

No Fishing at Kalakaua Center: How the Leaks Were Plugged

by Vi Bashian Cooper

Imagine this for a concrete nightmare: water leakage in a 25,000-sq-ft parking garage extending 2½ stories below street level just two blocks from the beach in Waikiki.

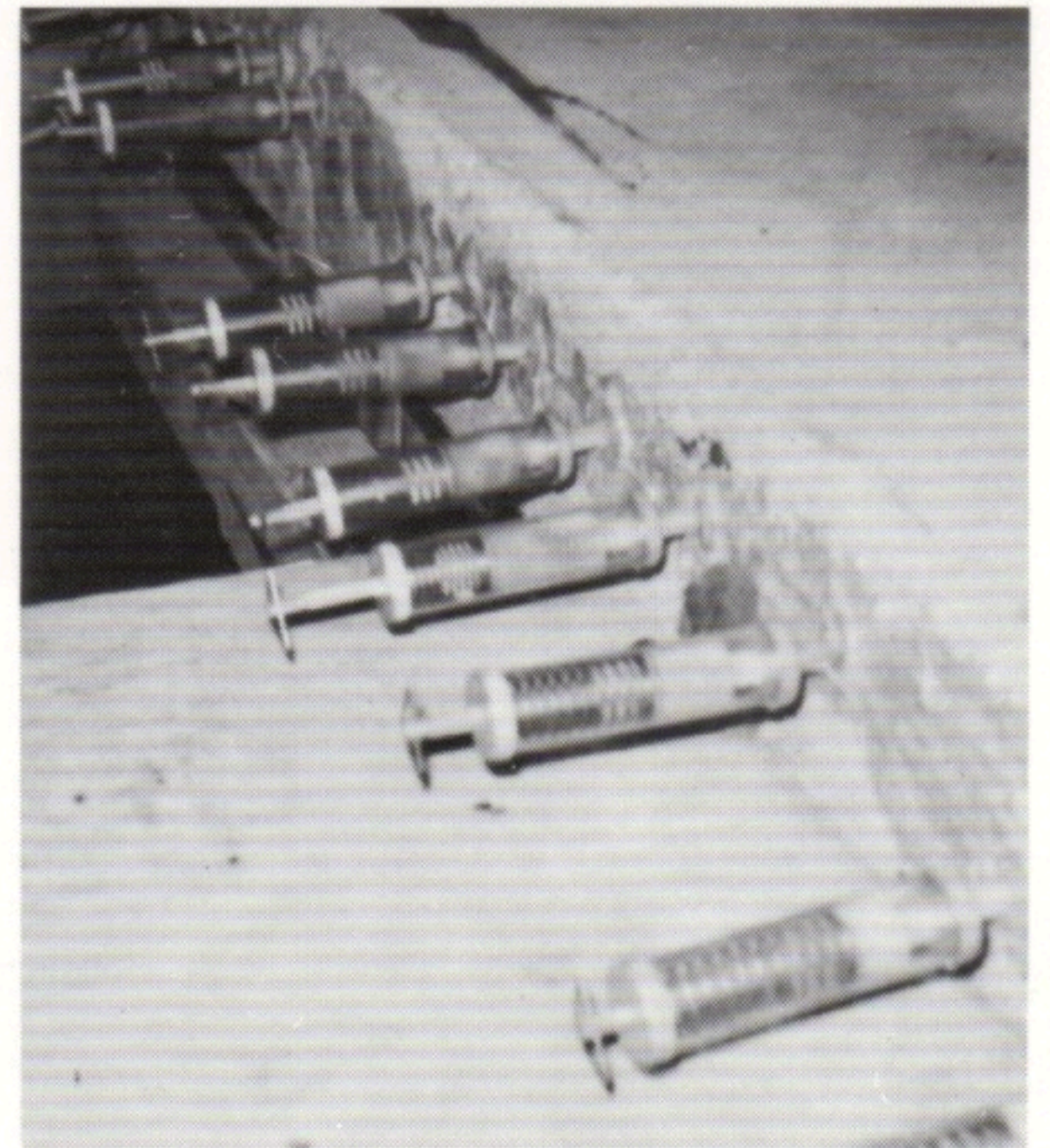
That's exactly what the development manager, the Honolulu firm of Graham Murata Russell, faced during the transformation, now in progress, of the long-vacant Mitsukoshi Building into Kalakaua Center.

