docomo

international working party for
documentation and conservation
of buildings, sites and neigbourhoods of the
modern movement

Journal 15

Curtain Wall Refurbishment

July 1996

international working party for
documentation and conservation
of buildings, sites and neighbourhoods of the
modern movement

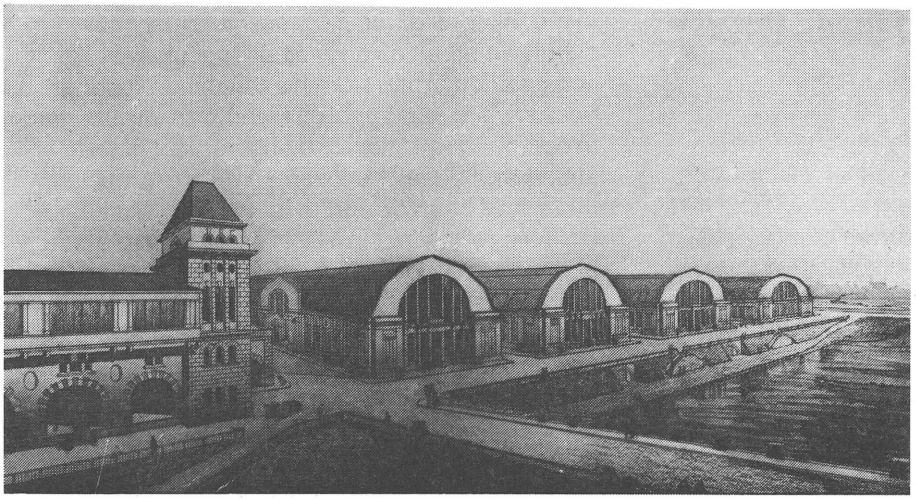
do_co_mo_mo_

Journal **15**

July 1996

Top: The Thyssen Haus, one of Düsseldorf's landmarks, was completely refurbished in 1993. More on pp. 54-57.

Front cover: When in 1929 the famous Van Nelle factories were completed, the curtain wall was still a breathtaking expression of progress, that was looked up at in wonder.



Drawing of the Riga Market Hall, designed by Pavils Dreijmanis in 1923 and completed in 1930.
Photo: Latvian Museum of Architecture.

Pavils Dreijmanis

Centenary of a Latvian architect

by Janis Lejnieks

Pavils Dreijmanis was born in 1895 in Latvia. After graduating at the Faculty of Architecture of the University of Latvia in 1923, he won the competition and the commission for the design of the Riga Market Hall. After its completion in 1930, it consisted of five pavilions and was the largest covered market hall in Europe. For the construction military hangers were used, that originally were erected during World War I for the German zeppelins. The shape of the building was inspired by constructivism, some elements were in *Art Deco*-style. Since 1926 Dreijmanis was the chief architect of Riga, until 1934, when he became the head of the Building Office in Riga. The most rigorous *Art Deco*-building in Latvia, the cinema 'Palladium', was designed by Dreijmanis in 1925. Unfortunately, it was burnt down during World War II. The fashionable style influenced other buildings of Dreijmanis: a two-storey apartment in municipal dwellings in Ropazu Street and Liepajas Street (1926) and the block of dwellings in Ausekja Street (1927).
In the 1930s, the architect interrupted his creative work and became a teacher at the Riga Technical College. Dreijmanis emigrated to Germany in 1944 where he worked as assistant professor at the Latvian Technical College. In 1949 he went to Australia and took a position as a designer of local public services in Adelaide. After his death in 1953 the archive of the architect was left to the Latvian community, and recently it was donated to the Latvian Museum of Architecture where an exhibition on the occasion of his centenary was organized.

Janis Lejnieks is the director of the Latvian Museum of Architecture in Riga.

Sir Norman Foster

An honorary doctorate

by Hubert-Jan Henket

On April 26 the architect Sir Norman Foster received the degree of Doctor Honoris Causa at the Eindhoven University of Technology.
Sir Norman Foster (1935) was born in industrial Manchester. His buildings have its roots in the English tradition of integrating engineering and architecture into one efficient beautiful whole. Besides satisfying the material needs of the individual and society, buildings want to express our direct and deepest feelings and in doing so they want to provide us with a healthier, happier, more meaningful and optimistic environment. The buildings designed by Sir Norman Foster and his team do just that. The two most poetic projects of the Foster team are the Carré d'Art in Nîmes with its delicate and extremely pleasing relationship with the Roman Maison Carré, and the Sackler Galleries at the Royal Academy in London. A little jewel of quietness and lucidity. What makes these buildings so special? Firstly there is Foster's unique mastery of dealing with processes and team building. Then there is the way he is continually changing the concept of industrialization in architecture, taking advantage of the latest technology to create responsive solutions. His unique approach to architecture should also be mentioned: always perfect and complete, always as simple as possible but never simpler.
In short, Foster's buildings, from the urban setting to the smallest detail, are born out of the greatest respect for man. His buildings are truly innovative in a social, a technological and in an aesthetic sense and have a great educational influence on many of us. They express the soul of our time.

Hubert-Jan Henket was the honorary promoter of Sir Norman Foster.

Universality and Heterogeneity

The Modern Movement and its Regional Reflections

Fourth International DOCOMOMO Conference, Slovakia Slovak Architects Society, September 18th - 20th, 1996

The Fourth International DOCOMOMO Conference will be held in Slovakia, a country that was part of the Republic of Czecho-Slovakia from 1919 until 1993. During the years in which the Modern Movement was developing, this country was one of its most active centres. Being one of the former 'Eastern Block' countries, the majority of Slovakia's Modern Movement buildings and neighbourhoods of the prewar period still remain relatively untouched by ever changing requirements.

This fourth edition in a series of international meetings of DOCOMOMO has chosen to explore the phenomena of Universality and Heterogeneity in relation to the diverse aspects of the Modern Movement - philosophical, historical, architectural, social, technological, and so on.
Within the context of DOCOMOMO's International activities it is becoming increasingly obvious that the ideas of the Modern Movement are much more widespread on a global scale than had previously been assumed. However, its evolution in individual states and regions was influenced by local conditions, such as social circumstances, cultural traditions, technical sophistication, climate and the creativity of architects. These facts compel us to reassess the myth that the Modern Movement was a universal, international style, and to recognize the regional reflections of modernity.

Program
To clarify the universality and heterogeneity of 'modernity' in a broad social and cultural context, the German philosopher Helmut Lethen will kick off the conference program. The regional reflections of the Modern Movement will be explored by the Greek architectural historian Alexander Tzonis. The specificity of Central European modern architecture is then explained against the background of a common Austro-Hungarian history by Dana Borutová. On the last day, Wilfried Wang, director of the *Deutsches Architekturmuseum* will conclude the conference by reflecting on the impact of the Modern Movement for architecture today and in the future.
In order to achieve a high quality program, the DOCOMOMO Specialist Committees on Registers, Education, Technology, Urbanism and Landscape & Gardens have made a preliminary selection of 122 the abstracts that were received for the other sessions, followed by a final selection by a Scientific Committee. In view of the complex nature of some of the themes, a few additional speakers were invited.

Tango Night
The conference will be concluded on September 20 with a grand 1930s Night of the Slovak Tango. In the first decade of the 20th Century, when the tango arrived from Latin America in the Spanish and Argentine bars of Paris, several young Slovak and Czech artists studied and worked in France. The popularity of the tango increased during and after World War I. Students and musicians returning from France brought along inspiration, memories and melodies. The first expansion of the Slovak (urban) dance music started in the early 1930s when the tango, in its universal form, dominated the Slovak dance halls. But in a very short time it was transformed into the so-called Slovak Tango. The tango was popular in all social levels and it was played in popular and simple places as well as in the best dance cafes for the upper class.

During this event, a competition will be held between dance couples from the various countries represented in DOCOMOMO. Of course, all other conference participants are free to join in and enjoy the orchestra 'BB Band' that has been contracted for the evening. This band consists of five musicians and singers. They focus on the repertoire of the 1920-1940s. There will be a special prize for style of dress for those who do not participate in the tango. In order to prepare for the competition information on the Slovak Tango, a cassette tape with authentic music and a competitors number for every country or region was distributed among the coordinators of each working party.
This special event will take place in the original Ballroom of the Palace Hotel, that still displays the modern grandeur of the 1930s. With its bars, balconies and large stairways the room will provide a genuine and lush atmosphere.

The program has also been extended with two new sessions, one on preservation, the other the famous 'Kaleidoscope', as well as meetings and presentations of the various Specialist Committees and an evening of debate on the main theme. Finally, a working session will be dedicated to finalizing the preparations for the International Selection, an international register of the most significant examples of Modern Movement architecture, as well as a proposal for nominations of modern architecture for UNESCO's World Heritage List.

Venue
The organizers of the conference have used experiences from the previous editions to improve the concept of the international DOCOMOMO meetings. One of the results is that a main part of this conference will be held in a venue with an authentic modern atmosphere of the 1930s.
After the opening ceremony and the plenary sessions of the conference in Bratislava, the main working sessions are scheduled for the second and third day in the spa resort of Sliac, a breathtaking MoMo site in the foothills of the Low Tatras. The various sanatoriums, pools, baths, tennis courts and other facilities in Sliac are still being used; the Palace Hotel will only temporarily be available for the conference.

Time and place
Bratislava, Tuesday, September 17
10.00 Meeting of the ISC's (closed sessions)
15.00 Preparatory meeting on Registers
18.00 Opening of exhibition

Bratislava, Wednesday, September 18
9.00 Official opening
10.00 Lectures on main theme
16.30 Welcome by the Lord Major of Bratislava
18.15 Departure for Sliac (by bus)

Sliac, Thursday, September 19
9.00 Parallel sessions: A. Architectural history
B. Landscape & Gardens
C. Education
14.00 Parallel sessions: D. Registers
E. Urbanism
20.00 Debate on main theme

Sliac, Friday, September 20
8.30 Parallel sessions: F. Preservation
G. Technology
Kaleidoscope session
15.00 Parallel: - DOCOMOMO Council Meeting
- Sightseeing tour to Banská Bystrica
18.00 Final lecture
18.45 Closing address
20.00 Dinner and 'Night of the Slovak Tango'

Saturday, September 21 - Sunday, September 22
Post Conference Tour

Detailed information
All inquiries concerning Registration and the Post Conference Tour should be addressed to:
DOCOMOMO Conference Office
Slovak Architects Society
Panská 15
811 01 Bratislava
Slovakia
tel. +42-7-5335 167 / +42-7-5335 177
fax +42-7-5335 744
e-mail sas@netlab.sk

Every Tuesday from 10.00 to 15.00 and Thursday from 11.00 to 16.00, telephone calls can be answered in English.
The official language of the Conference is English, with a simultaneous translation into French. According to the Law of the State, the Slovak participants have the right to use their national language, which also will be translated into English and French.
A booklet with the final program and all other details concerning the Conference is available from the Conference Office, as well as from the International Secretariat of DOCOMOMO in Eindhoven.

Fifth DOCOMOMO Conference in Stockholm

by Marina Botta and Eva Rudberg

The Fifth International DOCOMOMO Conference will be held in Stockholm, Sweden, in 1998 when Stockholm is the Cultural Capital of Europe. With the title 'Nordic Light and Social Welfare' the conference will focus on Modern Movement architecture and planning in the Nordic countries: Sweden, Norway, Denmark, Finland and Iceland. It will explore the local premises of the social meanings of architecture and planning. The ideology of the Modern Movement, coming from other European countries, was based, among other principles, on the essence and the functionality of architecture and it found in the Nordic countries a suitable ground for its own evolution.
At that time important changes were carried out in the social and political systems of the Nordic countries, resulting into a series of social reforms to arrive at a Welfare State. Architecture and urban planning too were influenced by these reforms. The research of practical and social values in every environment, from the scale of the kitchen to that of the suburb, prevailed over the formal-stylistic interests and the classical-humanistic development of the older architecture. A healthy and functional dwelling was considered a right of every citizen, as well as urban environments that

The Fifth International DOCOMOMO Conference will take place in the Swedish capital Stockholm, photographed here from a bird's-eye view in August 1984.
With its main theme, 'Nordic Light and Social Welfare', the conference will focus on Modern Movement architecture and planning in the Nordic countries.
Photo: Lars Bygdemark.

allowed an adequate development of the individual in terms of education, health and quality of life.
The result of this evolution of MoMo ideology in Nordic countries is the development of an 'everyday' architecture, of new building types and of many suburban residential areas, well placed in carefully planned surroundings with all the services, not just for the dwellings, but also for recreation and education. Social, intellectual and physical development of its residents was another key issue, and sometimes these areas are completed with working spaces.
But the character and the formal language of the Nordic modern architecture and urban planning are also connected to the geographical and climatic conditions of the Nordic countries, to the low density of their population and to their attitude towards nature. Because of the extreme difference between summer and winter, the orientation of the buildings, the incidence of light in particular, received special attention from Modern Movement architects in Northern Europe.
Nordic MoMo architecture and town planning often had to interact with non-urbanized areas, and therefore the landscape and the contact with nature had a very significant meaning, in the same way as in other, more urbanized countries, architecture more often had to deal with the older built environment. The cold winter climate may explain something about the formal aspects of the Nordic architecture, as well as the high value given to the interior, to the comfortable private dwellings, to the neighbourhood centres and to all the service structures as indoor meeting places.

Authenticity
The Fifth International DOCOMOMO Conference will aim at thoroughly analyzing these social and functional aspects of the Nordic MoMo architecture an urban planning. The issue of preservation of these aspects, including the abstract qualities and together with the consideration of more technical problems, will raise the question of authenticity and give the opportunity to discuss it in a more general debate on the conservation and modernization of Modern Movement architecture.
The conference will be organized by the Swedish DOCOMOMO Working party, with the participation of the other Nordic DOCOMOMO groups. The host will be the Swedish Museum of Architecture. The conference will be among the first events to take place at the then brand new Museums of Modern Art and Architecture in Stockholm, from September 16th up to September 19th, 1998. On September 19th, the participants will have the opportunity to get acquainted with the Swedish Modern Movement by means of a post-conference tour in Stockholm.
As from September 20th, the possibility of a second post-conference will be offered in each capital of the other Nordic countries: Copenhagen, Oslo, Helsinki or Reykjavik. A more extensive introduction to Stockholm, the conference and Nordic MoMo architecture will be presented at the 1996 Conference next September.

Marina Botta and Eva Rudberg are members of the Organizing Committee of the Fifth International DOCOMOMO Conference in Sweden.

ISC / Technology

The ISC/T had its latest meeting in Wroclaw, Poland last June 14. Apart from some formalities, the agenda listed various important issues.

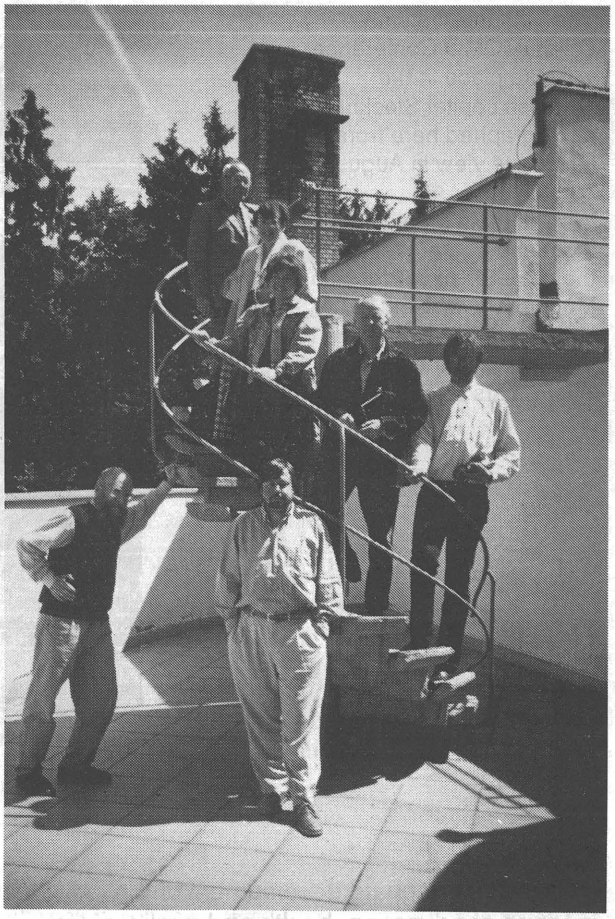
The data base of technological expertise within DOCOMOMO is growing and will remain a prime activity for the ISC/T. A main concern is still, that not all countries are participating in this project yet. The Committee is reluctant to believe that in these countries no expertise is available at all, so we keep on trying to extend the information.
For the time being, a first edition of the database will be available in Bratislava in September. The Committee is still exploring possibilities to have this information available through Internet too.
The data base is as well to identify omissions in knowledge of MoMo technology and restoration expertise. In Bratislava, we hope to present a set of recommendations for research to fill in these gaps. It seems therefore important to link such issues to the program of the ISC/Education.

A proposal to initiate MoMo expert missions to underprivileged or disaster areas was discussed extensively. The Committee agreed that the infrastructure and financial position of DOCOMOMO as a whole do not sufficiently allow for such an ambitious program. The ISC/T will see if we can participate in such missions by others, and still make our expertise available where needed most.

A discussion on the principle aims of the ISC/T concentrated on the paradox that it is necessary to reassess the impact of technological progress for the development of MoMo architecture, which is a long term academic work, and at the same time there is a great and urgent need for technical knowledge and support for actual preservation work. The Committee intends to follow both tracks. By organizing or supporting colloquia and thematic publications on various specific technical issues of actual importance, we hope to be able to generate essential information that could serve as a reference for a major publication on MoMo technology later.

The meeting was sponsored by Zygfryd Zaporowski, Lord Mayor of Wroclaw; Dariusz Speruda, director of the municipal Culture and Arts Department; Olgierd Czerner, director of the Museum of Architecture; director Zygmund Dawgiert of Raab Karcher Poland Ltd.; and president Adam Dziasko of the Admi Company Ltd. In between working sessions the Polish hosts had organized field trips, amongst others to the WUWA estate. Actual problems with the current restoration of Max Berg's *Jahrhundert Halle* (1913) were discussed on site.

(Report by Wessel de Jonge, chair ISC/T)



The ISC/T and colleagues on the roof of the Scharoun hostel in the WUWA estate in Wroclaw, Poland, during their last session in June. From top down: Olgierd Czerner, Krystyna Kirschke, Hans-Jürgen Kiehl, Ola Wedebrunn and Jos Tomlow. Ernest Nemczyk distrusted the concrete stairs and supported the committee in his own way. Bottom: Xavier Costa, Dennis Sharp, David Whitham, France Vanlaethem and Marieke Kuipers of the ISC/R at work last December. Photos: Wessel de Jonge.

ISC / Registers

An intense three day working session of the ISC/R in Eindhoven last December, was followed by a meeting in the first weekend of June, hosted by the École de Belleville and ICOMOS in Paris.

