

AUTOMATED VEHICLE STORAGE/RETRIEVAL SYSTEM UPDATE

By Donald R. Monahan, PE

After completion of the first two fully automated vehicle storage/retrieval systems (AVSRS) in October 2002 (Hoboken, N.J., and Washington, D.C.), it took another five years before the third system was completed in the U.S., in New York City. To date, 14 systems have been completed, and another eight are under construction. Many more are in the negotiating phase.

Current Automated Vehicle Storage Systems in the U.S. as follows:

	Project	Location	No. of Stalls
1	916 Garden Street	Hoboken, N.J.	324
2	Camden Grand Parc	Washington, D.C.	74
3	One York Condominiums	New York, N.Y.	40
4	123 Baxter Street	New York, N.Y.	67
5	1706 Rittenhouse Square	Philadelphia	64
6	Juniper Street Garage	Philadelphia	224
7	418 Jessie Street	San Francisco	27 (9 floors)
8	Johnson Avenue	Coconut Creek, Fla.	300 storage, 100 cars
9	I-595 & US-1	Fort Lauderdale, Fla.	300 storage, 140 cars
10	Palisades of Towson	Towson, Md.	409
11	148 E. 24th Street	New York, N.Y.	53
12	1504 Coney Island Avenue	New York, N.Y.	270
13	Brickell House	Miami	480 (12 floors)
14	123 Beverly Street*	Boston	300
15	275 Seabreeze Avenue*	Brooklyn, N.Y.	65
16	20 Grand Street*	Brooklyn, N.Y.	65
17	City Hall Garage*	West Hollywood, Calif.	200
18	308 E. Green Street*	Champaign, Ill.	240
19	Costa Hollywood*	Hollywood Beach, Fla.	175
20	1415 Park Avenue*	Hoboken, N.J.	374
21	900 Monroe*	Hoboken, N.J.	144
22	11th & Pearl*	Boulder, Colo.	70

*under construction



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So what have we learned about these systems during the past 12 years?

The construction cost is competitive with conventional, ramp-access, self-park garages, particularly when they are constructed underground, under a building, or on a site too small for a conventional garage. The same number of stalls can be constructed in an automated garage at half the volume of a conventional garage. The savings in construction costs can then offset the cost of the automated parking machinery. The construction cost just for the automated parking machinery (not the building shell space) is in the range of \$15,000 to \$20,000 per space for automated garages of up to 500 stalls and four to five levels. Smaller capacity garages and very tall garages can be up to \$30,000 per space.

The operating cost is approximately \$55 to \$75 per month per space, or approximately double the operating cost of a conventional garage. Maintenance is approximately half of the operating cost and ranges from \$35 to \$45 per month per space. Garages smaller than 100 spaces are at the high end of those ranges, while larger garages are at the low end.

Design Challenges


One of the biggest design challenges is to configure the correct number of entry/exit compartments for the peak hour arrival/departure traffic volume. One entry/exit compartment has an average service rate of approximately 30 vehicles per hour, although the inbound service rate may be somewhat slower and the outbound service rate somewhat faster. The aggregate volume-to-capacity ratio should not exceed 0.7 to minimize queuing. For example, the peak-hour volume for an office use may be on the order of 40 percent of the capacity for a 500-car garage. The peak-hour volume is then 200 vehicles per hour (the entry/exit compartment can serve both inbound and outbound traffic). The design volume is then $200/0.7$ equals 286 vph. The required number of transfer compartments is then 9.5, rounded to 10.

Configuring that many entry/exit compartments at the street level can be a challenge. Therefore, AVSRS garages are more feasible for lower peak-hour traffic volumes than for

hotel/residential uses or for small urban infill sites (i.e., less than 100 by 100 feet), where automated parking is the only option that can provide parking under the building.

Another design challenge is to configure the number of transport devices and lifts in the storage compartment to store or deliver a vehicle within two to three minutes. This

design is typically left for the manufacturer to determine, while performance testing is provided at commissioning the garage to ensure compliance.

Automated vehicle storage/retrieval systems have come a long way in recent years and are another viable tool to help meet owners' parking needs. 



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