The concrete slab and walls 30 ft below street level in the commercial building at Beach Walk and Kalakaua Avenue had experienced water infiltration, delamination, rusting rebars, cracked slabs, spalls and leaks in the gunite walls. Just about everything bad that can happen to concrete had to be corrected.

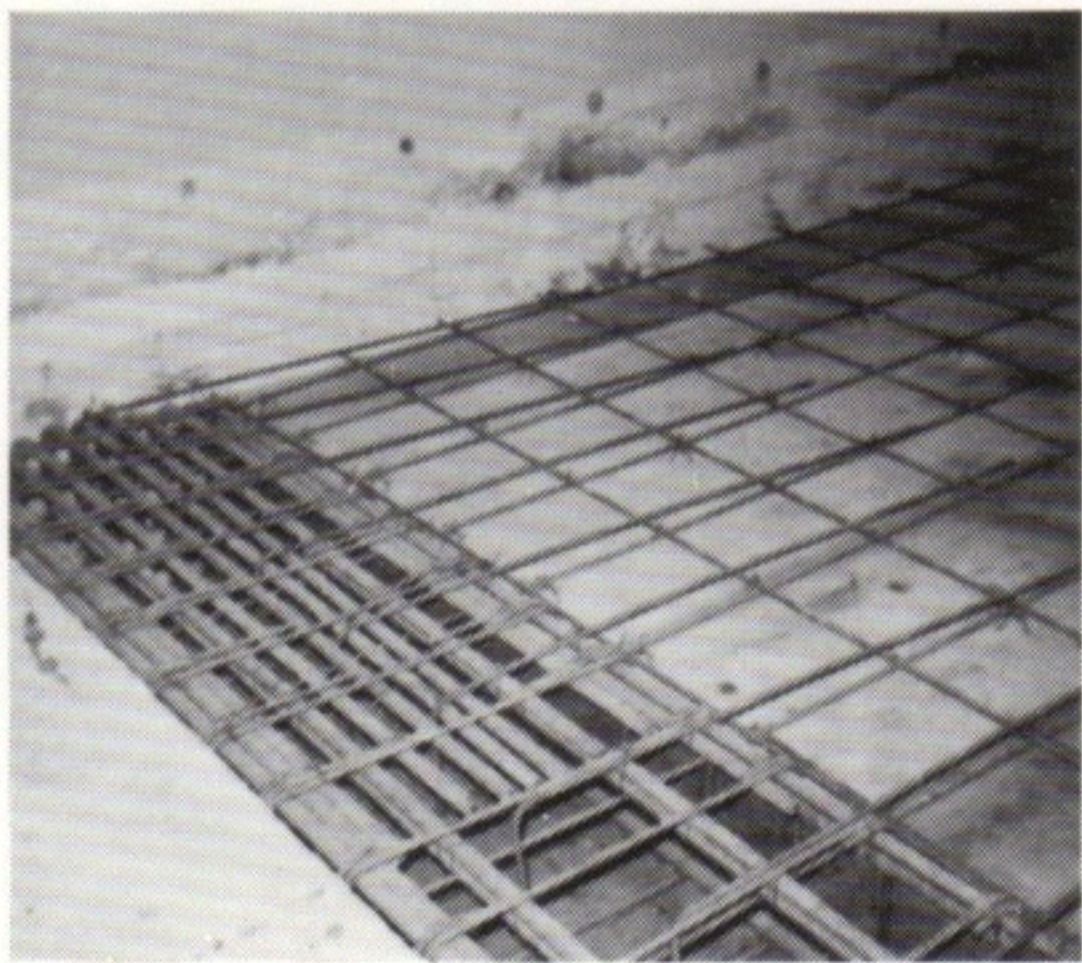
"I've worked in Hawaii construction for 15 years and in only one case have I seen water infiltration problems this extensive.

"The owner readily recognized that there was no way to quantify the extent of repairs required. A lump-sum contract would either make us rich or break us, and nobody was that much of a gambler. So we agreed to a cost-plus contract with a nominal fixed monthly fee," Malmgren said.

RCM's crews first tackled the wall-to-slab junction at the perimeter of the garage. They chipped out a 2-inch by 2-inch groove at that joint, and packed it with a quick-setting hydraulic cement that hardens even in wet conditions to stop or reduce the major inflow of running water. To true up the surface, a two-component paste epoxy bonding agent was applied 1 ft up the wall and 1 ft out onto the slab.