After the requests made to extend and complete the registers, most recently in February 1996, again fourteen working parties responded. The ISC/R was very pleased with the entries for the *International Selection* (IS), especially those from Argentina, Brazil, Bulgaria, Greece, Norway, Scotland and the addition for Slovakia. The level of the register submissions received so far is varying and can be summarized as follows:
- IS and motivation text complete: 7 Working parties;
- IS and motivation need adjustments: 3 Wps;
- addition to the IS required: 9 Wps;
- no new submissions since 1994: 7 Wps;
- not any submission received: 7 Wps.

This means that the last two years, 19 working parties have been very active to add on to the register project substantially. However, a main concern for the ISC/R remains, that some other countries are still completely missing in the IS. A few working parties complained about the required level for the IS documents and have asked either for postponement to be able to come up to these standards, or for a reduction of the standards or the amount of fiches to be completed. Still, a minimum representation from each country or region must be available by August 1st, 1996, to allow inclusion before the 1996 Conference. This minimum is to include at least the *motivation text*, the *minimum fiches* with some photos of all the selected buildings, and a few completed fiches. As far as the IS standards themselves are concerned, the ISC/R is well aware that completing the documents, in a language that is mostly not ones own, is not easy. Still we like to maintain these standards in view of a future publication. If funding for the IS publication can be secured, it is intended to have a first volume available by 2000.

Eight working parties sent in a proposal for the inclusion of MoMo architecture in the WHL, which allowed for a test of the criteria we had formulated in December 1994. The Italian group proposed a change by involving only scholars in the selection procedures. After evaluation of the submissions and an extensive debate, a tentative list of 17 MoMo items was formulated. This list will be submitted to a referee committee of internationally recognized scholars, before an official proposal can be presented to the Council in Bratislava. The ISC/R will further the completion of the IS by encouraging the working parties to submit their fiches. The English speaking members will concentrate on preparing the publication. In view of the substantial progress made with the various ISC/R projects the members of the Committee are willing to sustain their membership for another two years. However, a few new members would be very welcome, and especially members from the Americas are invited to apply as a candidate

(Report by Marieke Kuipers, secretary ISC/R)

Slovak MoMo catalogue

A great reference

'Architektúra & Urbanizmus', Vol. XXIX (1/2), Bratislava 1995, 153 pp., b/w ill., ISSN 0044-8680.

The Modern Movement between the two World Wars has been the most successful period in Slovak architecture in modern times. Excellent buildings were designed by noted architects, such as the synagogue in Zilina by Peter Behrens, the Green Frog swimming pool in Trencianske Teplice by Bohuslav Fuchs, Emil Bellus' unique glass bridge in Piestany and the curtain walled City Savings Bank in Bratislava by Tvarozek. In the *interbellum*, Slovak, Czech, Moravian, German, Hungarian and Jewish architects, who were trained in cities all over Europe, created a multi cultural Central European Bratislava. The variety of backgrounds and perspectives melted to what today can be recognized as an outstanding regional interpretation of the Modern Movement. Over the years, the DOCOMOMO Slovakia dedicated much of its energy to record the MoMo heritage, starting with the most notable buildings. It is their great merit that they created an opportunity to take advantage of their hard work, and to make their register public through a major publication. An entire 153 page special issue of *Architektúra & Urbanizmus* has so been made into an excellent bilingual catalogue of Slovakia's MoMo legacy. The skill and professionalism of the ten authors, all working party members, appears not only from the informative texts on the design and development of the 29 documented structures, but also from the geographical scope of their analysis, the inclusion of technical data on construction and materials, for example with the steel framed New Age housing scheme of 1932, and the attention given to various typologies, such as with the Ladce-Dolne Kockovce power station of 1933-34. Sanatoriums are well represented and of course the Palace Spa in Sliac, our 1996 Conference venue, is documented as well. With this catalogue, the Slovak group set a standard that will be valued as a great reference when the DOCOMOMO International train will cross Slovakia in September. -WdJ.

Foundation Villa Westman

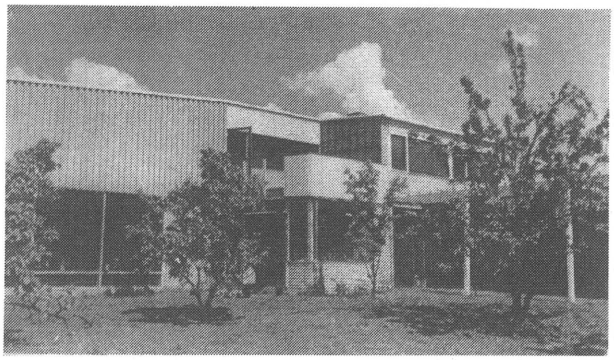
International forum

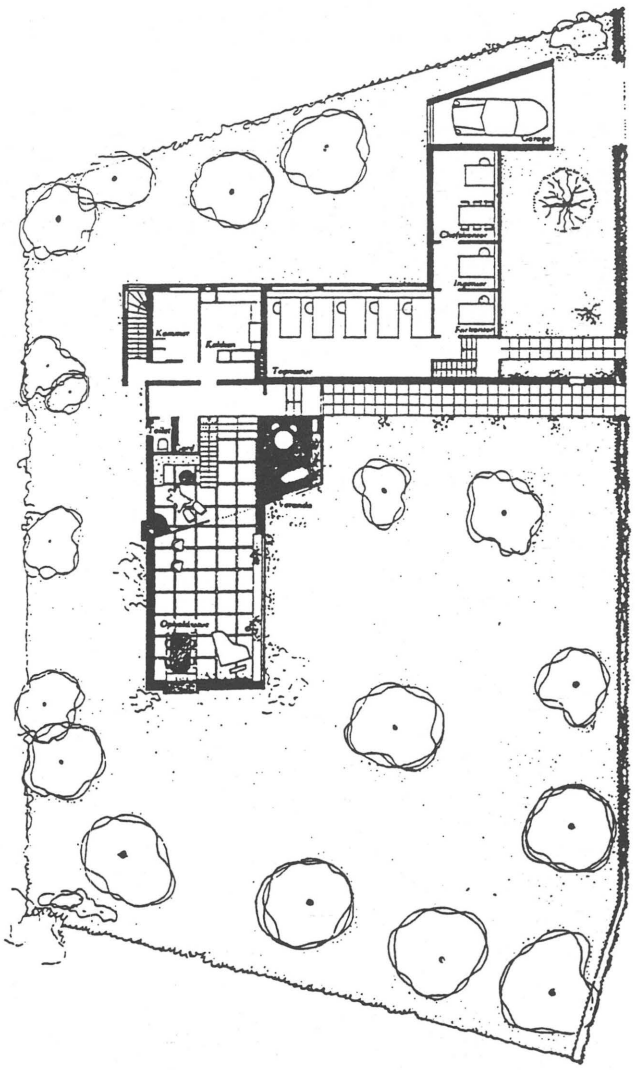
by Ylva Westman-le Normand

The Foundation Villa Westman was founded in December 1994, but yet sometimes I wonder if we are the only persons in the world that care for this wonderful architecture called Modern Movement or functionalism! And still we are, at the same time, working for a cause that could stimulate the employment for architects, builders, designers, as well as for those who have never been confronted with architecture or realize its influence on their well being in their daily life.
Even if Sweden is located a little aside comparing to the pulsing life of central Europe, its population is very educated, organized and computerized, yet without much understanding and knowledge of architecture, especially of its cultural value. Well-organized as this country is, architecture seems to be the concern of specialists only. This is were the cultural project of the Foundation Villa Westrman fits in!

Forum
The aim of the Foundation Villa Westman is to establish an international and regional forum for architecture, technology and design. In order to achieve this, the Foundation wishes:
- to emphasize the specific South Swedish architecture, technology and design,
- to stimulate a cultural and historical link to Denmark, Northern Germany, Poland, the Baltic States, France, England and other regions, and to show the current need of a broader international direction,
- to create a natural meeting-place, a regional as well as an international cultural network between the public at large and the professions, a forum with a general educational character intending to point out architecture's important role in daily life. Consulting and information aimed at the public, and exhibitions of current projects shall form an important and permanent part of the activities,
- to encourage international contacts, exchanges and development programs for building, planning, preservation and research in collaboration with the associations of architects and builders, the future Institute of European Studies, the Lund Institute of Technology, the Sketches Museum in Lund, the Museum of Architecture in Stockholm (in the new Museum of Modern Art) and others in Sweden and their international contacts all over the world.

History
The Foundation Villa Westman's purpose is to obtain funds to acquire Sweden's most modern historic architectural monument, the only of its kind, which is Villa Westman at Nationsgatan 3 in Lund in the very south of Sweden to accomodate the Foundation's activities.
This villa can be seen as a symbol of the 'boom' of the 1940s and 50s. Architect Hans Westman (1905-1991), just graduated from the Royal Institute of Technology in Stockholm when designing the house. Together with his family he moved to the south of Sweden in the 1930s, just after the Wall Street crash, as there were no jobs available in Stockholm. But with a tenacious faith in the future, a confidence in humanity's eternal circle, a unique solidarity with his colleagues and an ambitious and creative talent, he overcame several crises with great success in spite of the doomsday mood around him. For almost 60 years, and more than any other architect, Hans Westman has left his mark on Lund's modern architecture and influenced many other cities with his futuristic vision on architecture, that was far ahead of his own time. Up till the age of 80 he was faithful to the idea that it is vital to study architecture all over the world. He travelled all the continents regularly with several visits every year during his active professional life. For instance, the influence of Le Corbusier's architecture is very much present in Villa Westman. Many foreign architects came to visit his extraordinary villa and to meet the openminded architect themselves.
Villa Westman, built in 1939, is still very revolutionary in its design, and only a little affected here and there by the ravages of time. With the original carpentry and the basic natural materials still left, this villa is a typical representative from an architecture that reflects a unique curiosity and friendship between colleagues, and faith in a bright future for mankind. This detached building, surrounded by a garden of 1300 m², is situated in Lund's most attractive part, namely in the heart of the so-called professor's city. Its 350 m² are divided into a residence and an office area and a common cellar of 150 m².
The ground floor of the residence consists of a main entrance, kitchen, laundry, cloak room, lavatory, a dining room with a winter garden, a 'cosy corner' with a big open fire place and a huge living room of 60 m² with a free height of five meters, openly connected with the dining room and the 'cosy corner'. This living space is oriented towards the four points of the compass. To capture a maximum of daylight, there is a 4 meters high window directed to the south and a fully glazed facade directed to the west, that continues over the roof to catch the last sunbeams. The living room can accomodate up to 90 dinner guests. The collective spirit of functionalism is strikingly represented here in this huge and spatial living-room. Its height and the high window provide a 'right' feeling of space, light and air by erasing the confines between interior and exterior, according to one of the main architectural principles of functionalism.





Far top: View from the south on a period photo of the Villa Westman, with the living room on the left.
Top: Elevation of the house, also seen from the south. The windows of the living room on the left are four meters high to capture a maximum of daylight.
Right: The original plan of the villa, including the garden, made in 1939.

An exterior terrace and an interior balcony with an open fire-place on the first floor and all are directly connected to the huge living-room. A bathroom and five bedrooms are also located on this floor. The office, next to the residence but with separate entrances, has 8 office-rooms, lavatory, kitchen, a conference room storage rooms.
The main themes when Hans Westman created Villa Westman were *light*, *air* and *health*. Wall bars on the first floor of the residence are a witness of this epoch's life elixir: healthy buildings and healthy bodies. Not to mention the long rope hanging down from the ceiling in the living room, that was frequently used by the architect to swing himself up to the first floor instead of using the stairs - a challenge that few guests could take up. He was also stubborn in refusing to make an internal passage directly to his office just to force himself to consequently get his daily breath of fresh air.
The purposeful placing of the windows symbolize the *light*, the limitless world between the exterior - the garden- and the interior -the living-room. Sunshine was caught in the room until dark, when the stars and the moon took over this enlightening task through the roof window. The huge living room, intimately interwoven with both 'cosy corners', the dining room and the winter garden, symbolize the *air*.

Current situation

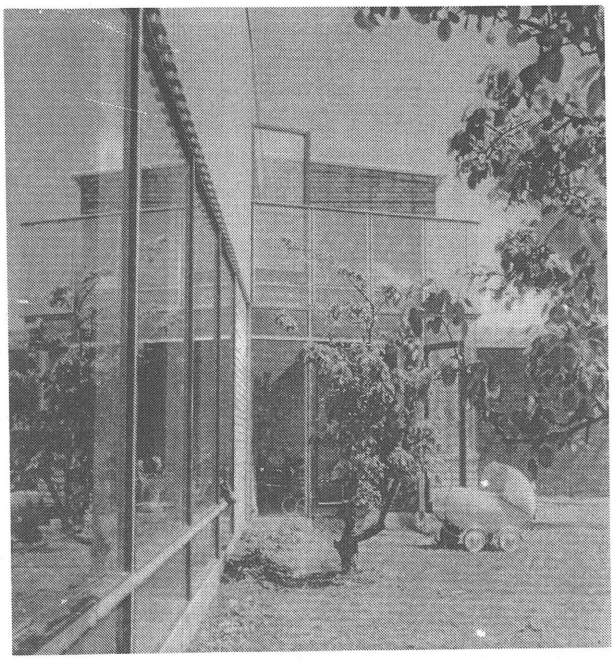
The state conservation officers have realized the importance of maintaining this building for future generations, and listed the house a historical building monument in June 1994, after an investigation of only eight months, a record for Sweden. The functionalist house was built in 1939 and is in need of minor renovation. Maybe just a 'refreshment' will do since the villa is largely constructed out of natural materials, with the exception of some unique 'functional' details that need more extensive renovation.
All together, the office, the residence and the garden are estimated at a market value of 3,5 million Swedish crowns. A professional quotation is estimated at 1 million for renovation of the villa, all taxes included. The investments for certain characteristic details can be reduced, since the Swedish government subsidizes up to 90% for these extra, in order to keep classified buildings in good condition. Among these details are the windows, the balcony and the veranda terraces which are specified in the listing documents.

For other details, for example the typical flat roof, the government pays up to 50% of the extra costs exceeding the usual maintenance. The state will never acquire this building, especially not because it is a private property today. Nevertheless, they are an important moral support to our cause, always present and eager to help us in matters concerning the villa's preservation and the best use according to our purposes.
It would be an incredible loss if a building of this high level, part of the cultural heritage, would become completely inaccessible, without a possibility for the public to experience this fascinating building, and without this architectural 'pearl' being able to stimulate a profession in crises. To be able to become an independent institution, the villa could be used for several activities.
Besides the office rooms that could be rented, there is the outstanding acoustics of the living room that would be perfect for smaller concerts. Occasional theatre performances, exhibitions, conferences, a library, student and/or scientist apartments, a cafeteria could be accomodated, or special events of any kind could provide additional means, next to sponsoring.
A cultural centre in this thrilling and timeless building can stimulate a new generation of architects and builders to cooperate internationally in this now 'hot' region in Europe. The Öresund region, with its 3 million inhabitants and in the future at least 1,5 million tourists from Sweden alone, is having an outstanding future ahead. Close cooperation between Denmark and Sweden is ahead, as they will build the longest bridge in the world and a tunnel between the two countries before the year 2000, which will connect Roskilde, Copenhagen, Malmö, Lund, Helsinborg, Helsingor, etc. Roskilde is the Danish centre of education, research and culture; Copenhagen is the capital of Denmark and has the international and Scandinavian aviation base; Malmö, Sweden's third town, has a communication centre, a harbour, aviation, important telecommunications, and Lund is the Swedish centre of education, research, culture and medical services. This Öresund region has the ambition to become a North European centre of industry, services, education and culture, in a near future.

Expectations for the future

Within the next two years many events will take place concentrating on Hans Westman's architecture, including a memorial exhibition at the Sketches Museum in Lund and a thesis about his life and works, both in November 1996. The exhibition will be presented at the Museum of Architecture in Stockholm in 1998, when Stockholm will be the European Capital of Culture. The last week of April has been very hectic for the council of the Foundation Villa Westman, representatives of the Lund Institute of Technology, lawyers, scientists and architects, since the Foundation organized a reception for potential sponsors and meetings with newspapers and radio stations. There is a lot of support for our aims and a great need to start this cultural project, but so far we have not enough means to build up this forum for architecture, technology and design, to promote cultural exchange and mutual international understanding. If we are not able to acquire and renovate Villa Westman, the house will be sold on the open market in October and will probably be lost as an accesible cultural symbol for the public!

Ylva Westman-le Normand, daughter of Hans Westman, is an architect and chair of the Foundation Villa Westman. For more information: Foundation Villa Westman, Torsdagsgatan 9, 21619 Malmö, Sweden.



Left: Exterior of the Villa Westman. Bottom: The living room, with the long rope on the right.
Period photos.

The Frank Lloyd Wright Building Conservancy

Survey to save Wright's architecture

announcement

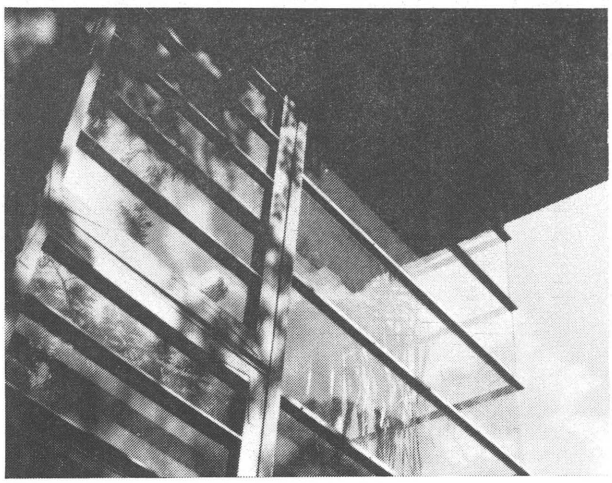
The Frank Lloyd Wright Building Conservancy has just undertaken a pilot study of its technical database to inventory Wright's remaining architectural heritage. About 25 structures from coast to coast will be included in the preliminary study. Eventually all remaining Wright-designed structures (estimated at over 400) will be inventoried. The study will be conducted under the direction of Dr. David DeLong, chairman of the graduate program in historic preservation at the University of Pennsylvania and professor Frank G. Matero. The two are team teaching the graduate seminar entitled *Seminar: Frank Lloyd Wright.* Sixteen students in the graduate program in historic preservation who are taking the seminar have been selected to work on this pilot program. Both the students and the professors are donating their time with travel expenses being covered by a grant of US $ 30,000 from the National Park Service's National Center for Preservation Technology and Training.

'Frank Lloyd Wright is widely regarded as America's greatest architect, and by many, as the greatest architect of all time', says Dr. DeLong. 'He designed nearly 1,000 buildings, yet many remained unbuilt, and of those completed, many have been lost. The protection of his remaining works is of critical importance.'

The purpose is of the study is to provide a database for Wright homeowners and administrators of Wright properties. This comprehensive inventory of Wright's buildings, with information about their history, condition, and their conservation, will be assembled to help protect these works as well as other buildings of the recent past.

