ELEVATION

A view of the UK Lift Industry

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PROJECT REVIEW – 125 OLD BROAD STREET, LONDON

BY SIMON RUSSETT

125 Old Broad Street, in the Square Mile (City of London) was home for many years to the London Stock Exchange. Share trading in London is steeped in history and the trade in shares began with the need to finance two voyages. The Muscovy Company's attempt to reach China via the White Sea North of Russia, and the East India Company voyage to India and the East. Unable to finance these costly journeys privately, the companies raised the money by selling shares to merchants, giving them a right to a portion of any profits eventually made.

The idea soon caught on (one of the earliest was the Earl of Bedford's scheme to drain the fens). It is estimated that by 1695 there were 140 joint-stock companies. The trade in shares was centered on the City's Change Alley in two coffee shops, Garraway's and Jonathan's. The broker, John Castaing published the prices of stocks and commodities called, "The Course of the Exchange" and other things in these coffee-shops. In 1697 a law was passed to "restrain the number and ill-practice of brokers and stockjobbers" following a number of insider trading and market-rigging incidents. It required all brokers to be licensed and to take an oath promising to act lawfully.

The Change Alley exchange thrived. However, it was to suffer a set-back in 1720. Much excitement was caused by the South Sea Company, stoked by brokers, the company's owner John Blunt and the Government. Having set up the unprofitable company nine years previously the Government hoped to wipe out the large debts accumulated by offering shares to the public. Shares in the company, which had started at £128 each at the beginning of the year, were soon fetching as much as £1,050 by June. The bubble inevitably burst, with share prices plunging to £175, then £124. The incident caused outcry, forcing the Government to pass legislation to prevent another bubble, and it took a long time for the stock exchange to recover.

Jonathan's burnt down in 1748, and this, plus dissatisfaction with the overcrowding in the Alley, made the brokers build a new Jonathan's on Threadneedle Street, as well as charging an entrance fee. The building was soon renamed the Stock Exchange, only to be renamed again as the Stock Subscription Room in 1801, with new membership regulations. However, this too proved unsatisfactory, and the exchange moved to the newly built Capel Court in the same year. The exchange had recovered by the 1820s, bolstered by the growth of the railways, canals, mining and insurance industries. Regional stock exchanges were formed across the UK. Bonds (or gilt-edged securities) also began to be traded.

The former Stock Exchange Tower, based in Threadneedle Street/Old Broad Street was opened by Queen Elizabeth II in 1972 and housed the Trading Floor where traders would traditionally meet to conduct business. This became largely redundant with the advent of the Big Bang on 27th October 1986, which deregulated many of the Stock Exchange's activities. It eliminated fixed commissions on security trades and allowed securities firms to act as brokers and dealers. It also enabled an increased use of computerised systems that allowed dealing rooms to take precedence over face to face trading.

On 20th July 1990, a bomb planted by the IRA exploded in the men's toilets behind the visitors' gallery. The area had already been evacuated and nobody was injured. The long term trend towards electronic trading had been reducing the Exchange's status as a visitor attraction and although the gallery reopened it was closed permanently in 1992.

The old London Stock Exchange building.

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The floor plates of the building were dictated by the plot of land available to the site and the structural design, determined that columns would be inboard of the façade system. The central core carried each concrete floor and in turn each column was cantilevered from the core. These columns carried the pre-cast concrete cladding system that was cutting edge at the time of construction.

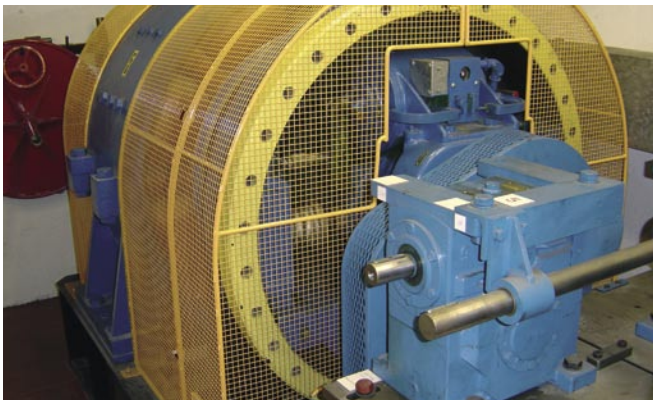
In the late 1990's, as the new millennium approached, the London Stock Exchange (LSE) were experiencing ongoing operational problems with increasing severity and business interruption.

