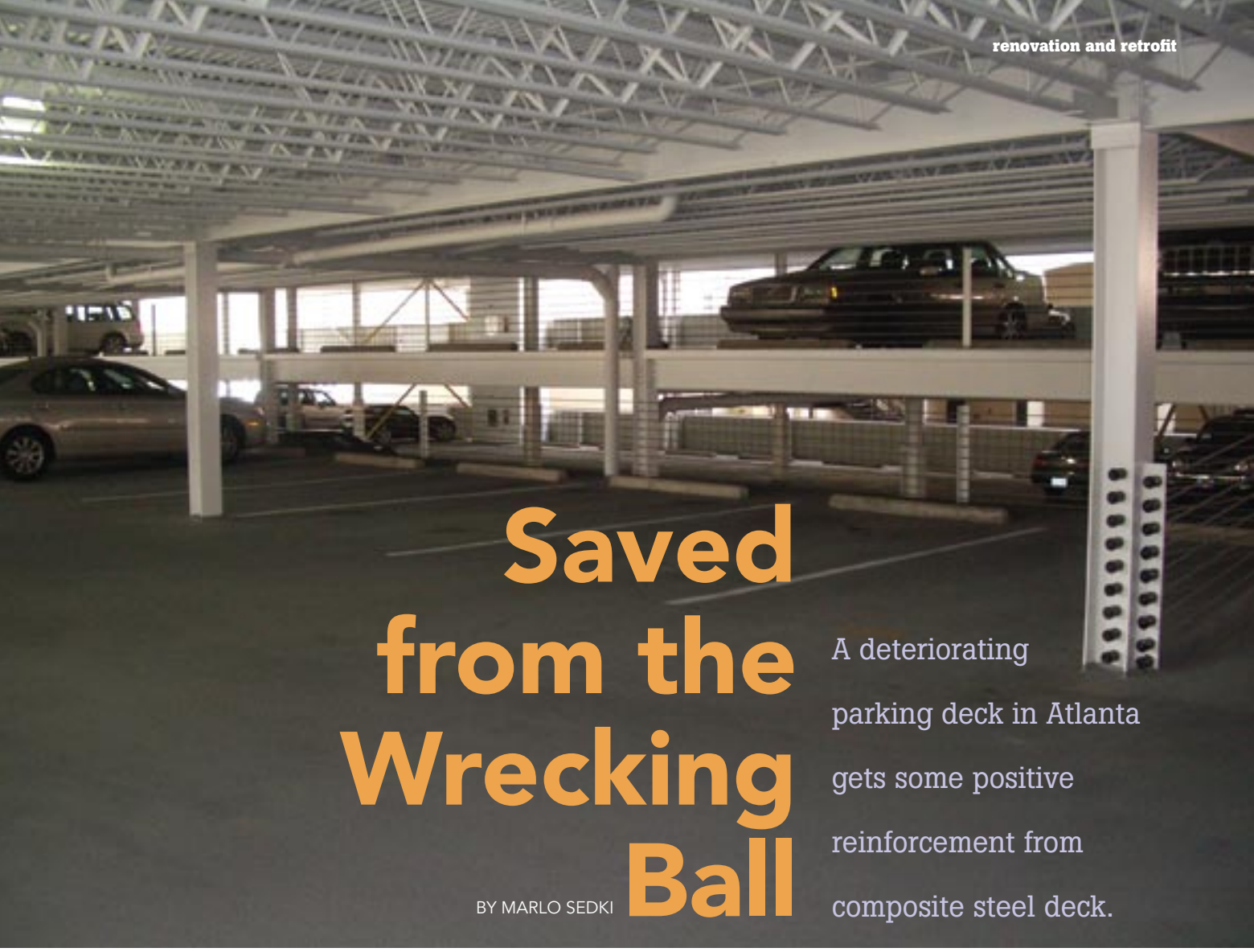

Saved from the Wrecking Ball

A deteriorating parking deck in Atlanta gets some positive reinforcement from composite steel deck.

BY MARLO SEDKI

YOU'VE HEARD THE OLD SAYING: "IF IT AIN'T BROKE, DON'T FIX IT." Well, here's a follow-up: "If it *is* broke, *do* fix it—don't destroy it!" That's the philosophy Sedki & Russ Structural Engineers embraced when confronted with a rapidly deteriorating parking deck at the Cornerstone Village condominium building in Atlanta.

