

Moving on up

Fundamental to the functionality of any high-rise building is an efficient lift system. FM Magazine talks to Jay A. Popp, the Asia Pacific/Middle East executive vice-president of Lerch, Bates & Associates Inc, Elevator Consulting Group, about effective lift designs and cutting-edge practices.

Imagine a world without elevators? Buildings would either be limited to five or six storeys or we'd all have to be... very fit, perish the thought. But there's much more to it than that. Elevators or lifts, depending on your particular vernacular, have truly transformed modern architecture and, in turn, the way we live and work.

It is said that elevators move the equivalent of the world's population every 72 hours. That's around 90 million people an hour or 25,000 a second. Mind-blowing statistics that are surely a mind-numbing task to compile.

In the GCC, there has been a proliferation of residential, office and hotel towers over the past several years. And, the more sophisticated buildings get, the more advanced elevator systems need to be. Dubai is a perfect example of that, with its ever-broadening 'Manhattan skyline'. Not to mention that it will soon host the tallest building in the world – Emaar's 700 metre-plus Burj Dubai. 'History rising' is its slogan. Those

responsible for the skyscraper's 58 elevators rising have equal concerns for them descending, and being in the right place at the right time.

"We were the lift designers and façade access designers for the Burj Dubai," explains Jay A Popp, executive vice president, Asia Pacific/Middle East for Lerch, Bates & Associates Inc (LBA), Elevator Consulting Group. "We worked directly with Skidmore, Owings and Merrill in Chicago to design the number of lifts, the size, the speed, the capacities, and how the lifts are zoned within the building so that we can provide proper levels of service to each part of the building. And then we continued to work with Skidmore in the design of the core, designing the amount of space that was necessary to put the individual lifts in, preparing the documents that were used for tendering for the lifts,

responsibilities on Burj Dubai include submittal review and construction administration to ensure that the lift systems provided comply with all the required standards. Otis has won the contract to supply the elevator systems.

Due to confidentiality clauses, Popp is not at liberty to divulge some of the unique features that the Burj Dubai elevator systems will have. But he has much to say about the poor standard of elevator systems in the surrounding region. "What you see currently in the Gulf is a number of buildings that are very inefficient," he says. "A properly designed building has enough lifts to serve people as they arrive in the lobby so you don't create a queue. And you'd design the lift cabins of sufficient size to properly handle the population, and sufficient speed to get the tenants to their destination in an

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evaluating the tenders, and making recommendations on clarifying the tenders."

With offices in principal cities throughout North America and Europe, LBA has been a leading independent consultant for the movement of 'people and materials on vertical and horizontal transportation systems' since its founding in 1947. Having opened an office in Dubai this year, the company's continuing

acceptable period of time. A lot of the buildings here don't have that because they are an extension of the thought process from 20 years ago, from what the manufacturers knew at the time and the relatively simple needs of the tenant."

Popp mentions buildings in Dubai where a single group of lifts serve up to 40 storeys, twice as many local stops as any lift system is capable of making while providing an adequate



GOING UP: Jay A Popp, executive vice president, Asia Pacific/Middle East for Lerch, Bates & Associates Inc.

service. The result is you find crowds of frustrated people in the lobby, waiting longer than they should have to for a lift to arrive. And when one comes, not everyone can get in it at peak times. A good design would serve in the range of 15 local stops per zone, says Popp. From a health and safety perspective, lifts should be designed to accommodate a stretcher for emergency situations, but this is also often lacking in the GCC.

"So there are a number of issues here and it's a result of the market changing very rapidly," says Popp. "Cities such as London, Paris, Frankfurt and New York evolved over a long period of time and those markets learned proper lift requirements over a period of time. Dubai is trying to learn this in a relatively short period of time. Within the past 10 years, for example, there has been a tremendous amount of development on Sheikh Zayed Road. >>

In that 10-year period, they are trying to understand design and traffic handling criteria that have been developed over 100 years in much older cities."

On the subject of criteria, Popp says that the first fundamental step to take in developing an appropriate lift solution for any particular building is determining what the population is going to be and how the building is going to be used. This might seem fairly obvious, but the more detail required, the more complex it gets.

"Fundamentally, you establish a population density for each type of structure, and with that density you determine what percentage of that population needs to be transported up from the lobby in the mornings over a specific period of time," explains Popp. "Industry standard is typically a five-minute peak period and you design to that period. With that in mind, you look for certain performance intervals for service. In

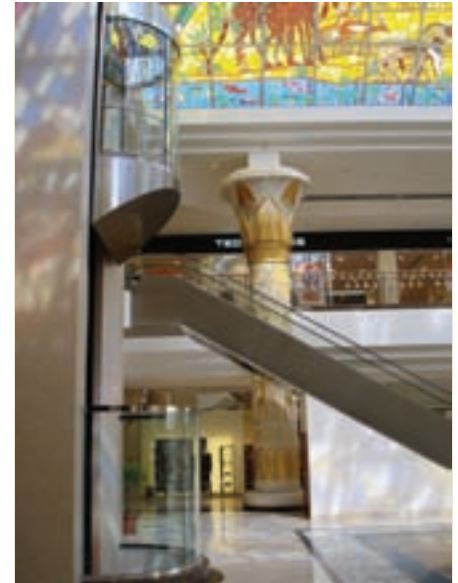
other words, you need to have enough lift departures from the lobby over this five-minute period of time so that you don't build a queue of people in the lobby that are waiting for service.

