

Space-Age Garages That Save Space - Correction Appended

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Body

IT lumbered and thudded into existence -- three years late, some still-debated but hefty amount over budget -- but the Hoboken municipal parking garage that opened its robotically controlled doors last year displays a stunning agility. It lifts and carries cars about on computer-controlled steel pallets as if they were delicate ballerinas, moving with precision and speed inside a structure that is remarkably compact.

While performance tests are still going on, the garage is limited to operating at two-thirds of its full capacity. When all systems are go, however, it will park 324 cars on just a 100-by-100-foot lot. The seven-level garage is 56 feet high, not much higher than the four-story row houses that are its neighbors.

"This is amazingly proficient use of space," commented Darius Sollohub, a New Jersey Institute of Technology professor who studies parking and urban land use. "It may provide one of the solutions to the most important conflict in urban design: where do you put all the cars in environments where car volume is high and space is at a premium?"

Although an automated garage is more expensive to build it typically takes only about half as much precious real estate as a conventional ramped garage to handle the same number of cars, or even more. That is why in European and Asian cities, the automatic garage was long ago anointed as the best solution, Mr. Sollohub said.

The Hoboken structure, designed by Gerhard Haag, an engineer and architect born in Germany, where ramped garages are rare and automatic garages common, is a first-of-its-kind in the United States. There are other automated garages in the country, some dating from the 1950's. But the Hoboken garage -- and another smaller one designed by a different company in a Washington apartment building -- belong to a new generation of fully automated garages that parking industry specialists say is generating new interest. Indeed, Mr. Haag said, there are 67 American cities, including Manhattan, where his company is currently discussing proposals.

Hoboken's Garden Street Garage is completely computerized, with two identical elevator systems that are able to move simultaneously in both vertical and horizontal directions and communicate with each other by wireless transmitters. The garage's computer figures out which of the hundreds of spaces in the building a vehicle should occupy, and then delivers it there untouched by human hands.

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A monthly parker pulls into one of four driveways at the red-brick building on Garden Street, which on the outside looks pretty much like a group of Hoboken row houses. The driver powers the car forward a few yards onto a steel pallet, maneuvering the wheels between guardrails as instructions appear on an L.E.D. signboard about correct alignment, then turns off the engine and gets out.

After locking the car, the parker swipes a card in front of a magnetic reader, and while the sign on the wall is flashing a reminder to step back, automatic elevator doors close around the car and it is whisked to a computer-assigned slot.

The computer factors in the vehicle's size when making an assignment, putting larger S.U.V.'s on lower levels. It also takes into account the driver's schedule on previous visits, putting vehicles whose owners enter and exit frequently in the slots that the system can most easily access.

When the owner returns for the car and swipes the card again, the process begins in reverse. Within seconds, another electronic sign announces at which bay the car will appear, still on the pallet where the parker placed it. In its first year of operation, according to the computer records, the average wait to retrieve a car was 2.5 minutes.

THE key breakthrough with his type of design, according to Mr. Haag, is that the mechanized system is "truly redundant." With older automated designs, said Mr. Haag, all three movements a car elevator can make -- in and out, up and down, side to side -- are powered by one central unit. If any single part fails, the garage becomes inoperable.

Mr. Haag's patented design has dual systems, so that its two elevators can move separately and independently, and the three types of movements they make are each powered by separate motors. Furthermore, each individual motor has a backup. There are twin motors powering the rollers under the pallets, for example, each working at less than half capacity and programmed to take over if the other should fail.

Besides increasing reliability, notes Dale F. Denda of PMRC, a national parking market research company, the fully automatic garage means "throughput" is enhanced -- parking lingo for shortening the time it takes to store cars and retrieve them.

The one other fully automatic garage in the United States is set beneath the Summit Grand Parc, an apartment building two blocks from the White House in Washington that incorporates both a new apartment tower and historic structure that was once home to the United Mineworkers. Designed by the Spacesaver Parking Company, a division of the Mid-American Elevator Company, and using equipment manufactured by a German concern, Wöhr, the garage parks just 74 cars, and has only one automated elevator system.

"But without the automated system," said Michael A. Underwood, a senior vice president of the project's developer, Summit Properties, "we wouldn't have had parking at all. For the kind of luxury apartments we provide, we had to have parking -- but this was a narrow lot between existing buildings, and with a conventional garage, we found ourselves hamstrung by site constraints. Automation provided an option."

Urban land use specialists say that this sort of situation will continue to occur in congested American cities, and that automated parking could become a widely used option. Tomorrow, in fact, a seminar on automated parking is scheduled at the Urban Land Institute, a Washington research institute, using the Summit Grand Parc as a case study.