'The first 25 structures chosen represent a full range of Wright's practice', says DeLong. 'We have examples from Wright's earliest works to his latest, including both domestic and civic designs. Every site will be visited by a student to make a condition/needs assessment, to photograph exteriors and interiors, and to identify [and record] preservation and maintenance projects'. The inventory will also record previous architects and contractors who have been involved with the house as well as former owners and descendants. The findings will be stored in the database compiled by the Frank Lloyd Wright Building Conservancy located in Chicago. The not-for-profit membership organization was organized in 1990 to help facilitate the preservation of the existing Wright structures. According to Sara-Ann Briggs, executive director, 'one in five Frank Lloyd Wright structures has been destroyed. Many more are threatened by age, neglect, the stripping of their decorative arts, or encroaching development. The Conservancy works to preserve Wright's heritage with technical help for homeowners, preservation easements, by providing educational programs, and linking preservation-minded buyers with sellers of Wright properties'.

The Samuel & Harriet Freeman House in Los Angeles, CA, home of DOCOMOMO US.
Photo: Wessel de Jonge.



Among the 30 Wright structures included in this preliminary study is the Samuel & Harriet Freeman House, which also houses the main office of DOCOMOMO US. The students in the Frank Lloyd Wright seminar include some working simultaneously toward a degree in architecture and a certificate in historic preservation, architects with professional degrees who have returned for a degree in historic preservation and students within the program who are specializing in architectural conservation or history and documentation. Backgrounds vary widely; four have worked and/or lived abroad, most have some work experience, and all are committed to historic preservation.

The database was created by Dotlogic, Inc., a Chicago-based information of technology consulting firm specializing in turnkey business solutions in the areas of Internet website development, intranets, local area networks, management information systems, and corporate and personal training. It is a customized database using a Microsoft Access database engine.

The Frank Lloyd Wright Building Conservancy is located at 343 South Dearborn Street, Suite 1701, Chicago, IL 60604-3815, USA.
Tel. +1-312-6631786, fax +1-312-6631683,
e-mail: bldgcons@aol.com,
website: http://www.swcp.com/FLW.

An early curtain wall in Edinburgh

by Suzanne Ewing

The 1937 extension of the St. Cuthbert's Co-operative Association Department Store at 28-32 Bread Street, Edinburgh by Thomas P. Marwick and Sons introduced one of the first curtain walls of glass into Scotland. It is of some significance now due to the survival of the original glazing and mullions.
Neighboured by four storey stone *palazzo* buildings (of 1892 and 1914) and with a plain rendered brick rear extension, the four storey infill block has its principal facade to the south side of a built up street south of Edinburgh's historic centre. The new building was constructed of a steel frame with pre-cast concrete floors to allow maximum useable showroom space. The expanding department store, already occupying the adjacent buildings, wanted an area of flexible space to be used as new furniture showrooms. Lift and stairs were located to the south west corner with ground floor access to other areas of the department store. The ground and basement floors later housed a footwear salon.

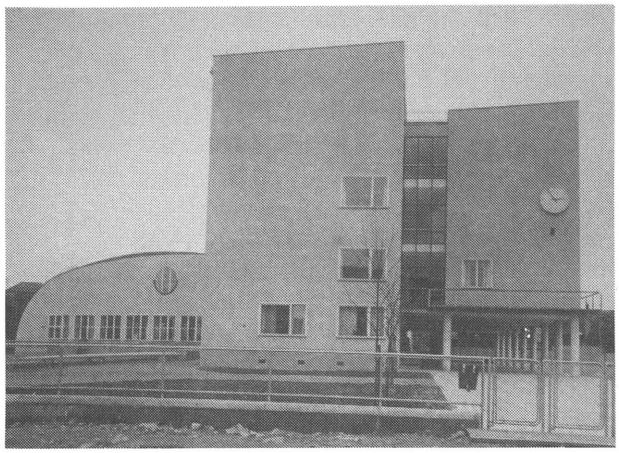
Bronze sashes
To the Bread Street facade, the narrow flanking piers and parapet are of brick, stone faced with grey granite in banded courses. The curtain wall is composed of bronze sashes glazed with plate glass. Sashes are cantilevered from the structural steel framework with attachments to stanchions and floors at regular intervals. The soffit of the continuous bronze canopy to the top of the curtain wall provided a facility for floodlighting the facade interior. The original shopfront below comprised plate glass, stainless steel and bronze components.
Unfortunately the distinctive external cellulosed finish sign lettering above the entrance has now been replaced.
The architectural language of the exterior was unashamedly 'modern' with the slightly projecting large glass wall appearing to float on the stone trim of the surround. The detailing and grid of the curtain wall, subdivided into 12 panels horizontally and 9 panels vertically, with its physical fixings to the proportionally related internal structure combine with the lit panels in the canopy soffit to link the exterior and interior. A transformation of the two dimensional exterior grid of the facade skin was achieved as it visually extended into the primary structural frame to become a coherent expression of the flexible, accessible spaces inside, particularly successful when the showrooms were lit at night.

Glass skin
The client chose a suitably innovative architectural solution to express the 'modern' aspirations of both a developing building type, the city Department Store, and also the democracy of the Co-operative Movement. Drawings of the Bread Street elevation with conventional windows in a masonry wall facade were superseded in 1936 by the present design. The later St. Cuthbert's Co-operative Department Store in Clerk Street, Edinburgh, also utilizes a curtain wall facade in a similar situation. The expression of the facade as essentially an oversized window stood apart from contemporary department stores developed elsewhere in Edinburgh, for instance, Jay's store, Princes Street, by the same architects. Similarities can be seen with the Peter Jones Department Store, London (Slater and Moberly, 1936) and in particular with the Bila Labut department store, Prague (Josef Kittrich and Josef Hruby, 1937-39). The latter elevation is also composed of a massive window with a glazed grid of obscured and clear glass panels.
Technically the Bread Street showrooms displayed

St Cuthbert's Co-operative Association Department Store in Edinburgh, designed by Thomas P. Marwick and Sons in 1936. Photo: British Architectural Library, RIBA, London

an innovative use of a complete glass skin in an urban situation, overcoming the limitations of a long, narrow north facing site where neighbouring premises prevent any sunlight reaching the facade, while meeting the principal criteria of the brief: to maximize visibility of showroom goods from the street.
Unfortunately alterations to the facade (1961, 1964 to the shopfront, entrance doors, replacement of external signage lettering; 1988 general alterations and painting of portions of the glass curtain wall) coupled with change of use to a Paintball Warfare Centre leave current perceptions of the building dulled and negative. The 1937 facade is at present Category 'A' listed and any future development which recaptures the original's daring and unashamedly 'modern' vision for transparency between building and street, fusing exposed frame structure, interior open space and exterior skin through the materials, detailing and integrated use of lighting would be very welcome.

Suzanne Ewing is a member of the DOCOMOMO Scottish National Group.



The Sveaplan Secondary School in Stockholm in 1936 (top) and after restoration in 1996 (bottom). Photo: Eva Rudberg.

Swedish MoMo highlight saved!

The Sveaplan School

by Eva Rudberg

The Sveaplan secondary school for girls, built in Stockholm in 1936 and one of Sweden's most important buildings of the Modern Movement, has been in jeopardy for a long time (see also DOCOMOMO Journal 11, pp. 34-35). After many years of decline -the roof and the windows were damaged- and plans for big changes, the municipality of Stockholm, owner of the building, finally found a solution. The main problem had been to find a suitable user, who would maintain the original function of the building -a school- and who also would be willing to pay the costs for the renovation. After many negotiations the Stockholm University decided they could be making use of it, for both lecture-rooms and offices.
In February 1996 the school was inaugurated in all its beauty, carefully renovated. The outside has been restored to its original state, except for one addition: sun blinds, which was a better, more adequate solution than changing the glass of the windows into a darker shade. The heat from the sun through the big windows to the south was a long existing problem.
Inside, the large lecture-hall, the central staircase-hall, some classrooms and a corridor have been restored, other parts have been changed into offices, study rooms and meeting-rooms, suiting the original building. All the changes have been done in such a way that it will be possible to return to the old situation, i.e. they are reversible. Toilets and elevators have been added (there were too few), and those additions have been marked by a new colouring. Windows, doors, glass parts and other details have been carefully restored. The daylight, the soul of the building, has been well taken care of. The architects (ARKSAM, Torbjörn Almqvist) have indeed succeeded in keeping the character and soul of the building, a hard task with all the demands and wishes from the owner, the user-to-be and the authorities! Astonishingly enough all seem to be satisfied, not at least the new owners who now will work and study in a great piece of MoMo architecture!
The Swedish DOCOMOMO group has been involved in the discussion at an early date, and has also written articles about the building in order to save it, and we are very happy with this solution. And so are the original architects of the building, Helge Zimdal and Nils Ahrbom, both over 90 years old!

Eva Rudberg is the coordinator of the Swedish DOCOMOMO Working party.

Modern matters: principles and practice

English Heritage Conference, November 1995

by Stephen Gee

What do we conserve? How do we conserve? These were the opening questions from Chris Green, chief executive of English Heritage, formulating the themes of the two day conference organized by English Heritage, one of the first in the United Kingdom to address the conservation of modern buildings.

The interest in the conservation of modern buildings is a relatively recent phenomenon in the UK and the search for an appropriate philosophy largely dominated day one. The first step was to look abroad to USA, Canada and Australia where their heritage values are more widely accepted, and dealt with the use and adoption of international conservation terminology and documents such as the Venice Charter and the Burra Charter.

As a practitioner the conservation of buildings of all ages can be carried out on the same philosophical principles and methodology. One of the most useful practical documents is written by James Semple Kerr *The Conservation Plan - preparation of conservation plans for places of European cultural significance*. The Conservation Plan is a document setting out what is significant and, therefore, what policies are appropriate to enable that significance to be retained or recovered, in its future use and development. The plan is founded on as definitive examination of all relevant data as practicable. It should consider the *Place* which is taken normally as the fabric but also its contents, services and, above all, its setting. The finished document is considered as a dynamic report, able to be developed, refined and amended as further evidence comes to light or resources change. The work is subdivided into two stages with the gathering of information for the evaluation of Cultural Significance and the development of Conservation Policy to retain or reveal that significance.

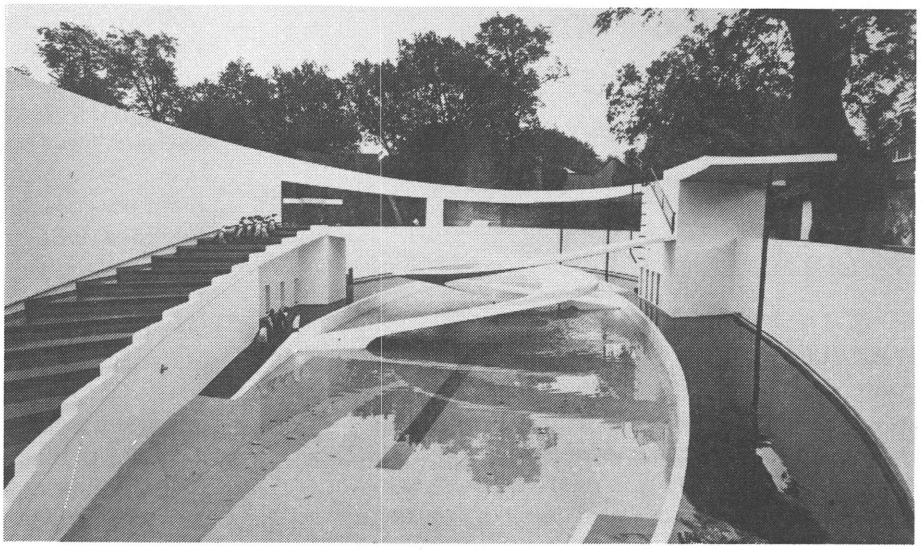
Original fabric

Susan Macdonald, secretary of DOCOMOMO UK, highlighted a major conflict in the reconciliation between the philosophy of conservation and the repair of modern buildings, as opposed to 'old', as being *'Authenticity' - in design, materials and workmanship*. The fundamental characteristics of modern architecture are the utilization of new technology and construction techniques, use of new materials and new disciplines of planning and functionalism. Susan identified that the material and construction issues versus aesthetic/design issues are problematic in regard to authenticity. Renewal of structural elements, such as steel or masonry, is not new. Renewal of concrete, as a structural skin and integral part of the architectural anatomy, can be argued that it reduces authenticity by no longer retaining historic fabric. It is unfortunate to see complete renewal of concrete on a large scale whilst maintaining the structural armature of Perret's Notre Dame du Raincy (1922) near Paris. The Metropolitan Cathedral of Christ the King, Liverpool (Gibbert, 1967) has adopted a short term policy of overcladding where the original glass mosaic treatment has failed in order to arrest deterioration. There is no economic solution whereby the design and aesthetic intention can be salvaged but also resulting in the loss of original fabric. If buildings cannot be conserved (preserved means in the state as found), be it economically inviable etc., a current argument against conserving Keeling House, then it should be thoroughly documented and preserved for the academic realm. Keeling House, a cluster block at Claredale Street designed by Denys Lasdun in 1954, predicts huge costs for its conservation coupled with the long term uncertainty of repair. Methods such as realkalisation have no guarantees yet. The absence of guarantees for these currently available repair options has meant building owners and state funding bodies were reluctant to invest in the building's future.

Penguin Pool

The conference highlighted the difference between working with buildings of the recent past and the distant past as essentially one of social programmes and the embracement of technology which changed rapidly during the last decades. The advent of the 20th Century brought new building types, such as density housing, school types, universities etc and of new materials, surfaces and finishes.

The understanding and sensitive approach to one new building type was equably demonstrated by Catharine Croft, of English Heritage, in Alexandra Road housing, Camden. Modern and old buildings undergo change in their 'historical time line'. An area of Alexandra Road density housing necessitated a change in use to suit its current social programme. Practical issues of conservation were established but unfortunately the proposed sympathetic repair techniques were not implemented. Lubetkin's Penguin Pool at London Zoo successfully accommodated the change to the diving pool in order to maintain its use and to suit its original programme. Wessel de Jonge's lecture on Rietveld's Venice Biennale Pavilion (1954) was a welcomed relief exhibiting how a conservation project can be successful because its significance was well understood through thorough analysis and also in its technical execution. Jadwiga Urbanik's solutions to the Polish problems of



The Penguin Pool at London Zoo, designed by Berthold Lubetkin in 1934, photographed in 1987. With assistance of a grant from English Heritage it was successfully restored between April and September 1987. For an extensive discussion of the restoration, see DOCOMOMO Journal 3 of June 1990, pp. 25-27.

continued use and change to Hans Scharoun's experimental hotel housing in Wroclaw, Poland, were resolved with varying degrees of success.

Uncluttered appearance

Concrete decay, reinforcement corrosion and problems with metal windows were the predominant themes of day two and much of the decay for MoMo buildings was seen to be related to the lack of maintenance which is an essential pre-requisite to their survival. Technology and conservative repair is an area where practitioners are struggling but Dr. Gareth Glass of Imperial College London, enlightened all with the rudimentary and fundamental lessons in the deterioration of concrete and reinforcement; John Figg of Ove Arup's in collaboration with Troughton McAslan saw the chemical analysis of concrete of Wright's Florida College. Metal window replacement must be strictly controlled as the alteration of fenestration to comply to British Standards 8213 and CDM (Construction Design and Management Regulations) is a major intervention which should be avoided. Peter Johnson showed it was possible to repair historic metal windows without leading to their replacement. It was disturbing that on a Grade I listed building such as Highpoint that metal windows were being replaced with new sections that bore no relationship to the original.

A range of approaches to similar issues emerged. The National Trust's attitude to Nº 2 Willow Road (Ernö Goldfinger, 1938) perhaps was partially determined by the amount of public funding necessitating greater access and also lead to interventions to provide a cinema, exhibition space and modifications to the fabric for a change of use which could be questioned. Preservation as found right down to a half bar of used soap might be questioned as surely the significance of Willow Road lies in its being an example of 1930s English modernism exhibited by its uncluttered appearance as was illustrated in published photographs in the Architectural Review when built. Equally, if the acquisition of The Homewood (Patrick Gwynne, 1938) by The National Trust should proceed one might question whether it should be frozen in time, as one would hope that it continues as a 'living house'. Both have the right to go on living in line with their original design programme.

Significance

If another conference is organized it should perhaps continue on the same lines as theoretical and practical issues cannot be dissociated due to their symbiotic nature.

It is important to recognize our recent past has justification for conservation. Awareness and dissemination of information is of paramount importance if we are to succeed in the conservation of all our built world heritage. There is a great urgency for the pursuit of technical research into the materials used this century to progress their conservative repair. The need to come to terms with appropriate philosophies for MoMo buildings can not be emphasized great enough and every conservation project deserves a proper Conservation Plan. The key is understanding 'why' we are conserving the cultural monument founded upon definitive study and is the basic stage in the planning process. Once the significance is understood, informed policy decisions can be made in order to achieve a 'fine' balance, so its significance is retained, recovered or, at least, impaired by minimal intervention. A clear understanding of the nature and degree of significance can suggest constraints on future actions but also introduce flexibility in identification of areas which can be adapted with greater freedom.

Stephen Gee is an architect with Peter Inskip + Peter Jenkins Architects in London.

The proceedings of the conference are due to be published in September 1996. Any enquiries, or to pre-order your copy, write to Modern Matters, Room 520, English Heritage, 429 Oxford Street, London W1R 2HD, United Kingdom.

Modern Movement architecture of the 1950s

A Stockholm Conference, October 1995

by Eva Rudberg

Last autumn, the Swedish DOCOMOMO Working party organized a conference on the 1950s: the characteristics of its architecture, its present problems and how to handle them. The conference was quite a success with over 160 participants (architects, conservation officers, journalists and other people interested) at the conference day and over a 100 at the post-conference tour the next day. The Swedish Board of Antiquities, the Museum of Architecture and the Stockholm Municipal Museum all participated in the organization. Speakers were invited not only from Sweden, but also from Denmark (Nils Ole Lund) and the Netherlands (Rob Docter).

The conference was held at the Årsta Centre of 1953, a rather controversial example of Modern Movement architecture and not really accepted by the 'true' modernists. But a modernistic, small community centre it is, one of the first of its kind in Sweden; a social experiment where the inhabitants had a theatre, a library, a community house, assembly halls as well as a health centre, a post office and shops gathered around the market place. The exterior of the building has colourful, abstract patterns, which should be seen as a type of wall with 'wallpaper', surrounding the 'market-room'.
The architects were Erik and Tore Ahlsén. Today Årsta Centre is regarded as a 'national interest'. It is partly in a bad state, but promises have been made to repair the roof and the windows. Some dull changes have been made during the 1970s, but as a whole it looks like it used to do during the 1950s. Today it hosts a lot of activities after a period of decline, so it looks rather promising! This is just one of the examples of quality built during the 1950s. It was the decade when our welfare state was developing, including many commissions for architects: schools, town halls, sport halls, churches, community centres, commercial structures, infrastructures, and -above all- housing. A good example of careful renovation of a housing block was presented at the conference - the result was convincing and not too expensive for the residents.

