Elevating Berlin
Glass Lift Architecture for the German Parliament

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ABSTRACT

Since reunification Berlin has seen an unprecedented boom in the building sector owing to the government move and promising forecasts for growth in the service sector.

Considering quality and originality of lift design and construction the paper reviews important new projects, focusing on the design of the 16 glass lifts for a German Parliament facilities building.

INTRODUCTION

Set against the background of a reunified Germany and highly promising outlooks for it's future as an important metropolis of the 21st century, Berlin has seen a great number of new building projects come into realisation during the last years. Both office and retail developments have widely been designed for a public willing to pay considerable rents inside suiting environments. Furthermore institutions of German government sought to arrange and fit out their new and renovated buildings according to needs of representation and effective functional layout, with the government district around the Reichstag building being designed as the "parliament of short distances".

Many new projects have been laid out within the block structure of Berlin's urban grid, resulting in covered malls or courtyards, and presenting floor plans with internal horizontal and vertical access positioned into the open space of their main halls.

For the design of vertical transport this meant a new era of free standing elevator structures, fully visible in all their technical detail.

Considering the multitude of technical and safety regulations the architectural vigour of these open lift structures is subject to close and comprehensive team work of construction firm, elevator engineer and architect.

Decades of elevator construction confined to the hidden spaces of concrete lift wells are responsible for a seriously conservative lift construction industry (and philosophy).

The new generation of glass lifts presented here shows, that with both enhanced knowledge of technical aspects on the architect's side and enthusiasm for special construction on the engineer's and constructor's side fine elevators can be built.

A NEW GENERATION OF ELEVATORS

As a result of post-modernism, particularly the rise of a "high-tech architecture" in Great Britain, technical building services have become subjects of architectural design since the 1980ies. Where the often extensive spaces, e. g. for air condition or vertical transport, had been neglected and hidden away by the architect, they have now changed into elements of the building's visible spatial structure, as for example the pipes and ducts of the air-conditioning system at Lloyd's, London by *Richard Rogers*, or, in co-operation with *Renzo Piano*, the glazed escalator tubes of the Centre Pompidou in Paris. A German archetype for this new attitude towards technical structures is *Ludwig Leo's* Berlin Hydrotechnical Institute of 1976 next to the Landwehr canal. The pink coloured experimental water pipe visibly curves underneath and through a laboratory "box", thus almost self-explaining the use of the building.

For the design of elevators this initialised the reintroduction of the lift well into open spaces of the buildings. In order to supply for high spatial efficiency the "functional design" of modern architecture had sought to minimise spaces for horizontal and vertical transport. Following their ethereal youth as extensively adorned transport cages crowned with a garland of stairs the lift wells had been buried inside the concrete building cores for decades. The renaissance of the open elevator is therefore closely related to the critique of modernism rising in the 1970ies. It was felt that the reduction of architectural principles to the requirements of purpose and construction, once seen as a resounding triumph over a highly decorated and eclectic past, had produced environments not corresponding to the needs of their inhabitants.

Then, the "less is more" principle of *Mies van der Rohe*, who had adopted this attitude while working for *Peter Behrens* on the design for the famous AEG Turbinenhalle factory building in Berlin, was replaced by *Robert Venturi's* "less is a bore". With *Walter Gropius'* "form follows function" almost reverted, the projects named above stand for a "function is form", while the widest numbers of tendencies in contemporary architecture have at least adopted comprehensive design strategies considering more than only the functional aspects of architecture. These design strategies range from the highly rationalistic judgement of environmental parameters as in "green architecture", "high-tech architecture "or "careful urban renewal" to the more formal approaches of "deconstructivism" or "historicism".

The representative function of building features has grown throughout and was extended from the concern with an identifiable surface and layout of inner and outer spaces to the formal improvement of building services constructions such as the wing-topped, double-layered ecological facade of *Sauerbruch/Hutton's* new Kochstrasse office tower to the extensive steel-work of *Gerkan, Marg und Partners'* elevators inside the Friedrichstrasse Atrium.