The Spacesaver company has another 99-car automatic garage that has been approved in Aspen. The company reports additional interest in various Northeastern metropolitan areas, and a spokeswoman said it also had a project under discussion in New York City, although she would not provide details about the site.

The Manhattan site that Mr. Haag is eyeing would involve tearing down an old building and constructing a privately operated 300-car fully automatic garage.

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Monthly rates for parkers would be competitive with those at a conventional garage, said Mr. Haag, "or else the market wouldn't exist." In Hoboken, a standard municipal fee of \$200 per month applies, at the automated garage and all others. In Washington, Summit Grand Parc residents pay \$225 monthly, and for S.U.V. size spots, \$250.

Until very recently, the American way has been to indulge a cultural passion for driving, even in a parking structure, observed Shannon Sanders McDonald, an architect and scholar who is writing two books on the history of parking garages and land use -- one of them with Mr. Haag.

"People love their cars in this country," Ms. McDonald said. "and the car-loving culture is the main reason for the garage typology."

In Europe and Asia, the development history, traffic patterns, and parking "culture" are different, she said, and cities simply are not built to accommodate the hulking presence of a typical ramped structure. There are roughly 5,000 automated garages on those two continents -- including dozens that are fully computerized and robotically operated like the ones in Hoboken and Washington.

Ramped garages are actually very unpopular with many Americans -- "ignored at best," Ms. McDonald said, "hated by many." Why would people loathe a parking garage? Let her count the ways: "They are perceived to be ugly, grimy, scary places where muggers are waiting to snatch purses and wallets, you will probably get your car paint scratched or your fender bent, and you are more than likely to get trapped in a long line of cars spewing exhaust when you're trying to get to the exit."

Ms. McDonald, an architect who currently serves as an adjunct professor of architecture at North Dakota State University in Fargo, says garages have been made a "scapegoat for urban ills." Yet she and others in the emergent field of scholarly research on parking -- along with entrepreneurs like Mr. Haag -- make a case that automatic garages actually help alleviate some of what ails modern cities, by eliminating the dirty-and-scary factor, and by maximizing land use.

"The main advantage of automated garages," said Mr. Denda, who is the research director for PMRC, which is based in McLean, Va., "is that they can be built on sites that are too small or irregular for the construction of conventional garages."

Of course, the cost of construction and operation also figure in heavily to a developer's decision to build an automated garage.

IN Baltimore, Ashbourne Properties is considering Mr. Haag's Robotic Parking system for a proposed three-building apartment complex that has street access only 60 feet wide. "It is the only way we could provide on-site parking -- and we are happy to have the option," said Ashbourne's president, Crispin Etherington.

"The price we have been quoted is \$22,000 per space, when conventional parking costs about \$15,000 per space. We are studying the economics of our project, and the Baltimore market before deciding which way to go."

Another developer, David Barry of the Applied Companies in Jersey City, said his company recently decided against automated parking for a 12-story apartment structure going up in that city based on cost, and also the general reluctance of lenders to underwrite "something so new, and untested."

Mr. Haag also noted that being on the cutting edge can cause problems for conservative lenders. In his view, the ongoing tests of the structural strength and reliability of the Hoboken garage being done to satisfy the construction bonding company are "really overdoing it."

But as developers in many metropolitan areas find themselves scrapping over sites they would have considered unbuildable even a year or two ago, Mr. Denda said, automatic parking garage proposals are increasingly coming into play -- and familiarity with the issues they raise will rise.

The four-level automatic garage in Washington, beneath the Summit Grand Parc, occupies a space measuring 60 by 106 feet -- smaller than many suburban yards. It is 32 feet floor-to-ceiling -- shorter than many power poles.

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The Hoboken garage is situated in the middle of a block on a narrow street with metered spaces on both sides and is built on land that required considerable environmental cleanup.

Mr. Haag said that if a ramped garage could even have been built on the Hoboken site -- which is questionable in his view -- it would have provided only 95 spaces, compared with 324, and construction costs would have run close to \$30,000 per space, compared with \$20,000.

Precisely what the Hoboken garage cost, and how long it took to build, remain touchy issues in the city -- with the mayor having recently abolished the parking authority after an investigation into how it handled the project, and Mr. Haag's Florida-based company, Robotic Parking Inc., and Belcor -- the company that acted as general contractor -- still locked in legal battle over which one was responsible for construction issues that caused delays.