The LSE decided to dispose of the building seek new premises. Terms were agreed on a new development at Paternoster Square that would better suit their business needs and purchase negotiations began with Hammerson. Simple, one might think. However, the LSE owned the site and had appointed a services consultant to undertake a due diligence exercise. This was to determine the probable performance of the existing elevator configuration, with modern BCO occupier criteria applied, against future net internal areas (NIA). This was undertaken to advise prospective purchasers of the works and associated costs that would be necessary for future BCO compliance. A review of the traffic design report unearthed a sequence of inaccuracies that would ultimately render the future elevator performance underwritten by LSE inadequate, and put the sale of the site at risk.

BCO logo.

The calculations indicated that the existing 8 shafts, configured as 4 x low rise and 4 x high rise, could be reused to serve BCO populated floors and increased NIA, with a relocated transfer level. This claim was a little surprising as the LSE had overpopulated the building for some time, at around 1 person per 12m^2 and they were experiencing long waiting times. The existing Otis equipment had performed reasonably well and had only received replacement control systems, during 30 years of service. The original design criteria could not be located and the occupation densities used were probably much lower than modern expectations.

The existing Otis equipment.



The existing Otis equipment.

A thorough review of the LSE proposed design criteria and their services consultant's traffic design reports, indicated that with a population of 1 person per 12m^2 inclusive of 15% population diversity, the 8 cars, configured as low and high rise groups would simply not work! With conventional control systems, the lowest 6 levels had to be excluded from the calculations, with the low rise 4 cars serving between level 7 and 16, and the high rise group between levels 17 and 26. Both these groups would then achieve the BCO target of 30s interval and 80% loading. With hall call allocation (HCA) controls the shortfall could be reduced from 6 levels down to 3 levels. However, HCA systems had not reached the current market potential and the client had reservations using this type of control system.

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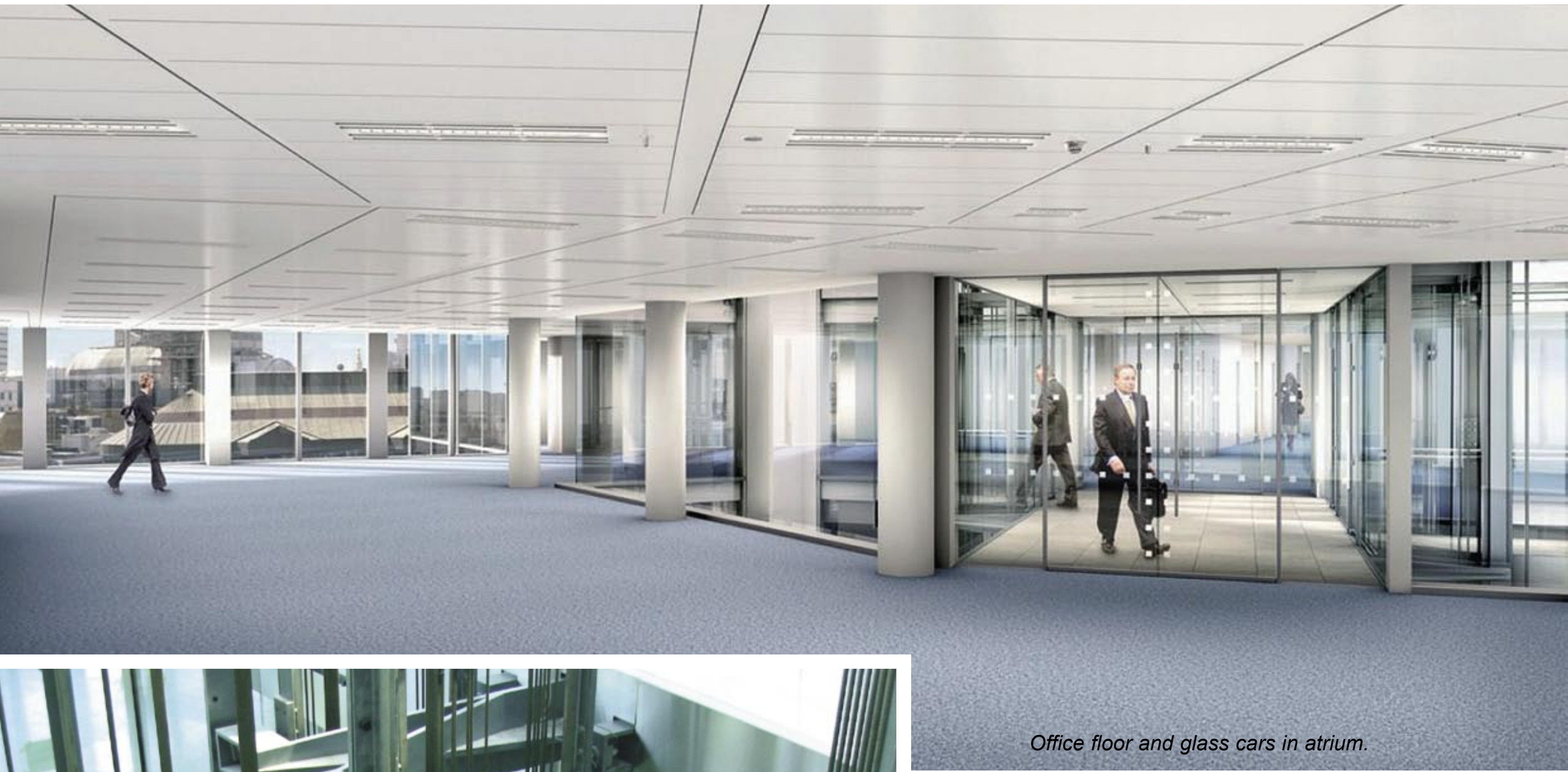