Extremely long horizontal cracks in this slab were repaired by injecting epoxy through capsules mounted on the surface. Later a new top coat of concrete was applied.

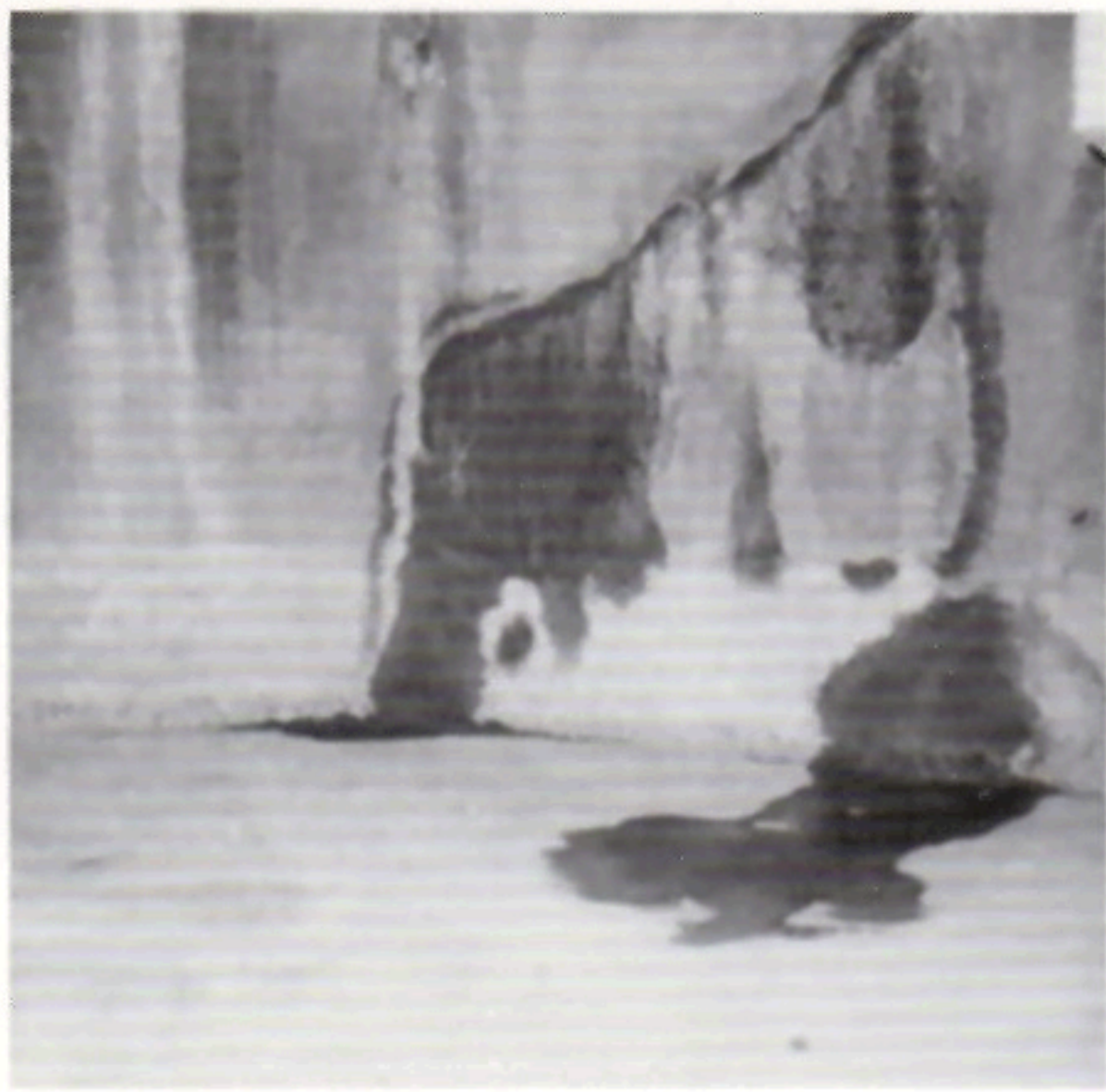


RCM's crews tore out a concrete-topped metal deck, reformed it and installed new reinforcing steel and concrete to repair severe spalling.