But Mr. Denda from the parking research company said none of that was particularly surprising. "That's the construction industry," he shrugged, "and in Hoboken, the municipality was involved, which only adds to the complications."

Seymour Gage, a veteran parking garage engineer from Manhattan, said he finds it difficult to believe one of the new fully automated garages will ever be built in New York.

Mr. Gage, 83, designed two automated garages in the 1950's that are still working today -- as is he. The Showbiz Parking structure in the Manhattan theater district, off Eighth Avenue, between 45th and 46th Streets, was built in 1957, Mr. Gage said, using an elevator-on-wheels system devised by an Iowa inventor, Virgil Bowser, and Mr. Gage's engineering know-how. Like other mechanized garages of the era, it requires a staff -- 8 to 10 people during peak hours -- with valets stationed on each floor.

The new robotic computerized garages are "a totally different animal" from that one, Mr. Gage said. He is currently working as a consultant on construction of a fully automatic garage in Moscow, "which is becoming a hotbed of parking," he said, with hundreds of buildings going up, all with automatic parking structures beneath.

"Other companies are building in Beijing," Mr. Gage said, "and in Europe, right now a company called Klaus is putting up about 30 -- very similar to the one in Hoboken."

"We Americans," he added, "are way behind on this, absolutely."

The additional cost of constructing an automated garage is one of the reasons for that, Mr. Gage said. "There is no question that the fully automatic garage is more expensive to build -- maybe 50 to 75 percent more for a small one, 60 spaces or less," he said.

On the other hand, Mr. Gage said he was recently asked to consult on a proposal for building a large underground automated garage being contemplated in Brooklyn. In that case, he said, a robotic garage would be cheaper -- by 20 percent.

"The main reason is it would be underground," he said. "That is more costly in general. But below ground, automated parking beats self-parking, because of savings on construction. You don't have to go as deep, or as horizontally."

AN industry group formed two years ago in Los Angeles -- the Automated and Mechanical Parking Association -- said the \$20,000-per-space cost of an automated garage is a "disadvantage" planners have to consider. On the other hand, Mr. Haag insists that if the cost of land is figured in, an automated garage for 60 cars or more is always less expensive to build than one with the same capacity with ramps.

"Also, when comparing costs, many times it is forgotten," he said, "that our price includes a closed facade, a sprinkler system and a valet parking service." Automatic garages do not require a ventilation system, he pointed out, since the car engine is never running while the car is inside, and no exhaust fumes are generated. No pedestrian elevators, fire doors or emergency staircases are needed either.

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An automated system uses more electrical power, he pointed out -- but is much less labor-intensive. In Hoboken, there are just two young men running the show -- Mr. Haag's son, Constantin, and Filipe Sousa, who oversees the computer system, watching blinking lights on his screen track the movement of cars through the garage, and receiving messages when any motor reaches one million revolutions and needs a maintenance check.

"It's really the garage doing all the work," Mr. Sousa said with a laugh. "We're just along for the ride."

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Correction

An article on Sept. 21 about garages in which cars are parked by automated equipment misstated the type of street parking available near the robotic facility in Hoboken. One side of the street is reserved for residents with permits; on the other side parking is allowed for up to four hours. There are no parking meters on the street.

Correction-Date: October 5, 2003

Graphic

Photos: A car, above, being positioned to roll on its pallet into one of the 324 spaces on seven levels in the Hoboken, N.J., municipal parking garage. At left, car emerges from the garage. (Photographs courtesy of Robotic Parking)(pg. 1); Garage on Garden Street in Hoboken, N.J., blends in with its neighbors. (Photo courtesy of Robotic Parking); Automated garage from the 1950's, on West 44th Street in Manhattan. (Photo by George M. Gutierrez for The New York Times)(pg. 4) Chart: "Robotic Chauffeurs" Cars parked at a robotic garage in Hoboken ride to their computer-assigned parking spaces atop a pallet. The pallet is moved by motorized carrier on and off an elevator and then on and off a platform that moves laterally to align the car with the designated space. 1. The customer drives into the garage and parks on a steel pallet. 2. The computer-controlled carrier pulls the pallet in and rotates it by 180 degrees, so the car is facing forward when it is retrieved. 3. One of two elevators takes the pallet and car to an upper level. 4. The pallet is transferred to another carrier that moves it laterally to an open space. 5. The car and its pallet are moved into the designated parking spot. Rows of parking spaces are separated by an aisle that allows cars to be moved laterally on each floor. Schematic drawing of robotic garage. (Drawing by Mika Grndahl/The New York Times)(pg. 1) (Source by Robotic Parking)(pg. 1)

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