Office floor and glass cars in atrium.

View of the lift shaft.

Double deck elevators were also considered, but due to inconsistent floor to floor heights, the application would have necessitated super double deck cars which would not have fitted in the existing and already limited shaft area. At the time, this type of car had only one supplier and would also have been rather costly. To compound the issue, the ground and first floors could not accommodate escalators to access the lower and upper loading levels. During this review, Thyssen Twin systems were becoming commercially available and whilst this technology would have worked, the problem with escalator configuration and grade level reception area could not be solved. Studies were also undertaken to add extra shafts to provide 2 x 5 cars arrays, but this rendered the floors inefficient, would have been technically complex and an altogether expensive solution.

The problems experienced by the services consultant were compounded by the exclusion of a proportion of the likely floor area that would be created from an old tower, with the façade inboard of the columns and a new tower with a modern glazed cladding system external to the columns.

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So, what do you do with a building where 6 lower levels cannot be provided with elevator service and no more shafts are available? The answer, following lengthy legal negotiations with the LSE, resulted in a new low rise group of elevators being introduced for levels 1 to 6. This group could not be located within the tower and initially it was considered to locate glass cars on the external façade. A new build low rise podium building was considered, to both accommodate the elevators and to create additional office space. The new architectural design was developed at planning stages by Grimshaw and delivered by GMW to respond to modern demands and maximize rental for a prime piece of City real estate.

The new building.

A cross section of the building.

The new tower and podium building would provide approximately 330,000ft^2 of NIA. The tower structure was one of the first of its kind and deemed to be of importance. This resulted in the structure being retained. Retention was further compounded by the fact that a new tower of the same height would not receive planning permission under current GLA regulations.

Retaining the existing structure presented numerous coordination challenges and the first hurdle was to commission a detailed survey to determine the condition and dimensions of the existing shafts. In fact the outcome of the survey indicated that the structure was in a reusable condition, the tolerance was no more than +/20mm and pull out tests were a success.