"We certainly faced a challenge," said Richard Malmgren, president of RCM Construction Corp., the contractor hired to repair the garage. "Although the building is only 10 years old, the water table here coupled with inattention to regular maintenance resulted in a repair program of major proportions.



Kalakaua Center under renovation.



Just one of hundreds of typical wall leaks in Kalakaua Center's underground parking garage.

For the cracks in the walls, RCM used a low-pressure epoxy system to inject a low-viscosity resin capable of penetrating cracks as small as .0007 inch. The wall was then painted white.

The choice of white paint was intended to increase the light in the otherwise dark underground area. But the white paint had another, unintended effect: It identified new cracks and leaks which the original visual inspection couldn't pinpoint on the rough surfaces of the garage.

"What we faced here was that when we stopped the leakage at one place, it only forced the water out at another point," Malmgren said.

So RCM's crew went back over the same walls, filling new cracks and repainting the now-sound surface. The crew first heated the wall with a torch to temporarily dry the surface and then quickly applied a moisture-insensitive epoxy coating and bonding



Leaks at an intersection of the perimeter wall pour were epoxy-injected, then recoated and painted.



Repairing wall joints required a multi-step process of chipping away damaged concrete, using a cementitious hydraulic filler as a water plug, applying several different types of epoxy mortars and coatings, then repainting the area.

agent. Any remaining leaking cracks were injected with epoxy. "It really became a very time-consuming project," Malmgren said.

Some walls contained so many leaks that the entire wall had to be completely coated with epoxy coating.

The vent shafts presented slightly different problems.

"Given the amount of water infiltration we encountered in the shafts," Malmgren said, "we decided to give the water a new path to escape by drilling 1-inch holes in the wall and installing tubing to act as temporary drains.

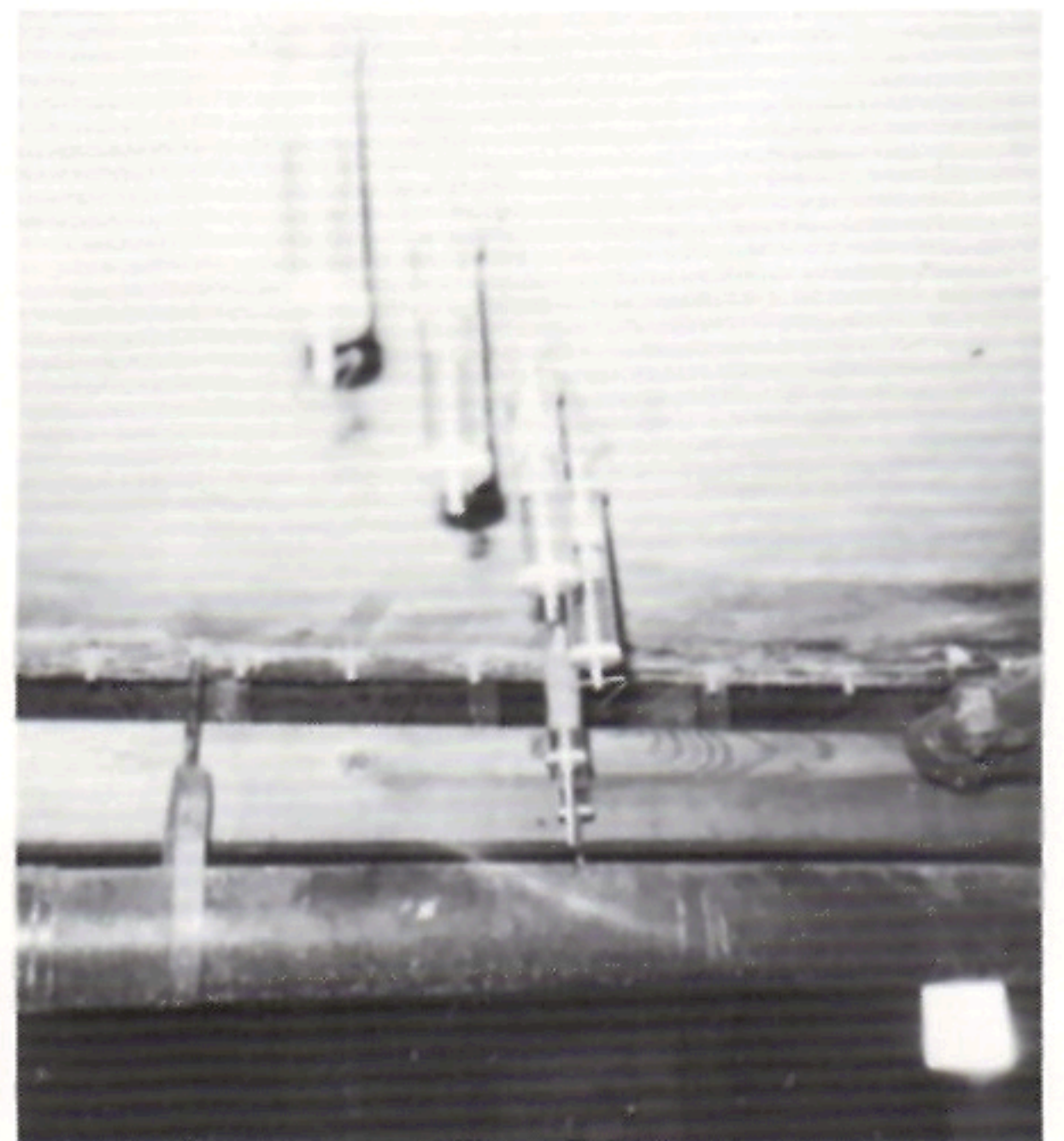
"We then used the hydraulic cement approach and epoxy coatings and injection, combined with an elastomeric membrane to dry up the shaft. The temporary drain tubing turned out to be a very effective method of drying surfaces, so we used it in the other wall areas as well."