The commodious staircases of pre-elevator centuries had an explicit meaning of representation. Although this is a frequently used comparison, I will attempt to extract a few guidelines for the analysis of the following projects from a confrontation of elevator and staircase in terms of design preliminaries.

Floor Plan Layout

The position of vertical access within a multi-storey building is crucial to it's design, because staircases, and even more so, elevators require coherent spaces between floors. Owing to their endeavour for the third dimension staircases always demand the architect's utmost care and attention. With staircases, almost as many different designs as buildings are found, while the elevator industry successfully manages to sell standardised products.

Communicating spaces between floors are conveniently, not necessarily, coupled with the constructive core of a building. Linked with the sanitary facilities, and recurrent in distances ordered by building regulations and fire protection, they usually predetermine the overall structure of buildings.

Orientation and Representation

Reaching beyond the pure need for access to upper floors most large buildings feature representational stairs in their entrance or hall areas. Carving their plan into the floors or buttressed through the volume of main halls, these staircases, if properly laid out, stimulate the individuals sense of space and orientation. They provide stages for dignified appearance and sudden falls. Stepping down, taking two steps at once, - the more physical aspects belong to the staircases only. Orientation and representation, also the display of wealth or good taste, can be supported by elevators, too, if they are designed as visual parts of the building structure. Panorama elevators always display the qualification of their construction firm.

Comfort and Safety

Naturally, good visual design will add to the user's feeling of comfort as much as appropriate technical layout with both elevator constructions and staircases. Where stairs with steps too narrow or high will cause stumbling, a badly tuned engine will cause nauseating effects.

The technical elevator standards, laid down in lengthy Eurocodes, negotiate almost every hazard presented by elevators. Guidelines for their architectural design are unknown.

The craftsmanship of glazing and metalwork, the height of doors and cars, the transparency or solidity of the well construction, the integrity of the surfaces and many more details influence the reception of free-standing elevators.

Design and Building Work

Even if architect and elevator consultant have good knowledge of their mutual working fields, designing a fantastic glass lift and trying to realise it may be two quite different jobs. Mass production has generated a confined range of standardised parts and has limited the technical skill in construction firms. The most accurate architect's contract drawings are often either not understood or ignored. Catalogues of standard elevator parts such as doors and displays, with very few exceptions, cover the full range of "kitsch" and mediocre design. Requests for minor changes usually generate insuperable obstacles. A reasonably priced solution for the problem of hanging cables inside the lift wells remains unsolved.

DESIGN WORK FOR THE PAUL-LÖBE-HAUS GLASS LIFTS

The following analysis of detail work in designing the glass lifts are limited to aspects of visual design, this being one of the architect's main interests. The multitude of important parts responsible for the flawless and lasting service, including high standard gearless engines and fast opening doors cannot be discussed here. The focus will be on visual details and the problems in bringing them into realisation.

It must be said, though, that within the planning process the architect is not only responsible for the design, but also for the co-ordination of elevator and structural engineers, and local institutions as the Berlin Senate's Office for Building and the Office for Labour Security, the appropriate application of norms and regulations, etc. Where high end lifts are designed, this part of the architect's job demands far more effort and time than the actual design work.

Building Design

Situated next to the Reichstag the Paul-Löbe-Haus will provide 57.000m^2 floor space for offices and parliamentary committees together with restaurants on the Spree river bank and facilities of the visitor's department. *Stephan Braunfels Architekten* designed the 7-storey building according to the regulated Berlin cornice height as a double succession of rectangular office wings and circular committee chambers joined to a glass covered main hall of 32m width and 192m length. Fully glazed main and office elevations allow for maximum transparency of the parliamentary

proceedings, while a strictly reduced canon of surfaces, of coated metal or refined steel, in situ concrete and glass, provides a precious but plain appearance.