The original analysis called for the garage to be demolished and bebuilt. However, the homeowners association for the building did not have the funds to build a new parking deck. So, Sedki & Russ found a way to renovate the structure.

Critical Cracking

Cornerstone Village's original parking deck consisted of concrete slab on steel joists. Almost immediately after the six-story deck was completed in 1999, problems, such as cracking in the slab, corrosion of the steel frame (due to water seepage through the cracks), and vibrations and deflection in the deck, began to appear. The cracking got worse with time, and in some locations the slab even punched through the metal deck. Areas where the slab was badly cracked had to be barricaded, and in other locations steel plates and angles were placed under the slab.

The homeowners association hired a testing lab to analyze the situation. The lab's report stated that the design of the concrete slab did not meet load requirements at mid-span between the joists (per the 1994 *Standard Building Code*, the slab must support 50 psf live load or a concentrated load of 2,000 lb acting on an area of 20 sq. in.), and it recommended removing the slab and replacing it with a new, lightweight composite floor slab.

The original floor slab specified was 3½ in. thick at the high point and 2½ in. thick at the drains. The slab was on 28-gauge corrugated metal form reinforced with welded wire fabric. The deck was bearing on steel joists at 2 ft 8 in. on center in the driving lanes and 2 ft 6⅞ in. in the parking lanes, with the exception of the first bay, which was 3 ft $13/16$ in.

The consensus was that the concrete slab was unsalvageable and needed to be replaced. Temporary repairs were made, consisting of inverted 1½-in.-deep 18-gauge type F metal roof deck over the slab, spanning between the joists and in the driving lanes only. Wood planks, 2 × 6, were cut to fit and added to fill in the valleys of the deck. The wood planks and decking were connected to the slab with ½-in.-diameter carriage bolts at close spacings.

The repairs were inspected monthly and performed satisfactorily for a while, but after approximately two years, the wood started to splinter and the bolts started to loosen. At this point, Sedki & Russ was hired to design the permanent repairs.

Driving Forward

The project had to be completed quickly because of the inconvenience to

residents, who were required to park several blocks away during construction. First, the concrete slab and deck in the driving lanes the ramps were removed, leaving just the parking lanes. Then, new joists were installed between the existing joists, and three rows of cross-bracing were installed, welded between the top and bottom chords of joists and at crossover points. The bottom chords of the joists located at the one-third points of the beam spans were extended with 2-in. angles. To stiffen the beams and increase their moment capacity, 1-in. round rods were welded at their top and bottom flanges.

A new 26-gauge corrugated galvanized metal deck spans the existing and new joists. The deck was connected to each joist with welding washers at 12 in. on center. The welding washers were 2 in. high for slab thicknesses 3 in. or greater, and 1½ in. high for thinner slab thicknesses. These washers have a groove at the top to support a continuous #3 bar, which placed the mesh at the top over the joists.

The concrete poured for the new slab was 4,000 psi with a 3-in. maximum slump, and 1.5 lb of fiberglass mesh per cubic yard. The slab is reinforced with welded wire fabric.

Crack-control joints were added at a few locations over joists at column lines, and alternating bars were cut at the joints. The joints were tooled, not saw-cut, and then filled with ISO-Flex 880 joint filler.

In the parking lanes, additional joists were placed between the existing ones. Since the deck was still in place, the joists were shipped with no camber and without bearing ends. After the new joists were in place, they were jacked up tight under the existing slab, and the bearing ends were placed. To provide lateral bracing to the top chord, ⅜-in.-diameter expansion bolts between the top-chord angles were anchored into the slab above. Three rows of cross bracing and joist bottom chord extensions were added to the bottom flange of the beam.

After being cleaned in accordance with SSPC-SP3 or SSPC-DP2, the entire steel frame was painted; it was spot-primed with Tnemec Series 135 and then a full coat of Tnemec Series 115 DF was applied. The last step was to apply Neogard Auto-Gard Waterproofing, a vehicular traffic-bearing waterproofing membrane, over the entire deck. The renovation was completed last year.

With the project complete, the garage is now structurally sound and safe for parking.

The original concrete slab was so badly cracked that it had punched through the deck in some places. Portions of the slab were barricaded.

Throughout the garage, new joists were added in between the original joists to decrease the slab's span.

The only drawback is that residents don't get as much exercise walking to their cars anymore. MSC

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