National interest
Examples of buildings of 'national interest' were being discussed; the expression turned out to be confusing as it contains no real legal protection, but an aim to be careful; the list of buildings of 'national interest' is made by the Swedish Board of Antiquities. One example, a high-rise block from the 1950s in the very centre of Stockholm, has been appointed 'national interest', but is handled with little care and is now being changed.
The problems with buildings of the 1950s often include a change of use, which often means the characteristics are damaged. A few of these buildings are protected, some in fact thanks to the help of the Swedish DOCOMOMO group, but most of them are handled with little care. The conference made it clear to the public that there are many great pieces of architecture from this decade, as well as many well-planned and functional buildings, which are worth being taken care of. This was also verified during the post-conference tour, when we visited Vällingby (a well-known community centre), schools and housing areas.
The conference also resulted in a book (in Swedish) in which most of the conference is documented and completed with some extra articles on the same theme. The conference proceedings are available at around US $ 20.--.

Eva Rudberg is the coordinator of the Swedish DOCOMOMO Working party.

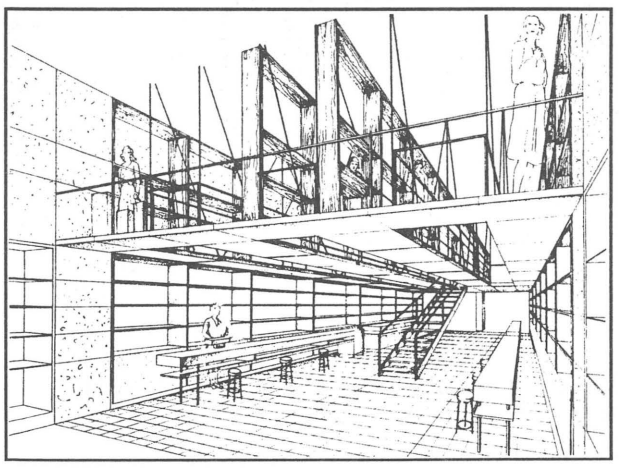
Left: Erik and Tore Ahlsén's Åsta Centre in Stockholm, photographed by Sune Sundahl in 1954.
Photo: Arkitekturmuseet, Stockholm.

Right: The *De Giovanni* store in Genova, designed by Pietro Lingeri in 1947.

Pietro Lingeri
Seminar proceedings

'Pietro Lingeri 1894-1968, la Figura e l'Opera', seminar proceedings edited by Elena Lingeri and Luigi Spinelli, Milano 1995, 142 pp., b/w ill.

Given the great public attention and interest for the seminar on the architect Pietro Lingeri, that took place in November 1994 as a part of the Triennale, the Architects Association of Milan and Lodi decided to publish the proceedings of the event that had been dedicated to this protagonist of Modern Movement architecture in Italy.
In view of a more comprehensive reassesment of the works and the role of some Modern Movement architects it is interesting to rediscover some individuals and works that do not fully comply to such rigid classifications as rationalism or functionalism, or a strict categorization in periods, nor an interpretation of history in terms of 'heroic' individuals, that attribute the merit of many to just a few. And even within the narrow view of such a limited chapter in historiography it remains more interesting to distinguish a common concept that was shared by many, also because that is the only message to be transferred to the younger generations of professionals.
In order to promote this initiative, the Association decided to publish the papers of the seminar in an attractive and comprehensive monograph on Lingeri. Editors Elena Lingeri and Luigi Spinelli made a great effort to reorganize and catalogue Lingeri's extensive archives. The book includes some 20 more essays, an indication that new lines for historic research were identified and that analysis has been the result of direct interpretation of historic sources rather than bibliographical notes or essays by other authors. It is therefore unfortunate that the publication lacks an English summary. -WdJ.



P.E. Blomstedt
Finnish functionalism

'P.E. Blomstedt 1900-1935 Arkkitehti', by Elina Standertskjöld, Jyväskylä 1996, 111 pp., English summary, colour & b/w ill., ISBN 951-9229-90-6.

announcement

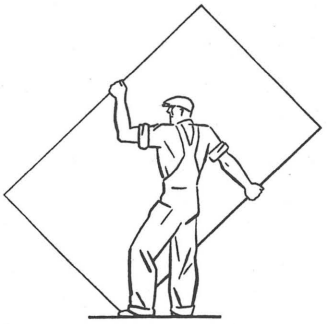
The Finnish architect P.E. Blomstedt (1900-1935) had a short career that lasted only ten years, and coincided with the economic depression of the late 1920s and early 30s. Of the 70 projects he designed, only seven were built.
Blomstedt is being regarded as one of the most pure-bred representatives of Finnish functionalism, and as one of the main proponents of functionalist ideas. However, his architecture contains a number of features that not easily fit into the concept of functionalism. There are clearly expressionist elements, and his final designs even contain mannerist features.
This well-documentated monograph, published in connection with an exhibition on Blomstedt's projects, deals among others with some phenomena of the late 1920s and early 1930s, and underscores the major changes in society and building technology. These led to a search for a new style and re-evaluations of the old forms. The first section of the book focuses on rationalism and modernism. The second part discusses expressionism, a style that never gained much attention in Finnish architectural history.
Expressionist features are prominent in amongst other the Kannonkoski Church, that graces the book's cover. The book ends with a chapter on mannerism, which is clearly present in Blomstedt's draft sketches and in his last works. A complete list of his works sums up a remarkable amount of projects produced in a brief career.

Research on modern architecture in China

by Zhang Fuhe

Looking back upon the research of the history of modern architecture in China, two periods can be distinguished: the first period started at the end of the 1950s, the second period begun during the mid-1980s and it is still developing rapidly.
Between 1958 and 1961, the Science and Research Institute of the Chinese Architecture and Engineering Department presided over the editorial work on a historiography of modern architecture in China. It was the first large-scaled research project of its kind in the country. In October 1958, the first National Symposium on the History of Architecture was held in Beijing. Scholars, organizations and several governmental departments collected materials that covered the history of modern architecture in ten regions of China. This led to the first draft of *History of Modern Chinese Architecture* in November 1959. Usually simply described as *The Draft*, it was not formally published until 1962, but it did play an important part in the research work. Combined with the illustrations of another book, it was last published in 1989 as *The Pictorial Collections of Modern History of Chinese Architecture*.
During the second period, Chinese architectural studies were coming at a turning-point when the past met the present and Western styles met native styles, which aroused great enthusiasm from scholars that studied architectural history. Foreign professionals, notably from Japan, also showed their interest in the research of this period. A research conference was held in 1986, the first nationwide symposium since 1958. It resulted into instructive guidelines for the development of researching modern history.
A third and a fourth conference, organized in 1990 and 1992, explored different aspects such as historical distinctions, education and restoration, and finally led to the publication of an *Anthology of the Fourth Conference on the History of Modern Chinese Architecture*. With the rapid development of domestic economics and advancement of society, preservation and reutilization of modern buildings is catching more and more attention. Suggestions and measures are being put into action; as a fundamental part of science, research of modern Chinese architecture is beginning to show its influence on construction projects. Its significance and importance is being accepted by a growing number of people.

Zhang Fuhe is an associate professor at the College of Architecture of the Tsingha University in Beijing, China. Text is based on an extensive overview of researches on modern architecture in China by Zhang Fuhe, summarized by the editor. The complete text can be obtained on request from the International Secretariat.



Modern materials

'Twentieth Century Building Materials, History and Conservation', by Thomas Jester (ed.), New York 1995, 336 b/w & 16 full colour pages, 250 illustrations, ISBN 0-07-032573-1.

The historic preservation community is increasingly turning its attention to modern buildings. However, restoration efforts have often been hampered by a surprising lack of historical and technical information about new building products used in these structures. This unique reference work has been created to fill that gap.
Thomas Jester, an architectural historian who is with the Preservation Assistance Division of the US National Parks Service, that is in charge of technical consultancy for architectural preservation, has done a great job in editing the thirty-six essays, reflecting the knowledge and expertise of forty-seven architects, historians and other professionals, and offering insights into the materials history, manufacturing, and uses.
Among the materials covered are stainless steel, shot concrete, aluminium, plywood, plastics, glass, sealants, various floorings like linoleum, vinyl, and a range of boards and laminates.

Readers will discover a wealth of information about how modern materials deteriorate and how to diagnose their condition, as well as valuable techniques and tips for repair, restoration, cleaning, reuse of salvaged materials, and future maintenance. A main problem will continue to be the unavailability of some specific products, such as glass blocks with certain types of decorative finishes that are now identified as being no longer produced. Yet every professional knows, that even such knowledge is vital to developing a proper strategy for repair or restoration.
An extensive bibliography lists further sources for historical and conservation research. *Twentieth Century Building Materials* will quickly take its place as a standard architectural reference for preservation professionals. -WdJ.

Salwator 1908

On the edge of modernism

by Anna Bojes and Katarzyna Zur

In 1908 an original housing estate called 'Salwator' was realized in Zwierzynic, a picturesque suburb of Kraków, the first example of modern town planning of a villa district in Poland. This pioneering development, the result of a competition, expressed the social and architectural transformations of European town planning at the turn of the century. It was a time in which new social and architectural solutions were sought for a modern development of the city. Before 1910, Kraków was extremely densely built, limited as it was by the strict Austrian fortress. The medieval centre with its ring of greenery called 'Planty', situated on the former city walls, was surrounded by a dense zone of 19th Century buildings. The area outside the fortress consisted of rural suburbs in an open landscape.[1] Salwator, which is one of those suburbs, was built as a garden colony for civil officers; it would become the precursor of the modern extensions of Kraków.

The asymmetric, organic shape of Salwator is a successful combination of the creative ideas of the architects R. Bandurski and T. Niedzielski, as well as purely rational reasons, because of the extremely difficult site. According to the conditions of the competition, all villas of Salwator had to have one or two floors, had to be detached (very rarely semi-detached), and had to be loosely situated between the gardens and the adjoining streets.

The bold solution of the plan coincides with the first experiments with new architectural forms that was typical for the first stage of Polish modernism between 1908 and 1914. Unfortunately, the interiors of the houses were still highly influenced by the 19th century tradition (hidden kitchens and bathrooms, rooms *en suite*). From this point of view, Salwator reflects an interesting confrontation between Art Nouveau, a historical style, and the rational tendencies of the Modern Movement. Salwator, embodying a 'new way of living in the city', introduced to Polish town planning its most precious values: space, sunlight, greenery, enriched by the wonderful views of the surrounding landscape, such as the Vistula valley, the Tatra mountains and the silhouette of old Kraków. Today, Salwator is still being recognized as the most beautiful residential quarter of Kraków. Its humanist character and the individualism of its architecture resist the passing of time, but the houses and gardens do not. Without proper conservation and municipal politics they are slowly turning into ruins.

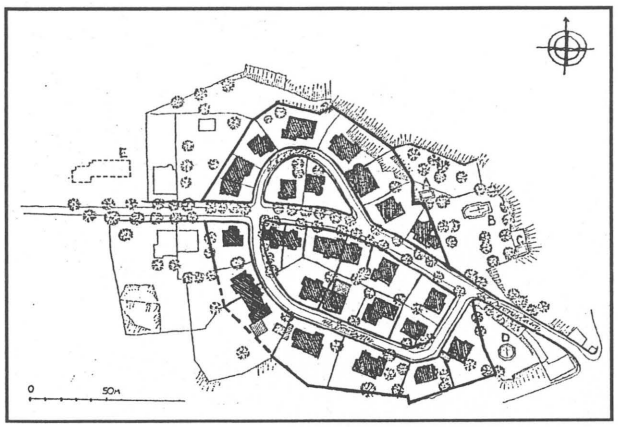
The complete architectural documentation of Salwator is now being done as a first step in solving the problems of its conservation. Two aspects are most important: the restoration and preservation of the whole ensemble of houses including the neighbourhood, and the conservation of each villa according to its individual character. It is necessary to start, as soon as possible, a preservation program of preservation to save Salwator, a monument of Poland's social and historical past and to revive its original splendour.

Anna Bojes and Katarzyna Zur are staff members of the Kraków University of Technology. The problems of the Salwator housing estate were the subject of a session of the Polish section of DOCOMOMO, on March 16, 1996, in Kraków.

Note:

1. E. Howard called it 'a garden city of the natural growth' during his visit to Kraków in 1912.

Bottom: Plan of the district in 1996. Right: Gontyna Street Nº 6 in Salwator. Drawing and photo: Anna Bojes.



The Modern Movement in Bulgarian architecture

by Ljubinka Stoilova

The introduction of the Modern Movement in Bulgaria has been determined by some specific events in the country's national history. The social and economic circumstances in the first two decades of the 20th Century have been decisive for its early development.
The economic and cultural developments, that accelerated after the national liberation of 1878, resulted in a direct import of ideas and technological innovations as well as extensive trade connections with Western Europe, the cultural standard of which was pursued by wide circles of socials.
The economic growth came to an abrupt end with the Balkan Wars and World War I (1912-1917), when Bulgaria lost much of its territory and population. After the depression of 1929 a period of relative economic stability started and it was in this period that the Modern Movement found support amongst the more creative of Bulgarian architects and engineers. Most of these were trained during the 1920s, at the academies of Paris, Munich, Berlin, Vienna, Prague, Rome, Torino, and other cities where modern ideas consolidated.
After their return to their native country, they followed a variety of artistic tracks. What they shared was an aspiration to overcome a poor cultural climate that most of them considered inferior, and to compensate for the losses that Bulgaria endured during the wars. However, this strive resulted in a rush to embrace almost any philosophical theory, idea or artistic movement, producing a series of contradictory cultural phenomena. Although the common intention to establish a national style was still strong, the artistic life in Bulgaria was dramatically torn between the traditional and the modern, in other words between the classical and the romantic, the academic and the innovative.
Conservatism and a tradition of scepticism in cultural circles led to a very mediocre artistic climate, that also affected architecture. The common pragmatism amongst socials determined not only the type of commissions but just as well limited the way architects could express themselves professionally.
At first, the inadequate development of science and technology in Bulgaria was a main obstacle to introduce modern ideas in building practice. For the same reason, technical or utopian social experiments were not very widespread. Although the restrictions of Bulgarian economy in fact caused a desperate need for new concepts, the great challenges to create new residential typologies and utilitarian structures were not always recognized.

Cooperative apartment blocks
Modernism in Bulgaria has always been very modest in its manifestations. Yet, it never became a fashionable whim, but has always been the result of serious considerations and discussions, and the social commitment and personal convictions of individual architects.
One of the more outstanding expressions in modern Bulgarian architecture in that period is that of the cooperative residential building. These multistorey buildings, that were constructed in a great variety of typologies and forms, were

Bottom: K. Plakunov, Resthouse in Nesebar, 1936.
Right: R. Radoslavov & K. Djangozov, Apartment block at 48 'Vitosha', 1938.
Photos: Ljubinka Stoilova and Peter Yokimov.

conceived in the spirit of the Modern Movement, as can be found in the early works of Walter Gropius, Mies van der Rohe, Le Corbusier, Hannes Meyer and others. Yet, also the cooperative apartment house did not come overnight. It developed slowly in terms of rational planning, spatial lay out and composition, and by taking advantage of the introduction of the reinforced concrete frame, to emerge as one of the most characteristic and progressive manifestations in Bulgarian architecture before World War II. It became a widespread national tendency when the clients participation in the design process increased. In that sense it should be considered a unique phenomenon, even in a European context.
Other examples of rational and modern architecture with unadorned facades can be found amongst the many public buildings, such as hotels, schools and office blocks that were constructed in this period. Most of these have a rather simple aesthetic appearance, that could also be explained from the scarce financial means of the state.
As is mostly the case, the main governmental buildings formed the exceptions to the rule. Although many of these buildings display a more impressive massing and neoclassical influences, most of them are still based on modern principles as regards lay out and plan.

Form follows function

The most interesting and typical examples of modern architecture in Bulgaria, however, are the private houses. Clients were the educated members of the middle class, who recognized the modern forms as symbols of cultural progress and integration with European civilization, as well as a way to display personal prosperity. Under these circumstances, the internationally orientated of Bulgarian architects took their chance to professional freedom, and closely followed the artistic credo of the epoch.
Most of these houses are detached two storey villas that are located in inner city courtyards. There is a functional differentiation between the premises for daytime use on the ground floor, bedrooms on the upper floor and accessory facilities on a basement level. On each floor a separate section is reserved for servants, including a service staircase. The main stairs are mostly used as a plastic element in the interior of the living room or the salon. Living room, dining room, salon and studio are usually large, and can be connected by sliding doors. The use of reinforced concrete frames allows for this spatial fluidity, as well as the flexibility in plans over the various levels. Another advantage of the concrete frame is the opportunity to open up the living quarters to the gardens by use of large windows.
These large windows and terraces constitute a relation between internal and external spaces, opening up the interiors to nature and making the orientation and boundaries of the property more manifest. The functional arrangements and the furnishings are close to Gropius' ideas of the house as a 'receptacle of moving life', which is to serve the varying needs of the inhabitants.

Sloped roofs

The laconic silhouette and the plasticity of these residential buildings, the lavish use of various building materials as well as the carefully contemplated proportions and rhythms create a logical composition of volumes, that reflects the various elements of the plans in the sense of 'form follows function'.
The typically unadorned facades are usually asymmetrical, with predominant horizontal volumes. Ribbon and corner windows illustrate the new structural freedom. Balconies project out of the main volume enhancing the dynamics of the composition. Inclined roofs of the external staircases seem to contradict the orthogonal general scheme. The contrast between window opening and walls are marked by horizontal elements, and roof terraces with decks and metal railings further refer to the principles of the European Modern Movement of the 1920s and 30s.[1]
By the end of the 1930s the roof decks and terraces were more frequently used as an expression of the stylistics and aesthetics of modernism. Yet, these features were far from everyday architecture in Bulgaria. On the contrary, although modern in lay out, plan and facade, these houses were typically designed with traditional sloped roofs, both in the works of the national-romantic architects[2] as in the works of distinguished modernists.[3] Apart from the economical advantages of the traditional sloped roof, it is probably the one element that illustrates the dramatic discord within Bulgarian architecture at the time. On the other hand, some architects recreated traditional elements with new materials. The specificity of the Bulgarian contribution to the Modern Movement in the 1920s and 30s is most obviously expressed in these residential buildings. It is this peculiar mix of elements from different aesthetic systems that changed in time and function.

Ljubinka Stoilova is an architect in Sofia and a member of DOCOMOMO Bulgaria.

Notes:
1. The authors explained their intentions in the same way of thinking as they did for for the House Kantardjiev in Sofia: to achieve the expression of the edifice and the harmony of its elements 'only by the three dimensions of geometrical forms'. The former name of the house, 'The White Ship', reminds of Le Corbusier's marine architecture.
2. B. Russev, T. Goranov, I. Vasiliov, D. Tzolov and others.
3. N. Iamantiev, S. Belkovski, A. Michailovski and others.