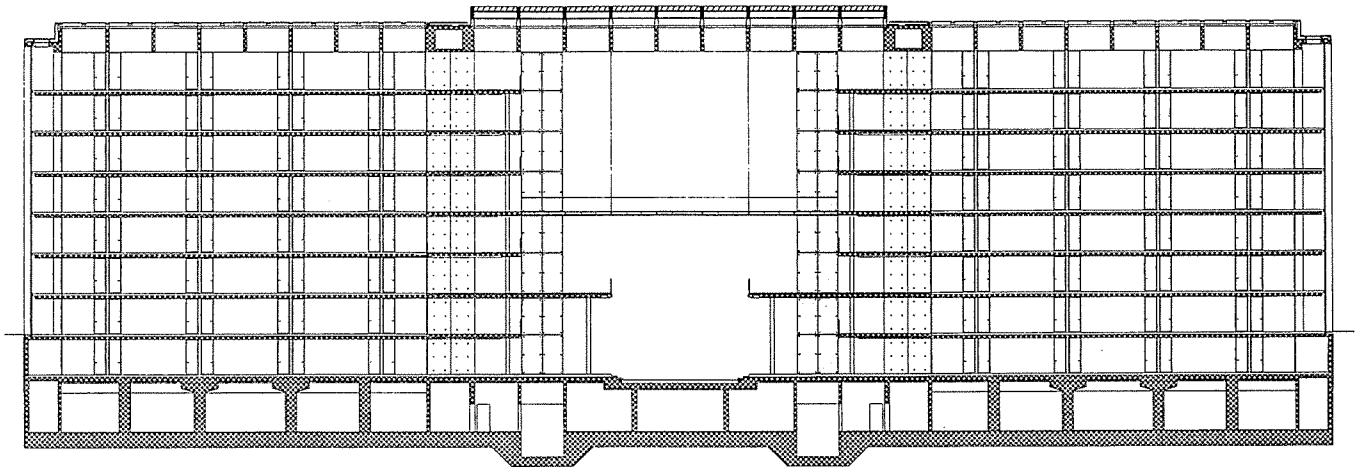

Figure 1
The cross section of Paul-Löbe-Haus shows the position of the glass lifts inside the roof-lit main hall.

Vertical building access is provided by cantilevered panorama stairs, closed staircases in the core area of the office wings and 16 elevators inside the main hall. Set into the roof-lighted area between the protruding chamber cylinders, their glazed lift wells vibrate the spatial structure of the main hall and grant almost unobstructed daylight transmission.

Apparently, the vertical accessibility of the upper floors is echoed in the frameless glass shafts of the elevators while their car size and layout within the floor plan stand for highly sufficient transport capacity. Within the main hall, they also indicate the entrance areas of the office wings and committee chambers.

Coming down, or rising up, from the office floor these elevators will support any passengers need for representation and comfort as they can oversee wide landing areas.

Because the Paul-Löbe-Haus is urgently needed for members and committees of parliament, construction work had to go ahead while plans and specifications were in the making. For the elevators this meant comprehensive planning on the design team side. Construction details, technical layout and structural engineering, e.g. attachment to the building by anchor rails and plates or construction proofs for the structural stability of the glazing have been developed by a team including elevator, structural and lighting engineers, facade consultants, and architect.

Design of the Glazed Lift Well

The architect's explicit wish for a lucid well construction with steel sections reduced as far as possible finally led to a suspended steel hoistway protected by point fixed glazing. It shows a very simple structure of 60/110mm horizontal frames and 30mm diameter rods fixed to the roof and the galleries of the main hall. Forming a major steel and glass construction the horizontal frames, the suspension rods and their connections to the concrete structure of the building were calculated and developed in close teamwork of architect and structural and elevator engineers. The resulting suspended load of the glass lifts was considered in the reinforcements of the concrete roof grid. On the elevator side, movements of the roof owing to it's physical qualities are allowed for in the steelwork of the wells: The threaded suspension rods provide means for adjusting and lifting the structure of the lift well. Experience with developing these details shows, that although the

architect is usually not equipped for calculations of sufficient structural sections, most steel parts can be reduced far below their initial structural design.

It is one of the important features of the Paul-Löbe-Haus lifts, that they are thoroughly covered with glass, thus adding tall, reflecting double columns to the heavy concrete cylinders of the committee chambers. Corresponding to the need for protection from moving parts inside the lift well they also reflect on the security standards: Surrounded by floor space on three levels more than 60% of the elevator elevations have to be shielded against villains and victims using dismantled umbrella sticks to reach these moving parts.