At the lowest supported level of the garage, water infiltration had undermined the soundness of both the slab and the reinforcing steel.

"We were surprised when we injected over 30 lbs of epoxy resin into the slab to fill these cracks," Malmgren recalled. "Then to strengthen the old structure, we built up several walls of CMU along the parking stall lines and sprayed a 6-inch gunite reinforced slab below the old supported slab and on top of the new CMU walls."

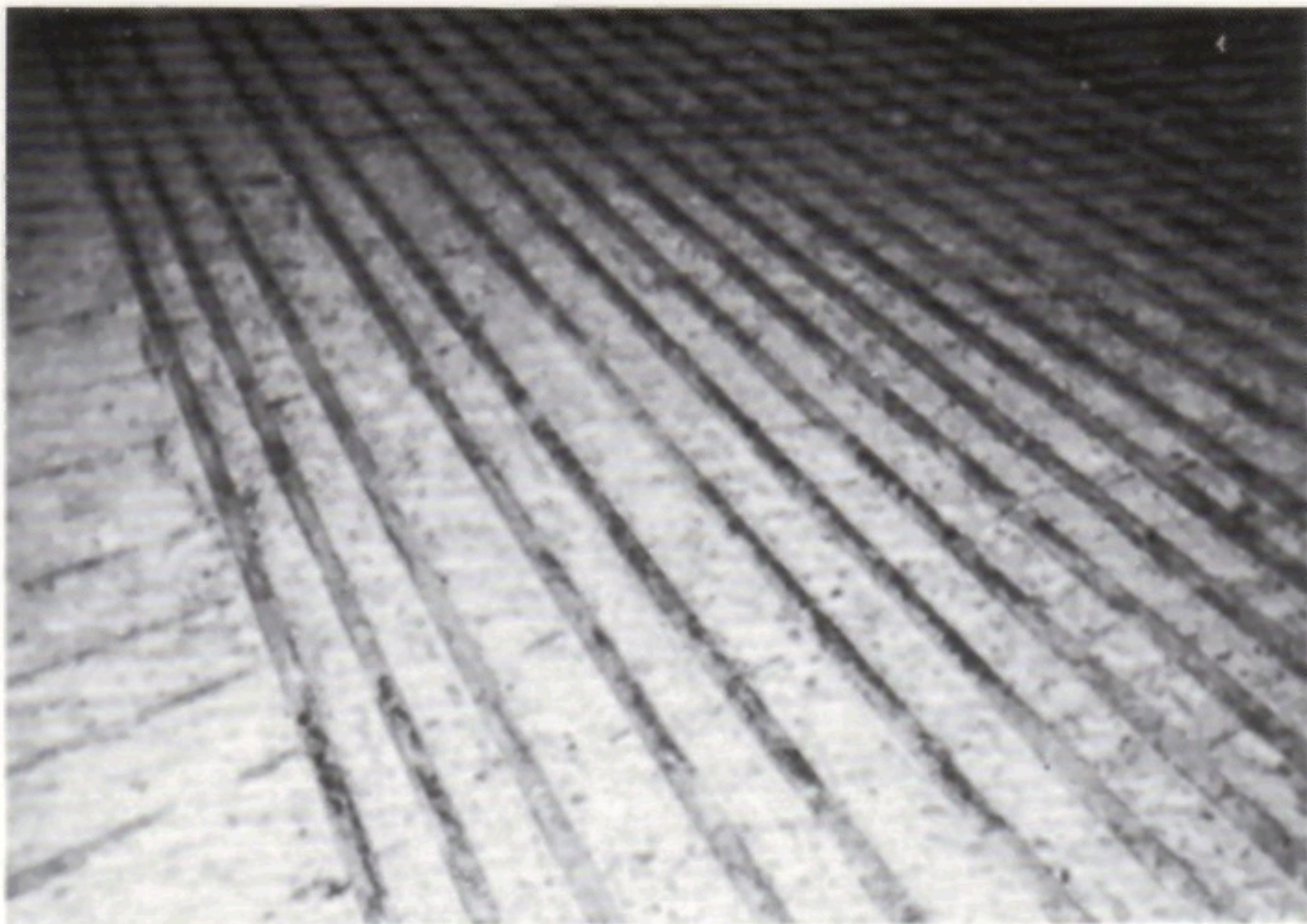
The RCM crew started from the lowest level of the garage and worked its way up. Along the way, the workers installed new concrete topping to drain water into newly installed sump pumps.