"So the population and the type of building that it prescribes the percentage of population that you need to handle in that five-minute period, and prescribes the acceptable interval for departures of that population. And with those criteria in mind and the height of the building, the number of floors, you perform calculations that then give you solutions to provide enough lifts of a sufficient capacity and sufficient speed to meet those criteria and properly service the building."

As with all technologies, elevator systems are continually evolving. Until 1979, it was a fairly slow evolution. The turning point was the introduction of microprocessors into elevator control systems. Since then, microprocessors have been used



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WAFI MALL: an escalation of elevators.

increasingly to control every aspect of elevator system operation. On the plus side, this has paved the way for highly efficient 'intelligent' elevators with in-built fault detection and fault reporting capabilities. The downside is that the lifecycle of these electronic systems is not nearly that of an elevator's traditional mechanical components.

"Over time, we're not asking the lift system to change anything; we're not asking for any additional computing power. It's still the same programme that we run every day," says Popp. "But where we have a weakness is that by providing you with high-speed, more efficient lift systems, we've tied ourselves to the computer industry. And the computer itself, the hardware, has a finite life, after which time the manufacturer doesn't support the hardware. At that point, the system becomes difficult to maintain and it starts to become

unreliable. As a result, the lifecycle of the intelligence portion or the brain portion of the lift system is much shorter."

Popp says manufacturers typically support computer parts for 15 years. After around 18 to 20 years, these parts must be replaced. However, unlike changing just the hard drive on a PC, the components of a lift and motor control system cannot be separated because they are integrated. "So you can't just change the logic part of the controller and leave the drive part of the controller," Popp says. "You have to change both simultaneously. But that's not replacing the entire lift system; it's a matter of simply replacing the electronics, the control system. All the hardware components, the lift cabin and so on, are just metal and they're not subject to much wear and tear. The underlying mechanical components are as reliable and durable as always."

So what is this advanced technology bringing to modern lift systems? Much progress has been made both in the nuts and bolts of the systems and, in turn, in the performance and quality of 'ride' for the user. Lift motors, for example, are becoming much more efficient electrically. A lift motor today that has x lifting capacity could be around 25 per cent of the size of an equivalent capacity machine in the 1960s. In addition, today's version uses around 30 per cent less energy to produce the same amount of work.

As for the hardware, Popp says we can expect to see the use of more

sophisticated composite materials in cabin construction to make lighter, more durable cabs that have better sound dampening and ride quality characteristics. And with the advent of adaptive suspension systems, ride quality is set to improve dramatically.

These systems compensate for deviations in the rail bed and make for a smoother ride. All lift systems are run on a rail bed, with segments measuring just over four metres a piece. At the joints of these segments, there are slight imperfections that can be transmitted into the lift cabin in

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the form of noise or sway by the guidance system. Furthermore, as a building ages, slight structural changes can change the alignment of the rail bed and consequently increase the deviations.

As for the intelligent systems or 'enhanced features', different forms of which many of us would have experienced, a variety of solutions exist. "As buildings get larger, as demands get more complex, as tenant population increases, then you get into six-car and eight-car lift systems and generally your lift system will use

some sort of artificial intelligence or learning capability," explains Popp. "What that means is that the system recognises where demand occurs during the day and creates a histogram of those events. It learns the traffic pattern of a building, and places cars on certain floors at certain times in anticipation of that demand so that people don't have to wait for service as long as they would if the lifts had to come all the way up from the ground floor to answer their call."

At the next level of control there are systems that are provided with what are called 'up-peak boosters' or 'hall call allocation systems'. With these systems, users tell the list control system which floors they wish to visit from keypads in the lobby. The system then seeks to minimise the number of local stops on any given trip by grouping people with like stops together or adjacent stops together. In doing so, it allows the lift system to make more cycles in a five-minute period of time and handle more people.

The next step beyond that is to go to a full destination-based system or full hall call allocation system where you tell the lift system your destination not only from the lobby but from every floor. The control system then knows where everybody in the building wants to go, up or down, before they get into a lift. Popp concludes: "So in effect you're getting into a taxi cab rather than a bus. You may wait a little bit longer for a cab to come, but once the cab is there, you have pretty much an express trip to your destination." 