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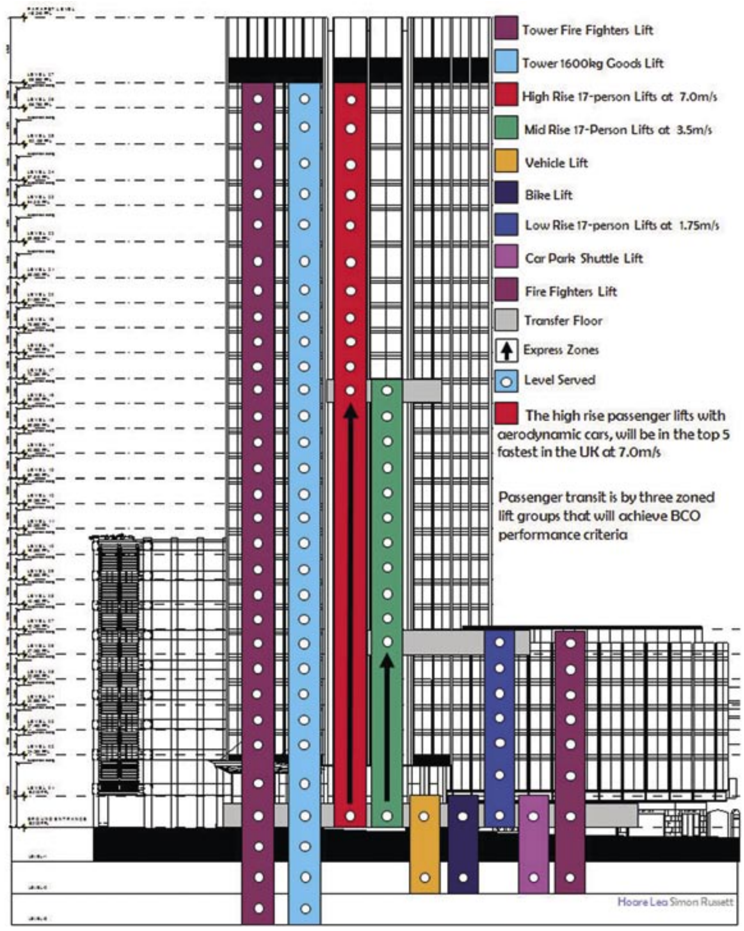
The existing elevators were sized to accommodate 15-person capacity and 1100kg load. The HLVT traffic design required all cars to be sized at 17-person 1275kg to achieve both the handling capacity and to fully comply with DDA requirements. The detailed survey indicated this was achievable and would necessitate 'shoehorning' the mid and high rise elevators into position!

To achieve the client's aspirations for the development, the VT design included the provision of the following 17 elevators:

The selection of the mid and high rise elevator rated speeds, for a tower of this height appear excessive, but with the limitation of 8 shafts, the speeds were necessary to achieve BCO Office Guide 2005 expectations. In fact, the 7.0m/s rated speed of the high rise elevators, would place the building amongst the current top 5 fastest in the UK!. To maintain performance during peak times, this would also require the transfer levels to be unavailable ensuring level 6 was accessed from the low rise group and level 16 by the mid rise group.

Group/Use	No. of Cars	Levels Served	Capacity	Load	Speed
Low Rise	3	0, 1 to 6	17-Person	1275kg	1.75m/s
Mid Rise	4	0, (6) 7 to 16	17-Person	1275kg	3.5m/s
High Rise	4	0, (16) 17 to 26	17-Person	1275kg	7.0m/s
Fire 1	1	-3, -2, -1, 0 to 26	8-Person	630kg	2.5m/s
Fire 2	1	-2, -1, 0, 1 to 6	8-Person	630kg	1.6m/s
Service	1	-3, -2, -1, 0 to 26	21-person	1600kg	2.5m/s
Vehicle	1	-3, -2, -1 to 0	46-person	3500kg	0.75m/s
Bike	1	-2, -1 to 0	21-person	1600kg	1.6m/s
Shuttle	1	-2, -1 to 0	13-person	1000kg	1.0m/s



Stacking diagram.

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One Bishops Square and the glass elevator.

The glass elevator design developed from the type of car that had been provided at One Bishops Square, London using minimal steel structure. The client's brief indicated that the minimalist of structures for the 3 low rise glass elevators was required.

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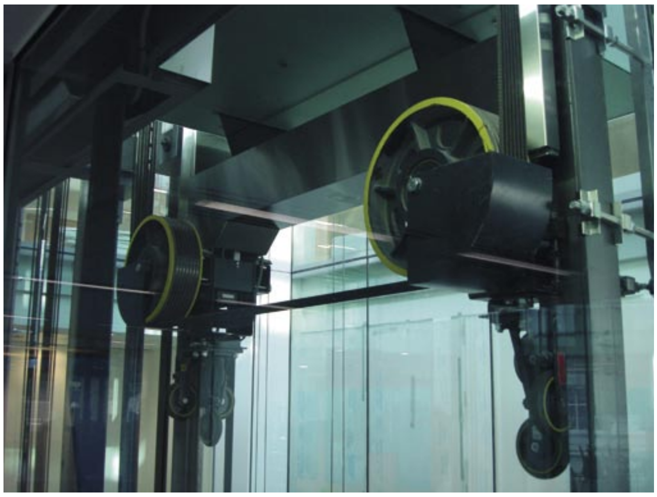
Kone MRL.