The understanding of security measures on overhead glazing has changed during the design stage: glass panels above floor height should rather be glazed with single pane security glass than with double pane glass. Chips of point-fixed single pane security glass will hardly hurt, even when falling from great height, while "unbuttoned" double pane glasses reach crushing weight. With measurable cost reduction the problem of glasses of different thickness was solved by using ferric oxide reduced "white" glass for the double panes.

The quest for minimised steel sections in the fixture brackets necessitates adjustable excenter disks inside the connective joints. These allow for manufacturing tolerances and ensure a stress-free reception of the glass and wind loads.

Design of Lift Car

With the design of the cars, unusually tight handling of regulations by local authorities lead to an unusual solution for the maintenance of the lift well: the roof can be rotated around it's short axis into an upright position. Using the upper horizontal car frame as a railing, the well is conveniently serviced and cleaned from inside the car.

Disregarding a cabin height of 2800mm these twisting ceilings had to be added to the original design of a roofless car as the problem of stuck passengers falling into the well while trying to climb the next landing had not been considered. Without help from the elevator consultant, who had formerly built two of the few roofless lift cars to be found in Berlin, this compromise

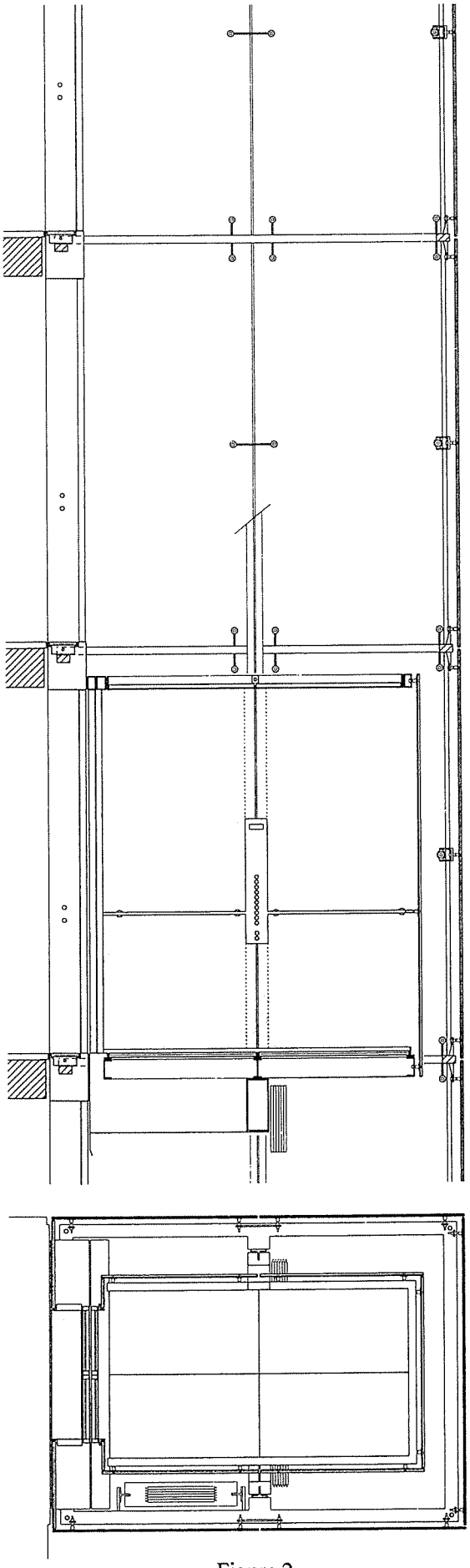

Figure 2
Section and plan of glazed lift well and car

would not have been settled with the authorities.

The inside of the cars is lighted through the translucent glazing of the floor. The triple pane security glass used here is equipped with an anti-slide surface and frosted back for levelled light transmission. Floor glazing requires special approval by the authorities and it has to be made sure, that the glass slabs cannot tilt or break in case of safety gear action. The fluorescent tubes are built into white lined bottom tubs that are serviced from below. They need electrical facilities for appropriate dimming.