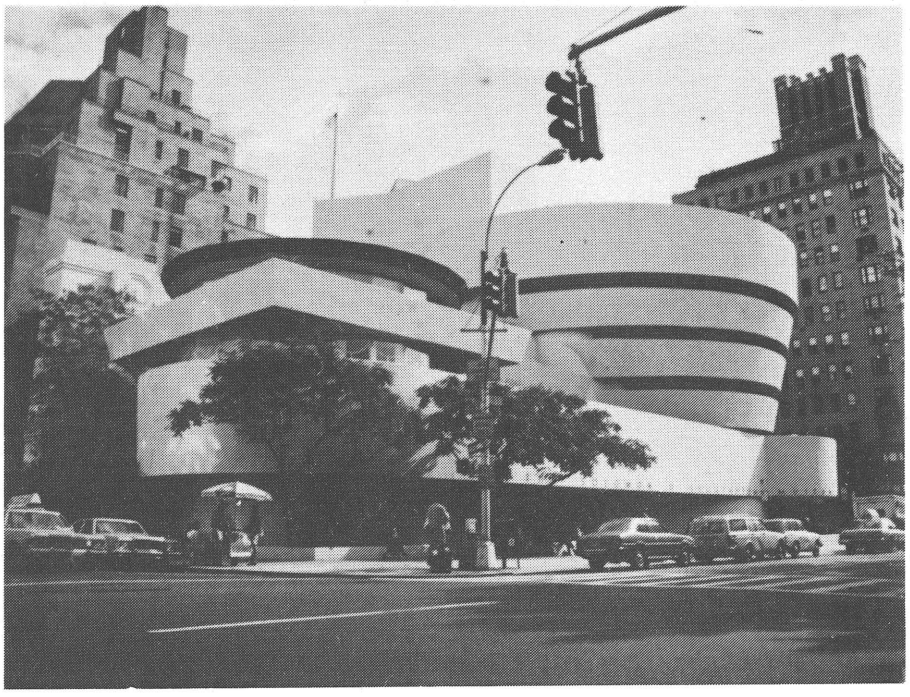
Preservation of landmarks

Curtain walls in New York

by Nina Rappaport and Theo Prudon

Preservation of modern and postwar architecture is a challenge that slowly begins to face New York City and other urban areas in the Northeastern United States. With the realization that our recent past has become historic, and that many buildings deserve preservation, also comes the realization of the difficulty of the task. The sheer volume of buildings during the period, combined with the size of most of the structures to be considered, make clear that the approach for preservation needs to be different but is certainly not less critical.
In New York City a building can be designated a City landmark when it is only 25 years old. But only a handful of buildings from this period have been designated. In one year of activity, our Northeast working group, based in New York, has initiated many projects. Postwar architecture, in particular has become a current focus since no organizations are working in this area and numerous buildings are slated for alterations. Not only did we begin our registry of modern buildings in New York City but we have written articles, organized seminars, and held tours of modern architecture. We have also met with the City Landmarks Preservation Commission, the governmental agency charged with historic monument protection in New York, to increase their awareness of issues which face the preservation, regulation and recognition of significant modern and postwar buildings.
While conceptually the idea of a historic district for Lincoln Center designed by Harrison & Abramovitz, with buildings by Philip Johnson (1962-1966), could be considered for Landmark status, most people would find the idea of a Sixth Avenue or Park Avenue commercial historic district Inconceivable. So much preservation activity in New York is controlled by real estate values and private ownership issues that it makes it difficult to create district designations in areas where the real estate values are high. It is obvious that different preservation methods and philosophies need to be found. We need to begin with basic education and outreach to architects, planners, preservationists, building owners and the general public.
This urgent need for new approaches and standards can also be illustrated in examples which were discussed in three seminars our working group co-sponsored this spring. The topics included: modern transportation buildings and the increased typological obsolescence; cultural institutions and their significance as artifact; commercial buildings and the separation and unity of inside and outside.

TWA Terminal
Functional and typological obsolescence is easily understood when looking at the many specialized building types that developed during the 20th Century. Examples are the branch bank and the airline terminal. On-line banking and Automated Transaction Machines are going to eliminate the need for the large majority of branch banks, those stately halls of money and respectability. Yet many branch banks are notable examples of postwar



One of New York's best known buildings: The Solomon R. Guggenheim Museum (Frank Lloyd Wright, 1959) at Fifth Avenue, seen from the west. The restoration of this building was discussed in detail in DOCOMOMO Journal 9, pp. 57-61. Photo: Wessel de Jonge.

design that contribute to the urban quality of their surroundings. They can't all be retail stores and coffee bars. As discussed in our seminar, 'Terminal Cases?', the nature of travel has changed so significantly that the TWA Terminal by Eero Saarinen (1962) can no longer easily accommodate the volume of traffic or security requirements. Yet the terminal is recognized as a masterpiece of 20th Century architecture, already a New York City Landmark but requires the ability to adapt to new functions.

Whitney and Guggenheim

Cultural institutions which were built as monuments face the challenge of being individual works of art which are difficult to alter. But as discussed in our seminar entitled 'Jewels of the Collection', in museums such as the Whitney and Guggenheim, building materials and technologies have changed. The buildings have to be brought up-to-date but at the same time be preserved as a unity. Gone is the sculptor or carver with the chisel; instead there are extrusions and castings. The relative significance and the intrinsic value of the original material may have to be reconsidered when dealing with failing technologies, If replacement is necessary, the preservation of the original design intent will become a critical preservation issue.

Changing architectural concepts requires the rethinking of legal boundaries of what is inside and what is outside and the concept of transparency so prevalent in modern architecture. In our session, 'People in Glass Houses', the restoration of the interior of Manufacturers Hanover Bank at 43rd and Fifth Avenue is an example of the issues the city faces when regulating the interior as well as the exterior of a modern building. Interior designations are difficult to enforce in tile U.S. because of the need for commercial viability, so that compromises are often made. The modern architects' desire for transparency of the outside wall makes a literal separation of outside and inside an impossibility, not just architecturally but from a preservation point of view. The appearance of the interior Is visual an integral part of the envelop which must be considered by the regulatory agencies.

Lever House

The Lever House, designed by Skidmore Owings and Merrill in 1952 is a New York City Landmark whose restoration plan is currently being evaluated. Skidmore Owings and Merrill's current firm proposes to replace all the spandrel glass and the rusted carbon steal supports of the curtain wall. This is seen as the only viable alternative because restoration of the materials is not possible and it is the overall aesthetic of the smooth and glazed wall which Is essential to maintain rather than the specific pieces of metal and glass.

What was recently new in New York is now becoming old, yet old methods of conservation don't apply any longer. New York preservationists are beginning to reevaluate the direction of modern preservation in order to continue to preserve the city's history. Our Northeast DOCOMOMO working group will host another series of seminar discussions in the fall and will be presenting a paper at the upcoming conference in Bratislava.

Nina Rappaport and Theo Prudon are members of the Northeast section of DOCOMOMO US.

Period photo of the Lever House (Skidmore, Owings and Merrill, 1952), famous for its curtain wall. For its restoration plan, the current firm has proposed to replace all the spandrel glass and the rusted carbon steal.
Photo: Leo de Jonge.

DoCo*MeMos*

• **Structure and Style** - A course on the conservation of 20th Century buildings, covering traditionalist as well as Modern Movement buildings is being held at York, England, on 31 October - 1 November 1996. 'Structure and Style: Conserving Mainstream Architecture of the Twentieth Century' is being organized by the Institute of Advanced Architectural Studies, University of York. It will discuss the challenge of evaluating and conserving the general building stock of the 20th Century. Papers will emphasize the pluralist nature of design over the last century. The second day will focus on the nature of 20th Century buildings - their design and the way that they were put together. Particular attention will be given to the conservation of challenges posed by structures where a steel or concrete frame is clad in stone, ceramic or glass. The course will be followed by a weekend tour of 20th Century buildings in Yorkshire. For more information contact Terri Tooms, the Events Office, IoAAS, the King's Manor, University of York, York YO1 2EP, tel. +44-1904-433982, fax +44-1904-433949.

• **Modern bridges** - Although mostly not included in architectural historiography, bridges are as well as churches and museums a reflection of society. Even more explicit than most buildings can, they also express technological progress. Picard Editeurs has published a major volume on this subject, in French. Starting with reinforced concrete, the book deals with steel, stone and timber structures, to end with prestressed concrete. 'Les Ponts Modernes, 20e Siècle' by Bernard Marrey, 280 pp., 295 ill., ISBN 2-7084-0484-9.

• **Bare concrete** - Following the successful Curtain Wall Seminar, the Eindhoven University of Technology is yet preparing another one on concrete repair. This international seminar is intended to concentrate on repair and maintenance of fair faced architectural concrete, for which technologies are still in their infancy. Architects and researchers with experience on this subject are kindly requested to contact the DOCOMOMO International Secretariat in Eindhoven.

• **The Spirit of Wood** - The Museum of Finnish Architecture, Helsinki, presents an exhibition on the use of wood in Finnish architecture, from 29 May until 13 October 1996. 'The Spirit of Wood' shows examples of traditional and historical buildings, modern structures and future visions with a main emphasis on contemporary architecture. A richly illustrated book serving as documentation of the exhibition and as an inspiring reference book is published in connection with the exhibition.
Museum of Finnish Architecture, Kasarmikatu 24, 00130 Helsinki, Finland, open Tuesday-Sunday from 10.00-16.00, on Wednesday 10.00-19.00.

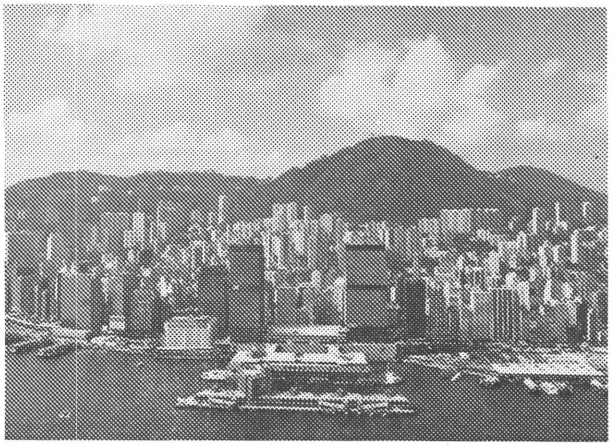
Reports

Selected information from the participating countries, received **before November 1, 1996**, will be published in the next Journal, December 1996.

Germany: preparing for Sliac
In mid-April, DOCOMOMO Germany had its spring session in Magdeburg, a city near Dessau that is well known for the MoMo social housing estates by Taut. Seventeen members and specialists concerned with the various fields of interest within DOCOMOMO were present.
Of course, attention was given to the set of documents received from Eindhoven, that will be discussed at the Council Meeting in Sliac. The German group appointed representatives to attend the various sessions and discussed the proposed amendments to the DOCOMOMO Constitution.
The German Working party is making great efforts to comply with the request by the ISC/R to produce a significant contribution for the International Selection of MoMo heritage. The activities of the ISC/T were another topic concerning the international projects of DOCOMOMO in which Germany is actively participating.
On a domestic level, the discussions concentrated on how to achieve a wider recognition of DOCOMOMO, its aims and activities, within Germany itself. It will be necessary to develop a more effective strategy as regards publicity, for instance in the professional press. Also, it will be inevitable to approach officials in charge of architectural conservation more comprehensively, possibly through the annual conferences of the *Landes* Departments for Conservation.
At the next national DOCOMOMO meeting in the fall in Leipzig, the issue of publicity will be focused on in more detail. The meeting will coincide with the annual ICOMOS conference in the same city, which will offer a great opportunity to make DOCOMOMO better known in Germany.

(Report by chairman Winfried Brenne, vice-chairman Hartwig Schmidt and secretary Ulrich Borgert; text translated from the German by the editor)

Ontario: planetarium at risk
The Zeiss planetarium projector, a technological invention from early this century, enabled the display of stars, planets, and constellations on the ceiling of a hemispherical shell for public entertainment and education. The planetarium building, while clearly a 20th Century type, shares physical characteristics with domed temples, basilicas, and chapels of previous centuries which had represented the heavens according to very different cultural values. In the case of the planetarium, the heavens are portrayed as though



Aerial view of Hong Kong island, subject of an exhibition in Scotland and maybe home of a future DOCOMOMO Working party.
Photo: Hong Kong Government.

solely understood through the laws of modern science. Technological advances in the field of astronomy had increased the knowledge of the objects in outer space and their physical relationships. The planetarium offered people a simulated experience of the night sky and travel through space. As J.B. Mays described, 'When the great heads of the Zeiss swung silently at the star theatre's centre, its pods, steel twigs and gleaming apertures glowing and twinkling, one was moved by the spectacle of the machine; but even more by the heavenly spectacle it portrayed....'
It was the public's fascination with space exploration combined with the mystical experience of the planetarium which resulted in an international proliferation of the building type through the mid 1900s. The more renowned North American examples include Frank Lloyd Wright's Gordon Strong Planetarium in Maryland and the Adler Planetarium in Chicago. The recent closure of Toronto's 1968 McLaughlin Planetarium (Allward & Gouinlock Architects) has raised concern for the future of this building and similar ones. One of six planetaria built in Canada in the 1960s, it opened its doors to an enthusiastic public the year prior to astronaut Neil Armstrong's historic walk on the moon. While more modest than its expressive counterpart in Calgary, Alberta, the Toronto planetarium entertained over three hundred thousand visitors annually.
By the mid-1970s the directors offered an alternative programme of laser shows accompanied by rock music. These shows have since declined in popularity. Citing the public's disillusionment with space exploration following the 1986 Challenger shuttle disaster, and the increased competition for people's entertainment money, the director of the Royal Ontario Museum chose the planetarium as the focus for the most recent round of government funding cuts. Museum officials have estimated they require $10 million (Canadian) to improve the technology to a level which would attract a jaded public. It is speculated that demolition is the most likely fate of the twenty-seven year old planetarium. As part of a campaign to prevent the demolition of this Toronto landmark and other planetaria at risk, DOCOMOMO Ontario is seeking information on the conservation status of these buildings in other cities, as well as successful examples of preservation strategy, rehabilitation, or adaptive re-use.

(Report by James Ashby, founding member of DOCOMOMO Ontario)

Scotland: publication of fiches
During the past year, our activities have been mainly focused, as before, on research, publication and education - above all in connection with our proposals for the DOCOMOMO International Selection. Largely following the example of the booklet produced by the Slovak DOCOMOMO group in 1994, David Whitham is now compiling an illustrated brochure containing our ten International Selection fiches, plus an additional five sites of special interest, varying widely in character and in date (from 1907 to 1977). It is hoped to have copies of the booklet available in time for the Bratislava conference later this year.
We have pursued a range of other activities of an educational or publicity-orientated character. Most notably, our involvement in the long-running proposal to mount an exhibition in Scotland on the architecture of Hong Kong has now began to bear substantial fruit. Following the decision of the Hong Kong Government to grant large-scale sponsorship, a major exhibition (to be opened by Governor Chris Patten on 25 October) will now definitely take place this year at the Edinburgh City Art Centre. The Hong Kong organizers have enthusiastically taken up DOCOMOMO Scotland's proposal that the exhibition should focus on the massive state housing and social infrastructure programmes of the colony. We felt that this exhibition might provide a stimulus to the formation of a Hong Kong group of DOCOMOMO; this idea has been taken up by Mr. Cheung Wah Nan, President of the Hong Kong Institute of Architects, and is currently being pursued.

(Report by Miles Glendinning, member of DOCOMOMO Scotland)

Specialist Committees

INTERNATIONAL SPECIALIST COMMITTEES (ISC'S)
Please note that all documents concerning one of the International Specialist Committees should be directed to the corresponding address listed below, and not to the DOCOMOMO International Secretariat (with the exception of the ISC/Technology).

International Specialist Committee on Registers
Marieke Kuipers, secretary
c/o Rijksdienst voor de Monumentenzorg
P.O. Box 1001
3700 BA Zeist
The Netherlands
tel. 31-30-6983357
fax 31-30-6916189

Members: France Vanlaethem (chair, Québec), Maristella Casciato (Italy), Xavier Costa (Spain), Jorge O. Gazaneo (Argentina), Dennis Sharp (United Kingdom), David Whitham (Scotland)

International Specialist Committee on Technology
Wessel de Jonge, chair
c/o DOCOMOMO International Secretariat
Eindhoven University of Technology
BPU Postvak 8, P.O. Box 513
5600 MB Eindhoven
The Netherlands
tel. 31-40-2472433
fax 31-40-2459741
e-mail docomomo@bwk.tue.nl

Members: François Goven (France), Thomas Jester (USA), Hans-Jürgen Kiehl (Norway), Susan Macdonald (Australia), Jos Tomlow (Germany), Jadwiga Urbanik (Poland), Anthony Walker (United Kingdom), Ola Wedebrunn (Denmark)

International Specialist Committee on Education
Mabel M. Scarone, chair
c/o University of Buenos Aires
Faculty of Architecture
Juramento 2161 - 3º "C"
Cassilla Correo 3881
1000 Buenos Aires
Argentina
tel. 54-1-7972514
fax 54-1-7962316

Members: Catherine Cooke (United Kingdom), Wenche Findal (Norway), Karin Kirsch (Germany)

International Specialist Committee on Urbanism
Marco Aurélio Gomes, chair*
c/o Mestrado em Arquitetura e Urbanismo - FAUFBA
Rua Caetano Moura, 121 - Federação
40210-350 Salvador - Bahia
Brazil
tel. 55-71-2473803
fax 55-71-2473511
e-mail docomobr@ufba.br

* substitute for Anna Beatriz Ayroza Galvão, until February 1997

International Specialist Committee on Landscape & Gardens
Franco Panzini, chair
via Monte Nevoso 20
00141 Roma
Italy
tel. 39-6-86800228
fax 39-6-86800228

Working parties

ARGENTINA
Argentine DOCOMOMO Working party
Prof.Arch. Mabel M. Scarone, coordinator
University of Buenos Aires
Faculty of Architecture
Juramento 2161 - 3° "C"
P.O. Box Cassilla Correo 3881
1000 Buenos Aires
tel. 54-1-797 2514 / 782 3654
fax 54-1-796 2316

BELGIUM
Belgium DOCOMOMO Working party
Luc Verpoest, coordinator
Catholic University of Leuven
Department A.S.R.O.
Kasteel van Arenberg
3001 Leuven (Heverlee)
tel. 32-16-321358
fax 32-16-321984

BRAZIL
Brazilian DOCOMOMO Working party
Angela West Pedrão, coordinator*
Mestrado em Arquitetura e Urbanismo - FAUFBA
Rua Caetano Moura, 121 - Federação
40210-350 Salvador - Bahia
tel. 55-71-2473803
fax 55-71-2473511
e-mail docomobr@ufba.br

* substitute for Anna Beatriz Ayroza Galvão, until February 1997

BULGARIA
Bulgarian DOCOMOMO Working party
Dr.Arch. Peter Yokimov, coordinator
Dr.Arch. Ljubinka Stoilova, coordinator
c. "Iztok", "Latinka" str., bl. 77/3, et. 3, ap. 46
1113 Sofia
tel. 359-2-208632
fax 359-2-430156