This posed another complex question of how to carry the loads applied with minimum structure. The inspiration for the solution came from the design of machine room less elevators, where the drive machine is attached to the guiderails and the loads are applied down the guiderails. For this project, the machine room was located directly below the shafts, which through intricate design enabled the vertical columns to be dispensed with, the diverter pulley's to be mounted on the rails and the rails would only be secured at floor levels with architectural beams.



The glass car design.

Calculations were completed and doubled checked to ensure the loads in torsion and compression, would not cause deflection of the structure, other than within design limits, with sufficient magnitude to cause failure. The calculations indicated that oversized rails would be required, with the addition of reinforcing at high level and between tall floors at the lower levels.

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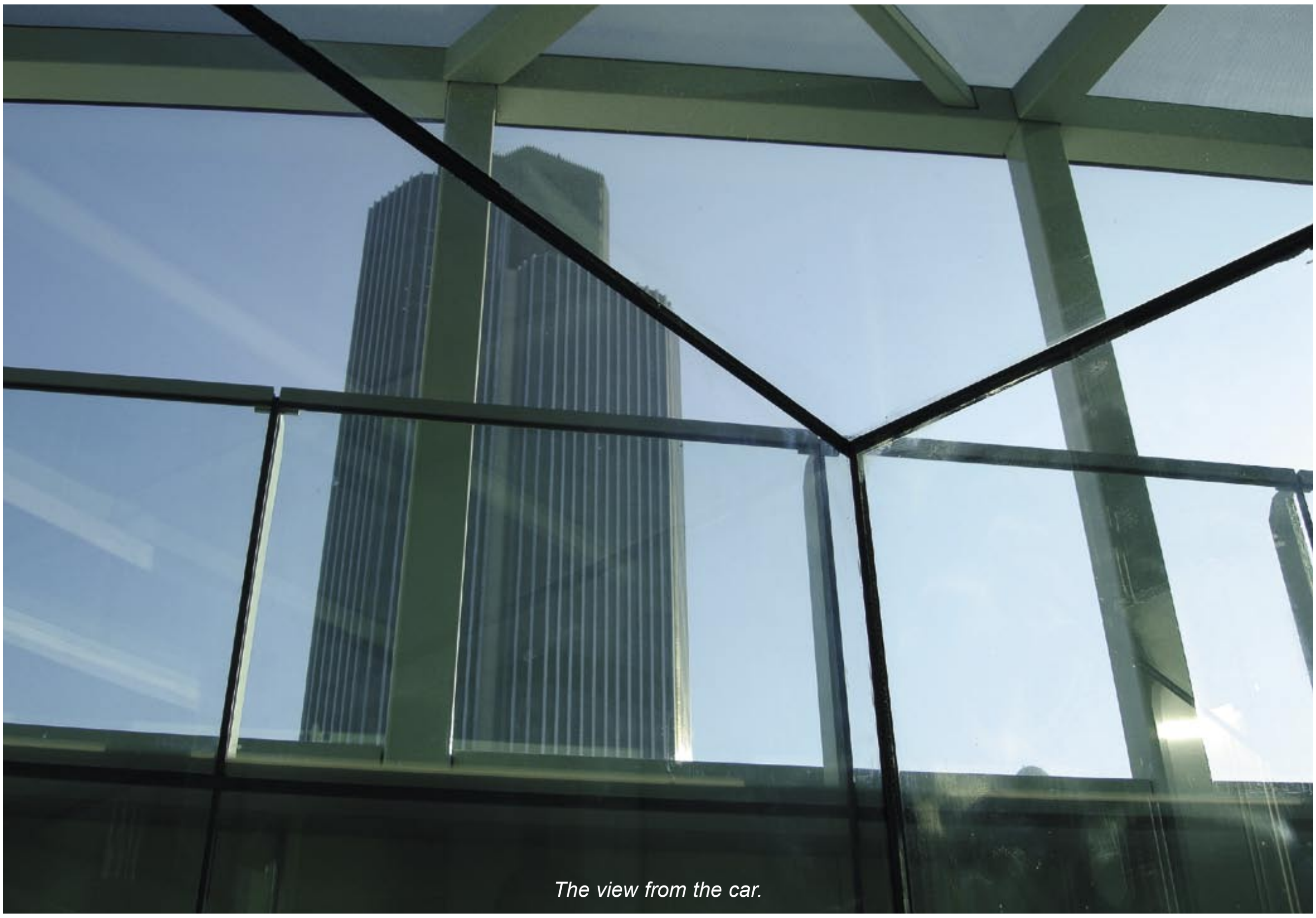

The view from the car.