Design of the Glass Doors

The glass doors of these elevators will comply to the overall layout of the building: doors generally come up to ceiling height. This meant 2800mm height by 1000mm width, or 2800mm/530mm or the single pane. Answering the needs for reduced weight, shock-resistant cover for glass edges and increased glass surface, a patent construction of narrow refined steel frames and security glass panels with silicone adhesive seams has been developed. Applying advanced glazing technology the connective bond between frame and glass allows for smallest metal and glass sections. The connecting areas between glass and metal frame are covered by enamel print on the back of the glass. Reflection is thereby provided for the total surface of these doors.

With completion of building work for the Paul-Löbe-Haus scheduled for the end of 2000 construction drawings by elevator company *Rangger* from southern Germany will receive final consent by architect, elevator and structural engineer in February. The majority of steel frames for the lift wells are already in place. It has taken some time to convince the company of the architectural and technical details developed during a concentrated design process.

OUTLOOK

It has been shown, that a number of architectural design guidelines must be applied to elevator constructions, especially when they serve as fully visible elements of a building's structure. The comprehensive understanding and realisation of the clients expectations requires good knowledge of technical detail and design principles on the side of the planners as well as the readiness to solve construction problems using advanced methods on

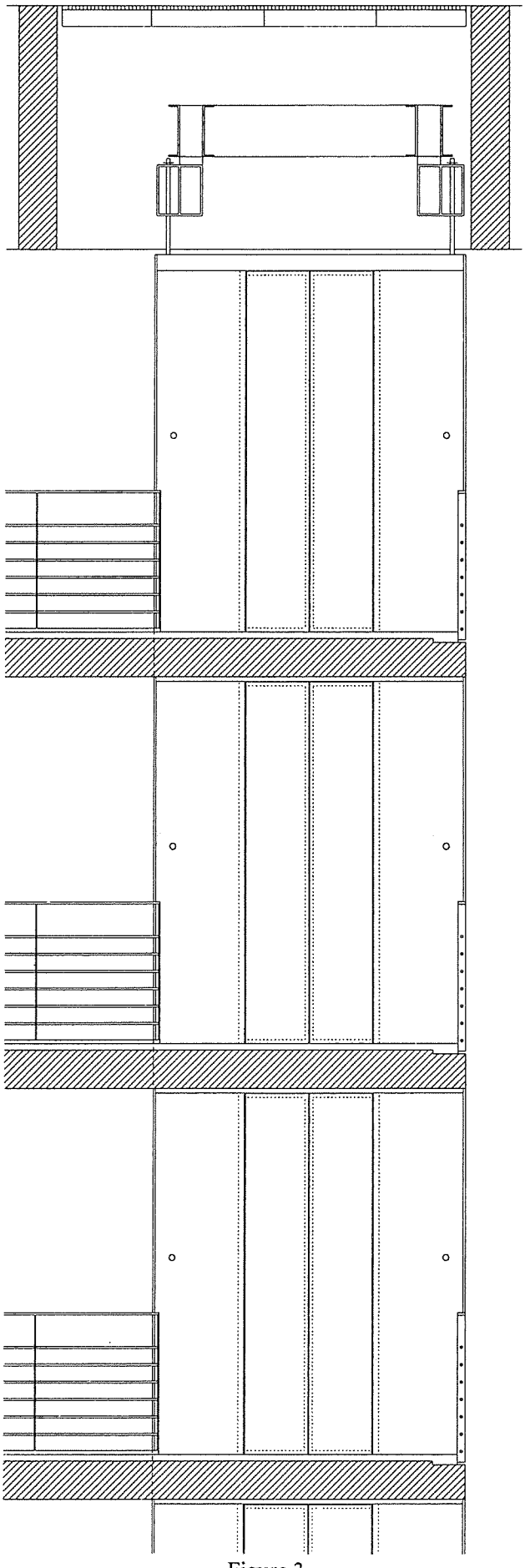

Figure 3
Door elevation with maximum glazed area

the side of the elevator firms. The examples given here stand for their unbiased approach and relentless design work. They prove, that extraordinary lifts can be built without restrictions to their technical layout. The majority of standard elevator construction displays substantial design deficits though.