Penyo Stolarov, chairman

CANADA

DOCOMOMO Ontario
Ian Panabaker, coordinator
53, Fraser Avenue, Box 17
Toronto, Ontario M6K 1Y7
tel. 1-416-538-4636
fax 1-416-538-4257

periodical:
DOCOMOMO Ontario News

DOCOMOMO Québec
Michèle Picard, secretary
6, rue Glencoe
Outremont, Québec H3T 1P9
tel. 1-514-737-7291
fax 1-514-737-7291

periodical:
DOCOMOMO Québec Bulletin

France Vanlaethem, coordinator
Alain Laforest, treasurer

CROATIA
Croatian DOCOMOMO Working group
Aleksander Laslo, coordinator
c/o 'Plan' dd
Bogoviceva 1/II
41000 Zagreb
tel. 385-1-423777
fax 385-1-421321

CZECH REPUBLIC
Czech DOCOMOMO Group
Dr. Jan Sedlák, secretary
Brno University of Technology
Faculty of Architecture
Porící 5
600 00 Brno
tel. 42-5-332948
fax 42-5-42142125

Vladimír Slapeta, president

DENMARK
Danish DOCOMOMO Working party
The Royal Academy of Art
School of Architecture
Ola Wedebrunn, vice chairman
Peder Shramsgade 1
1054 København K
tel. 45-33-126860
fax 45-33-129043

Jacob Blegvad, chairman

ESTONIA
Estonian DOCOMOMO Working party
Mart Kalm, coordinator
Ravi 19-13
Tallinn EE 0001
tel. 372-2-441203
fax 372-2-441203

FINLAND
Finnish DOCOMOMO Working party
Timo Tuomi, coordinator
Museum of Finnish Architecture
Kasarmikatu 24
00130 Helsinki
tel. 358-0-661918
fax. 358-0-662573

FRANCE
DOCOMOMO French Section
Emanuelle Gallo, secretary
Sorbonne Institut d'Art
3, rue Michelet
75006 Paris
tel. 33-1-43 255 099 poste 163
fax 33-1-44 070 179

Gérard Monnier, chairman
Emanuelle Gallo, secretary
Jacques Repiquet, treasurer

GERMANY
German DOCOMOMO Working party
Ulrich Borgert, secretary
Architektenbüro Brenne
Rheinstraße 45
12161 Berlin
tel. 49-30-8590790
fax 49-30-8594063

Winfried Brenne, chairman
Dr. Bertholdt Burkhardt, vice-chairman
Dr. Hartwig Schmidt, vice-chairman

GREECE
Greek DOCOMOMO Working party
Panayotis Tournikiotis, coordinator
Hellenic Institute of Architecture
P.O. Box 3545
102 10 Athens
tel. 30-1-7213916
fax 30-1-7213916

HUNGARY
Hungarian DOCOMOMO Working party
Tamás Pintér, coordinator
Radnoti M.u. 11
1137 Budapest
tel. 36-1-1175 985 / 1118244
fax 36-1-1184 699

IBERIA
Iberian DOCOMOMO Working party
General Secretariat, Fundació Mies van der Rohe
Lluís Hortet i Previ, director
Provença 318 - 3r. 2ªB
08037 Barcelona, Spain
tel. 34-3-215 1011
fax 34-3-488 3685

José Manuel Fernandes, president
Andoni Acedo Tellería, member of the board
Celestin García Braña, member of the board
Fransisco González Reyes, member of the board
Carlos Hernandez Pezzi, member of the board
Alberto Humanes, member of the board
Francesc Labastida Azemar, member of the board

IRELAND
Irish DOCOMOMO Working party
Shane O'Toole, coordinator
8 Merrion Square
Dublin 2
tel. 353-1-6761703
fax. 353-1-6610948

ISRAEL
Israeli DOCOMOMO Working party
Arie Sivan, coordinator
Bezalel Academy of Arts and Design
P.O. Box 24046
91240 Jerusalem
tel. 972-2-288877
fax 972-2-823094

ITALY **periodical:**
Italian DOCOMOMO Working party DOCOMOMO
Maristella Casciato, secretary Italia Giornale
University of Rome 'Tor Vergata', Faculty of Engineering
via della Ricerca Scientifica, s.n.c.
00133 Roma
tel. 39-6-7259 4545 / 7259 4537
fax 39-6-7259 4586

Sergio Poretti, president
Maria Marherita Segarra Lagunes, treasurer
Cristiana Marcosano Dell'Erba, member of the board
Giorgio Muratore, member of the board
Giuseppe Strappa, member of the board
Luca Veresani, member of the board

LATVIA
Latvian DOCOMOMO Working group
Janis Krastins, coordinator
Riga University of Technology, Faculty of Architecture
Azenes iela 16
1048 Riga
tel. 371-013-615056 / 611969
fax 371-8820094

LITHUANIA
Lithuanian DOCOMOMO Group
Morta Bauziene, coordinator
Lithuanian Museum of Architecture
Mykolas Street 9
2001 Vilnius
tel. 370-2-610456
fax 370-2-222191

THE NETHERLANDS
Netherlands DOCOMOMO Working party
Rob Docter, secretary
P.O. Box 25000
2700 LZ Zoetermeer
tel. 31-79-323 4462
fax. 31-79-323 4959

Prof.Ir. Hubert-Jan Henket, chairman

periodical:
DOCOMOMO
Nederland
Nieuwsbrief

NORWAY
DOCOMOMO Norway
Astrid Van Veen, coordinator
Norwegian Museum of Architecture
Kongens Gate 4
0153 Oslo
tel. 47-2-2424080
fax 47-2-2424106

POLAND
Polish National DOCOMOMO Section
Dr.Arch. Krystyna Styrna-Bartkowicz, secretary
Dr.Arch. Maria Zychowska, secretary
Kraków University of Technology
Institute for History of Architecture and Conservation
ul. Kanonicza 1
31-002 Kraków
tel. 48-12-218722 / 218744 / 218766
fax 48-12-335453

Prof.Dr.Habil. Andrzej K. Olszewski, president
Prof.Dr.Habil.Arch. Andrzej Kadluczka, vice president
Dr.Arch. Andrzej Bialkiewicz, treasurer

PORTUGAL see: IBERIA

ROMANIA
Romanian DOCOMOMO Working party
Arch. Christian Bracacescu, secretary
Direction of Historical Monuments, Ensembles and Sites
P.O. Box 53
70528 Bucuresti
tel. 40-1-155420

Prof.Dr.Arch. Peter Derer, chairman
Arch. Christian Bracacescu, secretary

RUSSIA
Russian DOCOMOMO Working party
Vladimir Rezvin, chairman
A.V. Shuchev State Research
Museum of Architecture
5 Vozdvizhenka Street
121019 Moscow
tel. 7-095-2912109
fax 7-095-2912109

SCOTLAND
DOCOMOMO Scottish National Group
Ranald MacInnes, covener
39 Partickhill Road
Glasgow G11 7BY
tel. 44-141-242-5520 / 337-1503
fax 44-141-242-5404

periodical:
DOCOMOMO
Scottish
National Group
Report

SLOVAKIA
Slovak DOCOMOMO Group
Elena Szolgayova, secretary
Slovak Architects Society SAS
Panská 15
811 01 Bratislava
tel. 42-7-5237365
fax 42-7-5335744

Klára Kubicková, chairwoman

SLOVENIA
Slovenian DOCOMOMO Working party
Stane Bernik, coordinator
Uprava za Kulturno Dediscino
Plecnikov trg. 2
61000 Ljubljana
tel. 386-61-221596
fax 386-61-213120

SPAIN see: IBERIA

SWEDEN
Swedish DOCOMOMO Working party
Eva Rudberg, coordinator
Arkitekturmuseet
Skeppsholmen
11149 Stockholm
tel. 46-8-4630535
fax 46-8-6114761

SWITZERLAND
Swiss DOCOMOMO Working party
Ruggero Tropeano, coordinator
ETH Zürich, Abteilung für Architektur, ETH Hönggerberg
8093 Zürich
tel. 41-1-6332873
fax 41-1-6331157

UNITED KINGDOM
DOCOMOMO UK
Christopher Dean, coordinator
The Building Centre
26 Store Street
London WC1E 7BT
tel. 44-171-6370276
fax 44-171-5809641

periodical:
DOCOMOMO
UK Newsletter

Sherban Cantacuzino, chairman
Susan Macdonald, honorary secretary
Allen Cunningham, honorary treasurer
James Dunnett, honorary editor

UNITED STATES OF AMERICA
DOCOMOMO US
Jeffrey M. Chusid, coordinator
University of Southern California
School of Architecture, The Freeman House
1962 Glencoe Way
Los Angeles, California 90068-3113
tel. 1-213-851 0671 / 740 2723 / 850 6278
fax 1-213-874 7392
e-mail docomomo@usc.edu

periodical:
DOCOMOMO
US Bulletin

DOCOMOMO Foundation
Hubert-Jan Henket, chairman
Wessel de Jonge, secretary
Michael Drabbe, honorary treasurer

DOCOMOMO International
c/o Eindhoven University of Technology
BPU Postvak 8
P.O. Box 513
5600 MB Eindhoven
The Netherlands
tel. 31-40-2472433
fax 31-40-2459741
e-mail docomomo@bwk.tue.nl

Executive Committee:
Hubert-Jan Henket, chairman
Wessel de Jonge, secretary
Klára Kubicková, member
Maristella Casciato, member

An image of modernity
An American history of the curtain wall

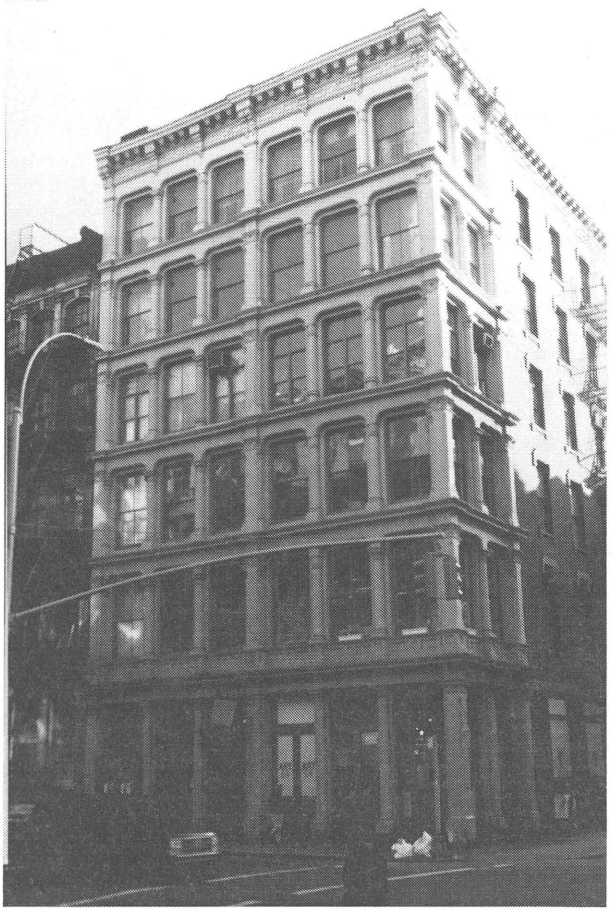
As defined in the first half of this century, a curtain wall is an enclosing wall built and supported between columns and piers, and on girders or other support, and sustaining no weight other than its own. The curtain wall serves only transfer lateral loads to the frame, protect the building from fire and the elements, and as an expression of architecture. The curtain wall dichotomy can be traced back to numerous nineteenth and early twentieth antecedents, including glass exhibition pavilions, cast-iron fronts, and masonry infilled metal frame structures.

by Stephen J. Kelley

The development of the curtain wall was primarily governed by three factors. Its technology was dependent upon the introduction of the metal skeleton frame and the development of adequate fireproofing systems. Economy dictated that the amount and weights of materials used be minimized, that fabrication occur in the factory rather than the site, and that construction become standardized. Aesthetics called for ever greater expanses of glass, and reflected the technological and economic developments.
In the United States curtain wall development became intertwined with that of the skyscraper. Skyscrapers would not have been technically feasible without the lightweight curtain wall. And it was through the skyscraper that the curtain wall achieved its greatest realization.

Antecedents of the curtain wall
London's Great Exhibition building of 1851, the Crystal Palace, is identified by Pevsner as the 'touchstone' of those technical achievements that point forward to our own era. The Crystal Palace had precedents in smaller, earlier structures, and set a precedent for later 19th Century exhibition buildings. It was an example on a very large scale of the aesthetic of a transparent skin encasing a wholly-visible iron frame. It was an early illustration of the use of mass-production, and was designed in standard parts - sections of cast iron and glass based on a modular unit.[1] Only by means of prefabrication and the use of construction techniques using dry materials (glass and metal) rather than wet materials (masonry) could a building of such a size be erected in the short time

Curtain walls in the US
Left: The Boley Building (Louis Curtis, 1909) in Kansas City.
Page 34: An example of cast-iron architecture in New York, mid-19th Century.
Page 35: The Reliance Building (Daniel Burnham, 1895) in Chicago.
Page 36: The McGraw-Hill Building (Hood & Fouihoux, 1932).
Page 37: The 860-880 Lake Shore Drive Buildings (Ludwig Mies van der Rohe, 1949-51) in Chicago.
All photos by Wiss, Janney, Elstner Associates, Inc.



of four months.[2] The Crystal Palace also exhibited the future trends in construction in which operations performed on site would be transferred to the factory.[3] The Crystal Palace and later glass-walled exhibition buildings of the nineteenth century were never built to last, and the glass curtain wall aesthetic that was employed did not make its way into mainstream architecture until the middle of the 20th Century.

By the mid-19th Century, cast-iron architecture was in widespread use in the urban centers of the United States. Since slender iron columns could support an entire facade, larger windows were made possible than in traditional masonry. Columns and lintels became a narrow grid for the support of windows that dominated the facade. The parts of an iron facade were fabricated and tested for fit at the foundry, and then the prefabricated parts were assembled at the site.[4] Though these facades were not technically curtain walls, the aesthetic of a glass facade had been realized. Perhaps the most significant development by a cast-iron front manufacturer was not the iron front but the McCullough Shot Tower (1855) erected in New York City. Constructed by James Bogardus, the tower was 175 feet high and was supported by an octagonal cast iron frame. The frame was visible from the exterior and was infilled with brick.[5]

The American skyscraper

The late 19th Century was an inventive era in American construction. The metallurgical industries, accelerated by the demands of the American Civil War, were able to supply structural metals in quantity for construction. Clay tile which could be used to fireproof the new metal skeletons was developed. Production of glass became industrialized, and larger sizes of glass were made possible.[6] Chicago architect William LeBaron Jenney was an innovator of the application of the iron frame and masonry curtain wall to the high office building. The Home Insurance Building (1884-1885), exhibited the essentials of the fully-developed skyscraper on its main facades with a masonry curtain wall.[7]

Spandrel beams supported the exterior walls at the fourth, sixth, ninth, and above the tenth levels. These loads were transferred to stone pier footings via the metal frame without load-bearing masonry walls.[8] Frederick Baumann, a noted Chicago structural engineer of the period, clearly described the potential of the masonry curtain wall for tall buildings.[9]

Jenney trained many of the architects who designed Chicago's early skyscrapers including Louis Sullivan, William Holabird, Martin Roche, and Daniel Burnham. The masonry curtain wall technique was fully developed within a few years by these architects, and was utilized in a functional aesthetic that came to be known as the Chicago School of Architecture. These architects were well aware of the contributions of Bogardus and Johnson.[10]

An archetype of the Chicago School can be found in the rigid frame Reliance Building (D.H. Burnham, 1895), the first skyscraper to use terra cotta exclusively as a cladding. The Reliance Building curtain wall is a clear aesthetic expression of the underlying structure and provides a maximum of natural lighting. The terra cotta units of the curtain wall are connected to a gridwork of cast-iron mullions, lintels, and sills which span between levels. Unlike the Home Insurance Building and other similar buildings, the Reliance Building did not rely upon the masonry curtain for lateral support.

In New York City the rigid steel frame and masonry curtain wall established themselves with the American Surety Building in New York City (Bruce Price, 1894), and, once adopted, skyscraper heights increased dramatically. The once impressive twenty-story buildings of Chicago were overshadowed by buildings 300, 600, and finally 792 feet with the Woolworth Building (Cass Gilbert, 1913). The Woolworth building utilized the latest developments in steel frame construction, but its masonry curtain wall, which incorporated gothic references, had not abandoned the hand-crafted ethic of masonry construction and ornament.

Early experiments

In Europe by the end of the century, architects were exploring the aesthetic possibilities of glass

and metal on building facades. Similar themes were explored in the United States. The Boley Building (Kansas City, 1909) by Louis Curtis, incorporated a transparent glass wall enclosing an entire structure. An early glass curtain wall appeared at the Hallidie Building (Willis Polk, 1918) in San Francisco. These experiments in the aesthetic possibilities of the glass curtain wall were largely ignored by American architects of the period.[11]

Europe

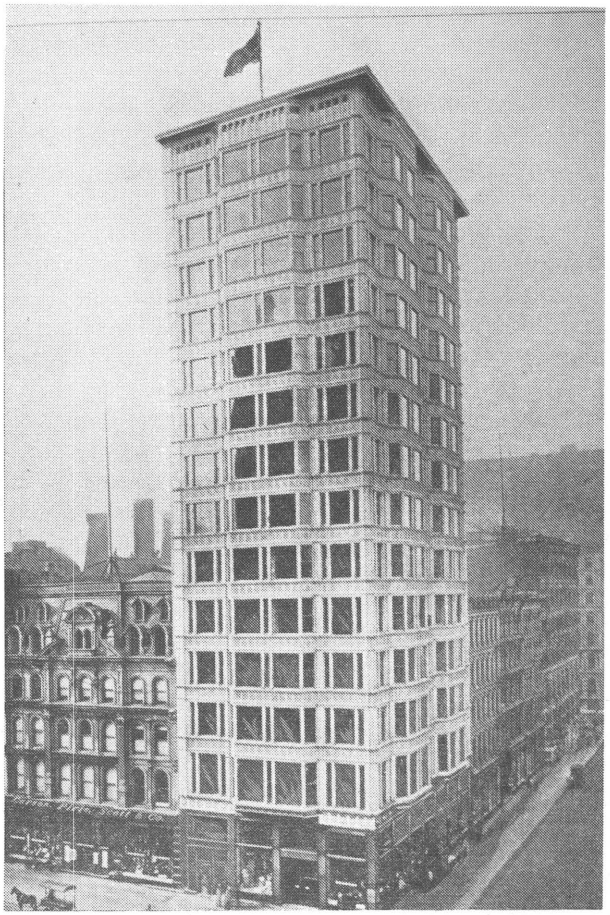
Prior to the First World War, German architects addressed the development of a modern aesthetic for the glass curtain wall. Upon leaving Behrens' office, Gropius and Meyer were commissioned to build the Faguswerke Factory (Alfeld-an-der-Leine, 1911), regarded as one of the founding monuments of European modernism. At this factory, each level is indicated by solid spandrel panels that are installed like the glass above and below them, a treatment echoed by post-World War II highrise curtain walls.[12]

The First World War administered the final blow to the arts and crafts movement in Europe, and the machine became the basis of the new architecture. Modern European architecture required that the labor of producing the parts be performed in the factory rather than by skilled craftsmen on site.[13] German intellectuals were in awe of the example of the American skyscraper, a strong symbol of the new world for which they endeavored.[14] Mies van der Rohe prepared a series of unrealized projects in which the most famous came to be known as the 'Glass Skyscraper,' a highrise enveloped totally in glass.[15] The theme of the curtain wall of the Faguswerke Factory, and Mies van der Rohe's glass skyscraper projects were furthered by the construction of the Bauhaus (Dessau, 1925) designed by Gropius.[16]