The tasks of repairing car-damaged pillars, squaring and patching corners, cleaning, priming and repainting handrails, and other miscellaneous chores were included in the \$500,000-plus



Above, epoxy injection around an earth-filled cavity. Below, the underside of an earth-filled cavity, looking up at a gunite slab.





Several large areas near five vent shafts were chipped away, rusting reinforcing bars cleaned and new bonding materials applied before new concrete topping was poured.



Water-stained vent shafts required patching, injection, recoating and painting. This multi-step process required an elastomeric membrane-coated concrete deck sloped to a new sump pit.

contract that took nine months.

Malmgren has a hard time comparing the scope of this project to others his crews have completed. "First of all, we don't have that many underground garages, especially so near the ocean. Then, I've never seen such untypically extensive deterioration," he said.

A Complete Rejuvenation

The nine-story Kalakaua Center is undergoing a total renovation by general contractor G.W. Murphy Construction Co. Originally a major retail center with Mitsukoshi Department Store the prime tenant, the building was sold to 2155 Partners, a group



A detail of the vent shaft area, showing new concrete forms in place.

BUILDING MANAGERS HEADACHE #3

Deteriorated Balustrade



RAILING REPAIRS

The concrete balustrade of this historic building was in varying stages of failure - complete failure to partial deterioration. The client desired to salvage as much of the 80 year old structure as possible. Just because your deteriorated railing may not be at the top of a 80 year old structure listed on the historic register does not mean you should wait to repair it.

SOLUTION

A low pressure epoxy injection system was used in all cracks to prevent further crumbling of the concrete pickets and railing. Spalled concrete was chipped away and replaced with Thorite over a coating of ProBond 200.

All concrete problems can't be treated with the same solution.

When you have a problem, consult a design professional or call us. RCM Construction Corporation. Phone: 545-2177.

RCM

CONSTRUCTION CORPORATION

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made up of Mutual of New York and the individuals who are partners in Graham Murata Russell.

Currently being sold to ANA Real Estate Co. of Osaka for \$63 million, the building was gutted to the concrete slab and structural supports in the \$20.4-million renovation. The interior will be completely refurbished, and a new teal, pink and gray glass curtain wall is replacing the solid plaster exterior.

Phillip Russell, a principal in the firm of Graham Murata Russell, is the principal in charge of the Kalakaua Center project, begun in October of 1987 and scheduled for completion this month.

Russell reported the building has 150,000 sq ft of rentable space and is already 80 percent leased, with retail firms on the first and second floors, and wholesalers on the third and fourth. □