The buttons are fretted into the glass walls.

The cars were also cutting edge with the buttons fretted into the glass walls, thus removing the normal and rather unsightly steel car operating panels. The glass walls also dispensed with the normal planar or pig nosed fixings and were simply held in placed by cantilevering from the car platform and structurally sealing each section together. The result is a car interior, clear of viewing obstructions and simple to operate.

The passenger elevator car interiors were also provided with cutting edge finishes. These included glass walls with edge fitted LED's illuminating the entire panels.

The project has now been completed and undergoing fitting out by numerous tenants, such as international real estate agency DTZ, and law firm Gide Loyrette Nouel, with Turnbull & Asser and Le relais de l'Entrcôte de Venise occupying the retail and restaurant accommodation

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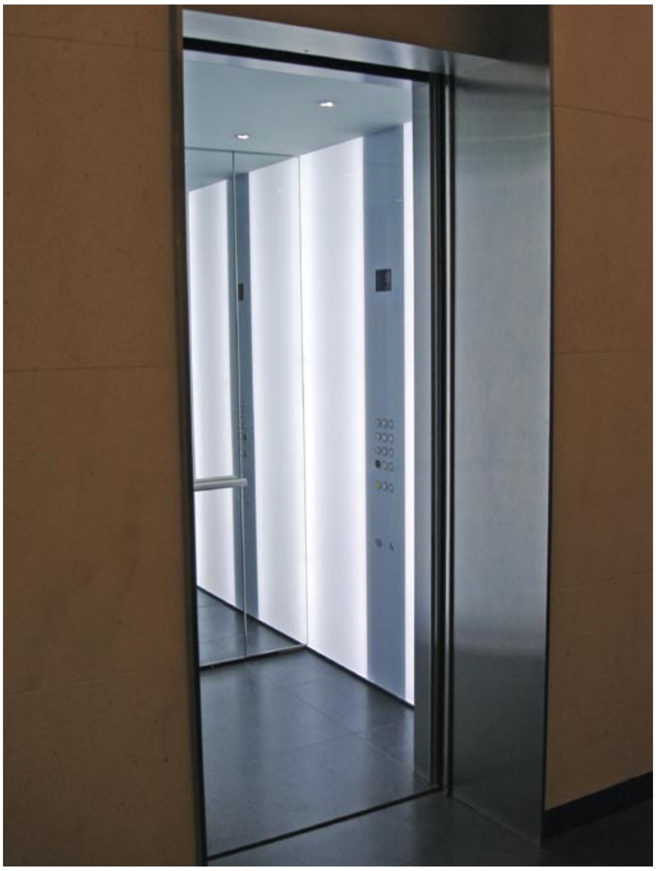

Passenger car interior finishes.

The project team is as follows:

Client	Hammerson
Architect	GMW
Planning Architect	Grimshaw
Vertical Transportation	Hoare Lea VT
Structural Engineer	Waterman
Project Manager	GVA Second London Wall
Cost Control	Davis Langdon
Design & Build Contractor	Bovis Lendlease
Vertical Transportation Supplier	Kone

The writer would like to thank all those involved with the Vertical Transportation for this project, especially Ron Cooke, who's diligent and thorough attention to detail has resulted in yet another superb HLVT system in operation.

Simon Russett CEng MCIBSE MIET MIAEE FFB is a Partner with Hoare Lea and in 2002 he founded the Vertical Transportation Group at the firm. He is a past Chairman (2004-2007) of the Chartered Institute of Building Service Engineers (CIBSE) Lifts Group. He was a member of the steering group committee and a section author for the 2005 Edition of CIBSE Guide D – Transportation Systems in Buildings. Simon is also a member of the committee for the proposed revision of the BCO Office Guide 2009. Simon is a Chartered Engineer, a member of the Chartered Institute of Building Services Engineers, a member of the Institute of Engineering and Technology, a member of the International Association of Elevator Engineers and a Fellow of the Faculty of Building.