With a growing demand for architectural design in elevator construction both architects and consultants will enhance their knowledge and train their judgement outside former limits of their profession. Engineering work of the elevator construction firms will be ready to meet client's wishes on an advanced level of technical and visual layout.

It will be made a task of the IAEE, and other associations in the elevator sector, to support the technical education of architects. Prizes and publications will be awarded to winners of elevator design competitions. Courses and conferences are offered, while engineering and construction trade are open for required and additional practical experience.

It is the responsibility of the architect to claim highest standards in fabrication, manufacturing and design of all elevator components, and to promote and co-ordinate effective teams for the planning and building of glass lift architecture.

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APPENDIX A

Reference Project: Willy-Brandt-Haus

Designed by *Helge Bofinger* the new Berlin headquarter of the Social Democratic Party (SPD) in Wilhelmstraße encloses a glass-covered triangular courtyard. Towering the statue of Willy Brandt, two fully glazed lift wells are dominating this representative space. Giving access to all floors above ground level the panorama elevators by *Vestner* are supplemented by standard concrete shaft lifts in the corners of the building, Enclosing the main staircase their transparent vertical volumes accentuate the horizontally layered facades of the courtyard and allow for visual connection of upper lobby areas and main hall. Positioned on the short side of the courtyard triangle they have become the preferred background for television reports from the SPD headquarter. The point fixed glass well is supported by a construction of standard steel beams. The fully glazed car with stone floor tiles is built without roof – a feature unusual in Berlin and never fully accepted by local authorities. Pioneering the advantages of transparent construction doors were built thoroughly of glass.

Reference Project: Ludwig-Erhard-Haus

The new communications and service centre for Berlin's chamber of industry and commerce offers 22.000m^2 of floor space for offices, conferences and stock exchange. Not far from Bahnhof Zoo station it's unusual silhouette, resulting from 15 giant steel arches forming the roof as well as the primary structure or the building, adds an astonishing new element into a heterogeneous neighbourhood. Matching this extraordinary outer shape the cars of the six panorama lifts, set in groups of three into the dividing glass division between main hall and two covered office courtyards, act as the vertical spines of the Ludwig-Erhard-Haus.

The curved helmet-like shape of the outer cladding made from mill-finish aluminium presented a difficult task to the contracted elevator firms *OTIS* and *Schindler*. In the end architect *Nicholas Grimshaw and Partners* found a small old-timer mechanic's store in England, who manufactured the bodies. Following a curved plan the interior of the cars is lined with maple veneer thus creating

the problem of fire hazard. With an alternative lining not being acceptable the solution for this problem was found in ship's elevators: a mobile sprinkler system carrying enough water to extinguish fire inside the car. For better comfort and because the elevator cars move inside the unheated courtyards the feature that makes them unique within Europe was installed: mobile air-conditioning. Unparalleled and unaccounted for in the standards local authorities found it difficult to agree with this high-tech equipment.

REFERENCES

Frampton, K. (1987). *Modern Architecture, A Critical History.* Thames and Hudson, London.

Wörner, M. (1991). *Architekturführer Berlin.* Dietrich Reimer, Berlin.

Remmele, M. (1998). Das Bogen-Haus. *Jnl. Bauwelt,* 44/1998.

Buddensieg, T. (1999). *Berliner Labyrinth, neu besichtigt.* Klaus Wagenbach, Berlin.

Bidmon, W. (1999). Planning hoistway towers for elevator systems. *Lift-Report,* 5/1999.

BIOGRAPHICAL DETAILS

Following studies of architecture in Munich and Glasgow as well as working experience in London, Hamburg and Berlin Berthold Pesch has been employed as architectural consultant with Stephan Braunfels Architekten for the last four years, one of his main subjects being the design of the glass lifts for the Paul-Löbe-Haus.