The 'International Style' in the United States

Contemporary with the European modernists, America had entered a second skyscraper era. The post World War I period brought a demand for increased speed in design and erection. Curtain wall construction, however, continued to utilize the masonry panel and metal frame techniques that had been developed by the turn-of-the-century.[17]

In 1922, Americans were not ready to accept the aesthetic of the very plain reticulated tower that was proposed by Gropius and Meyer for one of the most influential design contests of the 20th Century, the International Chicago Tribune Competition.[18] The Competition demonstrated the variety of the eclectic styles of the period and illustrated the split between American designers who borrowed from past styles, and some Europeans who were ready to embrace the machine aesthetic of the glass box. One of the architects of the Empire State Building (New York City, 1931) wrote of the masonry curtain wall:



'Tradition has clung to the heritage of thick masonry walls. We inherited masonry walls and seem unable to outgrow our inheritance. The idea that masonry is the only form of permanent construction was so deeply rooted that practically all building codes made masonry walls mandatory ... The covering of the observation tower ... accomplished by a combination of aluminum, chrome-steel and glass, [was] designed and fabricated into forms entirely free from masonry influences. The extension of similar treatment to embrace all of the inclosing walls of a tall building is quite conceivable and, if backed with insulating materials to reduce heat loss and properly finished on the interior, will result in a light wall, readily made weathertight, easy to fabricate and erect and requiring practically no maintenance.'[19]

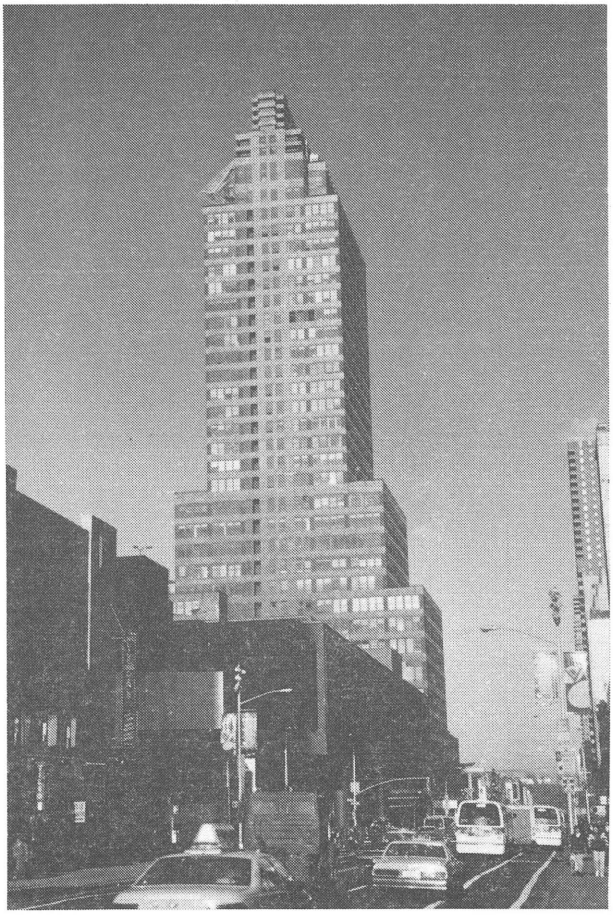
The European Modern Movement, which was known in the United States as the 'International Style,' was formally introduced to American architects in 1932.[20] The style dovetailed with demands of economy, efficiency, and the elimination of decorative features on the facade.[21] This trend was illustrated at the new headquarters for the New York Daily News (Hood and Howells, 1930), the McGraw-Hill building (Hood and Fouilhoux, 1932), and the Philadelphia Savings Fund Society building (Howe and Lescase, 1931). The effects of the Great Depression and the Second World War brought a halt to building in America in the late 1930s and early 1940s.

The glass and metal curtain wall

New technologies resulting from World War II had a great influence on the acceptance of the metal and glass curtain wall. These technologies were achieved through improvements in materials (of which aluminum was the principal metal), innovations in glazing, glazing treatments, sealants, and insulating materials. Extruded metal components were suitable for standardization and could be prefabricated for delivery to the site. This was important because labor costs had become a significant part of construction costs. The glass and metal curtain wall further decreased building weight[22] and construction cost, and increased usable floor area. Given the abundant postwar supply, aluminum was also reasonably priced. Glass curtain wall installation was less limited by cold temperatures which prohibited erection of 'wet' walls of brick and mortar. Out of this economic environment, the curtain wall had finally become almost entirely machine-made.[23]

One of the first postwar buildings to be constructed with a glass curtain wall was the Equitable building (Pietro Belluschi, 1948) in Portland, Oregon. Belluschi was able to take advantage of leftover aluminum stockpiled for World War II by smelters and to utilize assembly techniques derived from West Coast airplane plants.[24]

The Equitable Building was constructed with cladding panels made from rolled sheets of aluminum, and glazing frames of extruded shapes.[25]



The 860-880 Lake Shore Drive buildings in Chicago (Mies van der Rohe, 1949-51) were among the first residential buildings in the United States to be sheathed entirely in glass, and were the realization of Mies' 1920 proposal for a glass skyscraper. The steel, aluminum, and glass skin was assembled on the buildings' roofs in two story high units, and then lowered into place on the facade.[26] During the 1950s, glass-walled buildings following this distinctive aesthetic began to appear in many American downtowns.

At the Lever House (Skidmore, Owings & Merrill, 1952), the curtain wall has an interior frame of mild steel clad with stainless steel. Its simple appearance 'belies its complex internal construction which was cobbled together from off the shelf parts.'[27] Similar curtain wall effects were soon made easier by catalogue components, and the curtain wall industry of the early 1950s became dominated by manufacturers and contractors who had experience with aluminum windows. At the United Nations Secretariat building (Harrison and Abramovitz, 1950), curtain walls were conceived as an assembly of aluminum windows held in place with a grid of reinforced mullions.[28]

As at the Lever House, the lower portion of the curtain wall at each level was backed up by a concrete masonry wall to provide the fire rating that code officials felt was not provided by the curtain wall.[29]

Technical guidance in the use of metal and glass curtain walls for 1950s designers was limited.[30] The ideal curtain wall was defined as being between two and five inches thick, self-insulating, able to withstand high winds, weatherproof on the outer surface, vapor-proof on the inner surface, ventilated and drained for control of internal moisture, designed for expansion and contraction of the building, easily removable for repair, sound deadening, adaptable to all types of building frames, installed from the inside without scaffolding, easy to fabricate, ship, and handle, attractive, maintenance free, and moderate in cost. Furthermore, this system was intended to last 40 to 100 years.[31]

The approach to curtain wall design that quickly evolved was to make the joints as weathertight as possible, then provide positive means for conducting any water leakage out of the wall.[32] The economic impact of large lites of clear glass were also becoming apparent. The orientation of buildings in consideration of path of the sun, and the reduction in the size of windows to reduce solar heat gain were being practised.[33]

An alternative response to the all glass curtain wall, the Alcoa Building (Harrison, 1952) in Pittsburgh, used story-high panels of aluminum penetrated by relatively small windows. The windows were set in aluminum frames with rubber gaskets. Aluminum panels were formed with a

pressed pattern to add rigidity, create relief, and produce scale.[34] This type of sheathing became quite popular during the mid-1960s. In the Alcoa Building perlite insulation was sprayed on aluminum lath to provide fireproofing instead of using masonry behind the wall panels.

Continued development

While the machine-made potential of the glass curtain wall was being exploited, alternate cladding systems could not initially compete with the economy of glass-and-metal systems. In the face of competition, the adaptation of precast concrete, masonry, and thin stone veneers to the new curtain wall technology was comparatively slow to develop. Acceptance of these cladding systems did not come until the 1960s.

The first extensive use precast concrete for cladding was at LeHavre after the War, where panels were cast on site with standardized molds to be used on an extensive network of buildings.[35] The Hilton Hotel at Denver, Colorado, (I.M. Pei, 1958-1959), can be regarded as marking the beginnings of the use of precast concrete as a curtain wall cladding material in America.[36] Further examples of the development of precast concrete cladding include the Pan-American Building (1961, Walter Gropius and the Architects Collaborative) in New York, and the International Building in San Francisco (Anshen and Allen, 1959).

The development of masonry as a prefabricated cladding for curtain walls is traceable to Switzerland, France, and Denmark in the 1950s, and the United States in the early 1960s. The Brick Institute of America developed and patented a prefabricated brick masonry system which was used in construction of several building panels in the Chicago area.[37] Factory panelization techniques using latex mortar additives, however, fell into disfavor as evidenced by the reduction of companies that prefabricate masonry panels from 15 to only a few.[38]

Exceedingly thin veneers of stone such as marble and granite appeared on high rise buildings in the 1960s. Rational rather than empirical design principles for stone were established to reduce the weight and cost of stone.[39] Stone panels became thin enough to be erected within the metal grid employed by the metal curtain wall industry.[40] Examples include the Amoco building (Edward Durrell Stone, 1973) in Chicago, and Lincoln Center (Wallace K. Harrison, Philip Johnson and Max Abramovitz, 1966) in New York City.

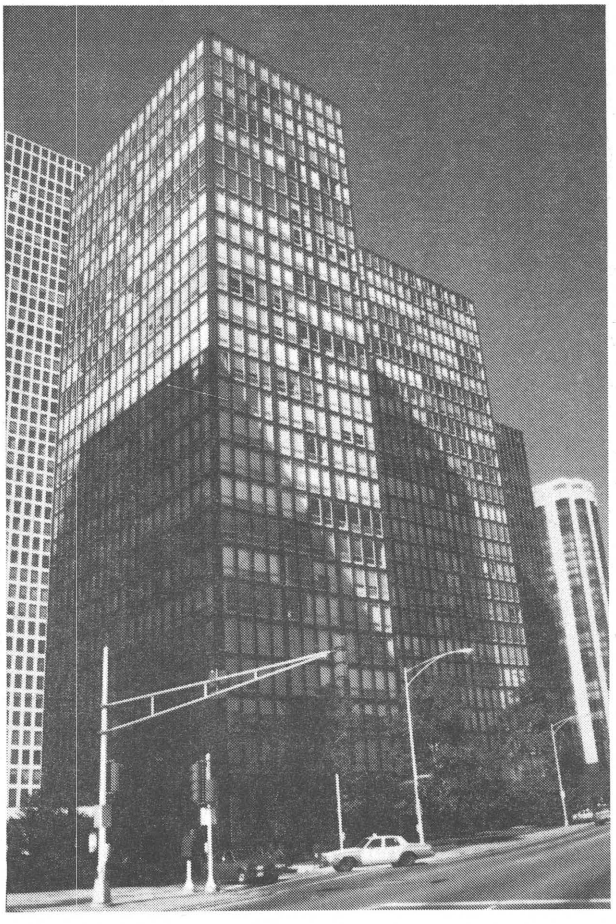
Future directions

New technologies have created the economy of using less material to cover more area, and of using new materials and installation techniques to achieve cost- effective construction. Structural silicone glazing is responsible for the large expanses of mullionless glass. Thin stone veneer applied to precast concrete panels and ceramics cast into glass fiber-reinforced concrete are just two examples of composite panels which take advantage of the permanence and appearance of the exterior material and the strength of the backup material. The rain screen curtain wall principle developed in Canada may help realize the abolition of sealants on building skins. Latex-modified stucco panels can now be fabricated for curtain walls and are being used for highrise buildings. The polyvinylchloride (PVC) window industry is also being utilized in curtain wall technology.

A distinction of our era is the relaxation of the guidelines established by the Modernists. The use of historical styles on highrise buildings are no longer looked upon by designers with disdain, and are used more for 'nostalgia, novelty, and innuendo.'[41] Though the International style is no longer the strict dogma of designers, the appearance and details of the curtain wall will remain forever influenced by the machine made aesthetic with which the early Modernists were captivated.

Stephen J. Kelley is an architect and structural engineer with Wiss, Janney, Elstner Associates, Inc. in Chicago.

This text was first presented at the Seminar on Curtain Wall Refurbishment, organized by DOCOMOMO on January 25, 1996.



Notes:

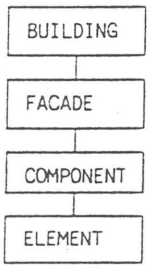
1. J.M. Richards, *An Introduction to Modern Architecture*, Baltimore 1962, pp. 66-67.
2. Nikolaus Pevsner, *Pioneers of Modern Design*, Hammondsworth- Middlesex-Baltimore 1974, p. 133.
3. Trevor I. Williams, *A History of Technology*, Oxford 1878, pp. 937-938.
4. Margot Gayle, *Cast-Iron Architecture in New York*, New York 1974.
5. Peter B. Wight, "Recent Fireproof Building in Chicago - Part II," *Inland Architect and News Record*, Volume 19, March 1892, p. 22.
6. Marcus Whiffen and Frederick Koeper, *American Architecture 1607-1976*, Cambridge 1981, p. 168.
7. New York, Chicago, and Minneapolis have all claimed to be the birthplace of the skyscraper. The question of whether the skyscraper originated in New York or Chicago remains a matter of controversy to this day. Comparative characteristics include the development of the curtain wall as well as the first use of the iron frame, appearance of the beam-column moment connection, height limits, and the theory of frame stiffness.
8. E.M. Upjohn, "Buffington and the Skyscraper," *The Art Bulletin*, Volume XVII, Nº 1, March 1935, p. 53.
9. The design is to erect on foundations a firm and rigid skeleton, or hull, of iron... The enclosure, whether of stone, terra cotta, or brick, or any combination of these materials, may be erected at the same time the iron structure is being put in place. But the latter might proceed much faster than the former; while the hull might be roofed within two months, the enclosure might not have proceeded further than the fourth story. Thus there need be no delay to a steady progress. Light, the great desideratum in all city buildings, is secured, even on the lowest -the most valuable- floors, whereas, otherwise, the necessarily broad piers would be a hindrance. The iron uprights are to be provided with a series of projecting brackets for the purpose of anchoring and supporting the parts forming the exterior enclosure. These supporting brackets will be so arranged as to permit an independent removal of any part of the exterior lining, which may have been damaged by fire or otherwise. "Improved Construction in Buildings," *Sanitary News*, 3, 15 March 1884, p. 123.
10. P.B. Wight, "Recent Fireproofing Building in Chicago," *The British Architect*, 6 May 1892, p. 347.
11. Burchard and Bush Brown, *The Architecture of America: a Social and Cultural History*, Boston 1966, p. 346.
12. Henry Russell Hitchcock, *Architecture: Nineteenth and Twentieth Centuries*, New York 1977, p. 491.
13. J.M. Richards, *An Introduction to Modern Architecture*, Baltimore 1962, p. 31.
14. Franz Schulze, *Mies van der Rohe, A Critical Biography*, Chicago 1985, p. 96.
15. Schulze, pp. 96-97, 100-101.
16. Hitchcock, p. 449.
17. Richards, p. 71-72.
18. Hitchcock, p. 483-484.
19. H.R. Dowswell, "Walls, Floors, and Partitions in the Tall Building," *Engineering News Record*, 19 February 1931, pp. 319, 321.
20. The exhibition on the International Style opened at the Museum of Modern Art on 10 February 1932, in the middle of the Great Depression. The style, with architecture stripped of ornament, was presented to a profession that was 85 % unemployed and created an immediate sensation. James Marston Fitch, *American Building and the Historical Forces that Shaped It*, Boston 1966, pp. 247-248.
21. Fitch, pp. 259-260.
22. Prewar masonry curtain walls could weigh up to 175 pounds per square foot. The new glass and metal curtain walls were designed to weigh about 5 to 15 pounds per square foot. Building structures and their foundations could be more economical since they would be designed to support a lesser load. "The Trend to Building with Metal Curtain Walls," *Engineering News Record*, 20 October 1955.
23. Paul Goldberger, *The Skyscraper*, New York 1989, pp. 103-105.
24. In 1943, during the planning stages for the Equitable Building, Belluschi stated "Our assumptions were affected by the peculiar circumstances found in our Northwest region - cheap power and a tremendous expanded production of light metal for war use, which beg utilization after the emergency." *Architectural Forum*, May 1943.
25. "Icons of Modernism or Machine-age Dinosaurs?," *Architectural Record*, June 1989, p. 145.
26. Peter Carter, *Mies van der Rohe at Work*, New York 1974, p. 46.
27. "Icons of Modernism or Machine-age Dinosaurs?" p. 142.
28. American Architectural Manufacturers Association, *Aluminum Curtain Walls*, Volume 5, p. 8.
29. "The Trend to Building with Metal Curtain Walls," *Engineering News Record*, 20 October 1955.
30. *Aluminum Curtain Walls*, p. 8.
31. "Metal Curtain Walls," *Proceedings of the Building Research Institute*, Washington 1955.
32. At first caulking compounds, ubiquitous in today's curtain wall construction, were not recommended for sealing joints. They held little promise because they "fail due to expansion/contraction and will require constant maintenance." John Hancock Callender, "The Design of Metal Curtain Walls," *Metal Curtain Walls: Proceedings*, pp. 79-97.
33. H. Wright, July 1955. A lesson had been learned at the United Nations Secretariat building where the two all glass facades had been oriented east and west and were subjected to the harsh rising and setting sun.
34. Burchard and Bush Brown, p. 473.
35. A.E.J. Morris, pp. 45, 66-71. Perret was the innovator of precast panels being used as cladding. At the apartment block at 51-55 rue Raynouard in Paris, he had hung precast concrete wall panels on a poured concrete frame in 1930. *Macmillan Encyclopedia of Architects*, Volume 3, New York 1982, p. 394.
36. Morris, p. 161.
37. Brick Institute of America, *Technote 40*, October-November 1973.
38. Mark A. Wallace, "Brick Panels, Ohio Style," *The Magazine of Masonry Construction*, June 1990, p. 267.
39. Ian R. Chin, John P. Stecich and Bernard Erlin, "Design of Thin Stone Veneers on Buildings," *Proceedings of the Third North American Masonry Conference*, June 1985.
40. Clar Monk, "The Rational Use of Masonry," *Proceedings of the Third North American Masonry Conference*, June 1985.
41. Ada Louise Huxtable, *The Tall Building Artistically Reconsidered: The Search for a Skyscraper Style*, New York 1982, p. 18.

A future for curtain walls
Typology, development, lifespan and refurbishment

The lifespan of a building is much longer than the lifespan of most organizations. Given the increasing speed of changed use of building space due to alterations in processes, social aspects and technological developments, the period after which a commercial building is likely to be renovated is shortening. We have to take into account minor refurbishment every 10 years, and extensive renovation work, either inside or outside, and often including an extension of the building every 25 years. The curtain wall, as an added non-loadbearing envelope of a building, is implicitly most suitable for alterations and renovations.

by Just Renckens

Considering refurbishment *of* curtain walls, we can also take into account that it is possible to renovate *with* curtain walls. This is often executed to reclad and improve stone or concrete clad facades. In such a case the original architecture is lost. It is also used for extensions of older stone or concrete clad buildings in order to create additional space, establishing an architectural contrast with the preserved architecture of the original.
Changing the facade not always means that the architecture of a building is changed without good reason. A number of projects of that period, and certainly some of the 1980s, with trendy curtain walls, hardly have any architectural value. In that case a new aesthetic appearance, complying with the present and near future trend, is justified. Or even better: is taking the opportunity to invest in high quality architecture to give the building an added value for the users and the built environment, thus ensuring an extended use of the building and consequently also of the curtain wall.



THE LIFETIME OF A CURTAIN WALL IS SUBORDINATE TO THE ECONOMIC LIFETIME OF A BUILDING, AS THE LIFETIMES OF FACADE-COMPONENTS AND ELEMENTS ARE SUBSEQUENTLY SUBORDINATE TO THE FACADE-LIFETIME

The lifespan of the curtain wall and its components is an important factor of return on investment, but also an aspect of environmental efficiency. It is obvious that the lifespan of the design is better secured if interim adjustments of facades are efficiently feasible. If the curtain wall can be adjusted to new demands and space requirements the facade is secured for a longer period of time. The type of curtain wall, the applied materials and the nature and method of construction are of influence to the suitability for future renovations and of the reuse and recycling value of the facade components, elements and materials at the end of their lifespan.

Lifespan
The most important lifespan of a commercial building, and consequently of its facade, is the economic one: the economic lifespan is decisive for the overall lifespan. If the market offers better quality office space for less rent the economic lifespan of a building concept has ended. In other words: the economic lifespan is the period in which the overall earning capacity of the investment is fulfilling the demands of the return on investments. Thus the economic lifespan can be influenced by economic factors, but also by:
- the aesthetic lifespan. This is the period in which a facade is still considered to fulfil the image requirements of the users.
- the functional and technical performances: respectively the comfort realized and influenced by a curtain wall and the technical condition of a curtain wall construction in relation to legitimate users requirements.
- the suitability of a facade for adjustments to future requirements.

Through renovation of the building, sometimes for another functional purpose, changing an office

building into housing for instance, a new life cycle can start, until finally ending at the demolition of the building.
The economic lifespan of a facade, starting with the delivery of the building, is the period in which the acceptance of a facade's image, the functional and technical performances, the energy efficiency and the maintenance costs are still in accordance with the requirements. A curtain wall's lifespan is subordinate to the lifespan of the building as a whole, as the lifespans of facade components and elements are subsequently subordinate to the lifespan of the facade.
Refurbishment of a curtain wall might be executed:
• to give the building a facelift in order to improve the image, the quality of the architecture;
• to adjust the facade to changed inside conditions: layout (rearrangement of space) or other use of space (change of function);
• to adjust the facade to new technical developments and regulations.
It is important to frequently adjust the facade performance to a state-of-the-art level, as a measure to support the relation between client and building. A flexible and easily adjustable curtain wall is implicitly offering a better opportunity to comply with the design lifespan of the facade. The relatively easy dismantling of curtain wall components and elements is a positive factor for refurbishment of a curtain wall, and serving its management over the full lifespan of this vital part of a building.

Curtain wall types
The curtain wall is a non loadbearing envelope of building space with vision glazing and spandrels, anchored to a skeleton type of building structure.
A cold cavity rainscreen clad semi curtain wall consists of an outside screen, fixed at cavity distance to a tight building structure insulated on the outside. The cavity serves as a barrier to secure watertightness of the facade construction by pressure equalization. The airtightness is fulfilled by the closed building structure and by the thermally insulated vision components, that close the openings in the facade.
A warm cavity facade is a second type of semi curtain wall enclosures: an insulated facade construction with vision and spandrel components is fixed at cavity distance on an airtight building structure with openings at the vision areas of the facade.
The pure curtain wall is most suitable for technical and functional refurbishment, as well as for aesthetic alterations. The rainscreen cladding facade is most suitable for aesthetic renovations, and suitable for functional and technical refurbishment within the limits of the closed building structure. The facade construction with a warm cavity is suitable for aesthetic, functional and technical refurbishment within the limits of the closed building structure.

Construction methods and life cycle
The construction method of a curtain wall can be of importance in relation to the easiness of refurbishment. We can divide the construction on site into two principles:
• Stick system. In this case the facade elements are assembled on site by individual fixing during erection and by consequently fitting in spandrel infills and glazing for the vision components.
• Component system. By increasing the industrialization of curtain wall prefabrication, construction on site is executed by fixing larger components or units with the spandrel and vision parts already placed in the workshop.
A curtain wall construction can be:
• a frame-system with infills of vision and spandrel components;
• a panel system with built-in vision sections, or with glazed sections between the panels.
In order to control the life cycle of a curtain wall we have to consider the difference in lifespans of its components and elements, including the lifespans of additions such as the surface treatment of aluminium profiles and sheets, mainly organic coating or anodizing. The part with the shorter lifespan has to be dismantled and replaced in a higher frequency. A further consideration is the reuse and recycling of elements, components and finally the curtain wall as a whole.
The technical lifespan increases from the outside to the inside. As a result, the aesthetic aspects are predominant. Due to the operation of the weather conditions upon the facade, it can be necessary to

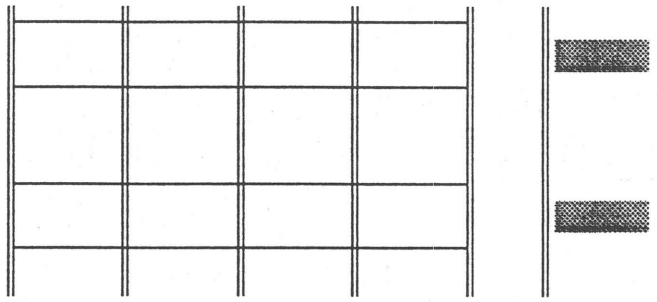
refurbishment	curtain wall	rainscreen wall cold cavity	thermal insulated wall: warm cavity
aesthetical	++	+++	++
functional	+++	++	+
technical	+++	++	+

replace parts or even the complete outside of the facade in order to keep the image of the building at a required aesthetic level.

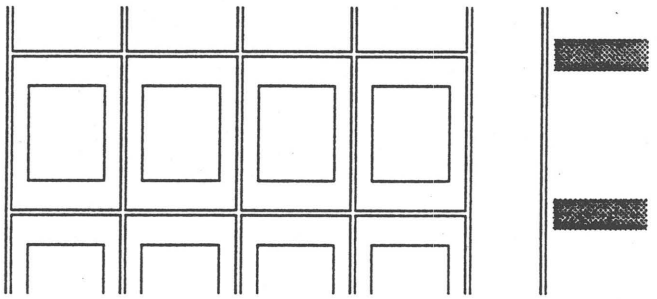
Early aluminium curtain walls
Starting in the 1950s the use of aluminium for curtain walls was increasing. Up to the middle of the 1970s the main concern was to realize weathertight and fire-safe enclosures. In the period 1975 up to 1990 the main attention was to improve the thermal performance of curtain walls and to take advantage of new sunreflective glazing for both vision and spandrel areas. As of 1990 a third generation curtain wall, the alu-glass-facade, is in development. The early curtain walls often have cultural value. At that time architects having the courage to combine new materials and innovative facade technology into advanced architecture have made a statement worth to preserve when refurbishments are necessary.
Renovating these older facades poses the following problems:
- new fully insulated facade constructions are heavier than the original curtain walls and subsequently for highrise buildings the total weight can be more than acceptable for the building's foundations;
- on the level of facade components the heavier construction can be too much for the existing anchoring to the building structure;
- the renovated facade has to comply with the existing applicable standards, which are more strict than the regulations at the time of construction.

Facility requirements
It appears increasingly possible to renovate curtain walls while respecting the original architecture. Yet, renovating and taking advantage of today's technological possibilities within a limited budget is easier if also the architecture of the building is adjusted to the new technology. The latter is not a setback if the original architecture is not worth to preserve, either by its concept, or due to required adjustment to the image of the buildings in the environment, or because of a change in function for the building.
We have to take into account as well that a change in facility requirements often means another proportioning of the facade is necessary. For instance: less vision glass; lower ceiling heights due to new airducts, or higher spandrel heights because of computer floors; more space per user; a change in lighting requirements because of working with computers etc. and consequently other or more advanced materials for elements and infills. In such cases the original architecture has to be adjusted.
Also because of the present building codes concerning energy efficiency, sound insulation, daylight and outlook, fire safety, health etc. it might be necessary to alter the existing architecture.

Real estate
The Netherlands minister of Housing, Planning and Environment (VROM) is not supporting an increased depreciation of real estate, as argued by the Dutch Institute of Real Estate Brokers.



framesystem with infills for spandrel and vision components



panelsystem with incorporated vision-components

According to the brokers an average office building is 'ripe' for demolition after 20 years of service, while the fiscal dictated depreciation period is 40 to 50 years, resulting in a low or negative return on investments.
But according to the minister we have to guard against short lifespans of commercial facilities, which can cause a decrease of architectural quality of commercial buildings and is against the principle of durable use of materials. She is of the opinion that developers, building owners, architects and contractors have to consider long lasting building concepts, soundly constructed for lifespans much longer than 20 years. In this connection, and given the increasing speed of changes in use due to alterations in processes, social aspects and technological developments, the curtain wall is suitable for durable building concepts. It can serve to preserve high quality architecture or to replace low quality architecture as part of a process of frequent refurbishment of facades to comply with new requirements, and in order to extend and secure the facade's lifespan.

Future developments
The demands concerning the performance of facade constructions are increasing. Up to now the curtain wall is typically an upgraded passive construction to separate the inside from the outside weather conditions. The inside climate is usually controlled by a mechanical or air conditioning installation.
The alu-glass-facade, the modern curtain wall, is re-actively anticipating, and, if intelligently controlled, even pro-active: a membrane taking advantage of outside weather conditions, offering natural ventilation, transferring sustainable energy (mainly sun energy), thus maintaining the inside climate (temperature, humidity, fresh-air etc.) on a comfortable level with the help of a mechanical installation.
Increasing the technology and developing a facade from a passive into an active building envelope means that the lifespan of the construction is shortening (compare it with computer technology: the more advanced and powerful computers are offered, the faster new concepts are presented, with new soft and hardware, consequently decreasing the lifespan of the hardware). In this connection the ability and easiness of adjusting curtain walls to new technical developments is an advantage. This ability is also important in case this new performances have to be realized within the existing architecture of the facade.

Conclusions
A curtain wall is typically fit for alterations to comply with changed functional or technical demands imposed on the envelope of a building. The architecture of the facade can be preserved or a similar appearance can be realized, but if the architecture is of a poor quality, also an architectural facelift can easily be realized.
Where real estate developers are arguing for short lifespans to be reflected in the fiscal legislation in order to secure a proper return on investment, the government wants long lasting new buildings, adjusted to the demand for high quality architecture and a durable use of building materials. As the curtain wall is subordinate to the lifespan of the building and the functional and technical developments of glass facade technology are accelerated, the adaptability of curtain walls is a valuable feature. The pure curtain wall in combination with a skeleton type structure is the most flexible and adjustable type of a facade, even when compared with rainscreen claddings and thermal wall cavity facades. As a group, the latter two are again far better suitable for alterations and refurbishment than conventional facades in stone, brick or concrete.

BUILDING FUNCTION	ARCHITECTURE valuable	average	poor
not changed	preserve	improve or renovate	alter
similar	preserve possibly with minor adjustm.	improve or renovate	alter
changed	preserve if possible, or change respectfully	alter	alter

Just Renckens is the founder of Renckens Consultancy for Facade Technology, and a staff member of the Delft University of Technology, the Netherlands.

The myth of permanence
Ageing stone claddings in the United Kingdom

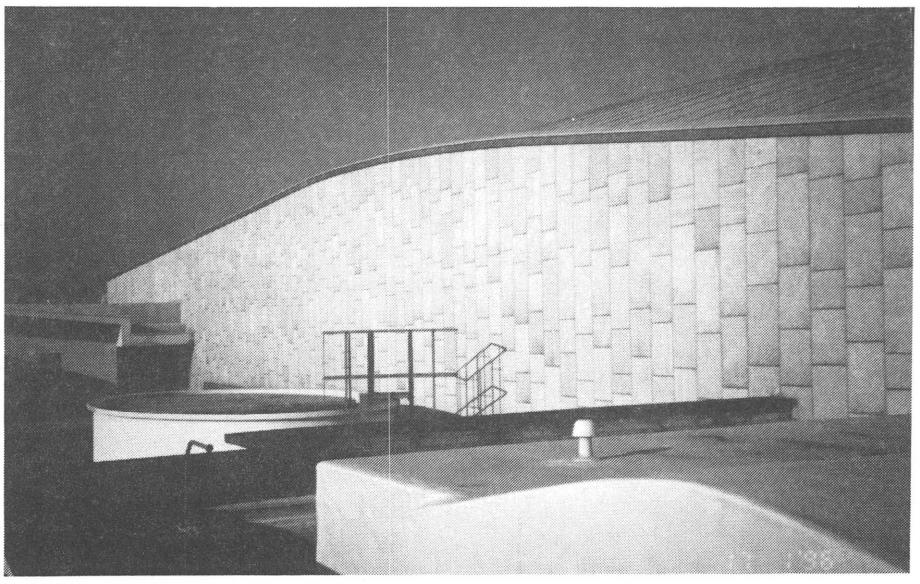
Stone clad curtain walls first started to appear in the UK in the 1930s, largely imported from the USA, where its use in highrise buildings was far more advanced. Not until after World War II, however, did it start to become popular in Britain and the European Continent, where its subsequent widespread use can be seen to have significantly influenced the direction and pace of postwar urban reconstruction. Forty years on, ageing as regards appearance, performance and functionality is increasingly being seen as a reason for recladding. If this postwar heritage is to survive, renovation of these claddings need to be looked at in a wider context, including restoration and preservation.

by John Redding

Stone clad curtain walling proved particularly appropriate for new multi-storey town centre buildings. Stone's perceived image of solidity, permanence and historical linkage, was apposite for the time and combined well with the more progressive and imaginative uses of concrete and glass. Forty years on, however, physical age and 'dated' appearance, poor performance, escalating cost of maintenance and limited functionality compared to modern curtain walls, are being seen, increasingly, as reasons for recladding.
With the approaching millennium, pressure for building renewal will undoubtedly grow. Removal and replacement of existing stone cladding is relatively straightforward and can often be accomplished with minimum disruption to the internal space. Building owners and developers, therefore, see it as an opportunity to upgrade the performance of the wall and at the same time, revamp the image of the building. The result is often a radical change to the original facade appearance and an irreversible change to the architectural balance of the area.

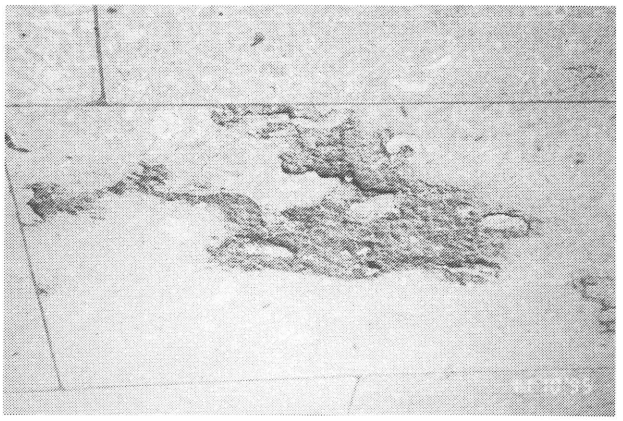
Wall construction
Stone has had a very long history of usage in wall construction for all types of buildings, providing protection and enclosure from the elements. Solid masonry walls successfully combined a structural and weathershield function. In the late 19th Century, largely as a result of the development of structural steel, the structural and architectural roles started to become separated. This is where the stone facade functions as a non-load bearing outer skin supported from ground level, and intermittently tied-back to the inner structural wall or building frame. With this type of self-supporting wall, the stone has to be a certain minimum thickness, typically 100-150 mm.
The desire to more fully utilise the load-bearing capabilities of structural steel, led subsequently to cladding, where the weight of the stone is fully supported by the building frame and the stone acts solely as a decorative facing and rainscreen.
At each stage in the evolutionary development of wall construction, the thickness of the stone has decreased, both in absolute terms and as

The Royal Festival in London (1955-60) is a landmark of the postwar period. The main walls were clad in Portland Stone, the roof level walls in Derbyshire Limestone.
Page 44: Spalling damage due to weathering to face-bedded Derbyshire Limestone. Note the original mortar joints.
Page 45: Forward displacement of stone on a Derbyshire Limestone facade. Note mortar has been routed out preparatory to stone being removed.
All photos by Ove Arup and Partners.



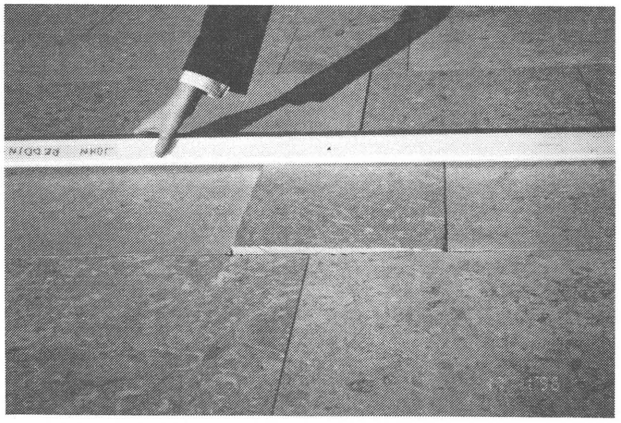
proportion of the total wall thickness.
In the case of modern high-rise buildings, cladding weight has become a major factor governing the thickness of the stone. Cladding on tall buildings typically uses stone in the thickness range 30-50 mm. While the physical thickness may have progressively diminished, stone's projected image has remained more or less constant. Belief, rightly or wrongly, in the permanence of stone, has often been a deciding factor in the choice of stone over other materials.
Changes in source and availability of stone have also run in parallel with changes in wall construction: from locally sourced stone for masonry walls; through regionally or nationally popular stone used in traditional ashlar and early thick cladding walls; to globally sourced stone for modern thin stone cladding. Source and availability have also influenced architectural style. For instance, during the 1950s and 1960s London saw a plethora of buildings clad in Portland Stone, largely because at the time few other materials were available. Today, stone has become what might be called a 'trendy' material. But just as fashions change so particular stones can become samey and out of date, such as granites used in the boom years of the late 1980s. An important factor that has influenced the changing role of stone, is its cost. Originally used because it was a cheap construction material, today the cost of cladding with exotic foreign stone can amount to 1/4 or even 1/3 of the total building cost.

Stone cladding
Although the stone facing is the single most visible element in any curtain wall cladding, the hidden part is of equal importance in terms of overall performance and life expectancy. Here, too, significant development changes have taken place. Early UK curtain wall construction using natural stone, essentially followed, what was by then, established American practice.
Throughout the early development years stone thicknesses of 50 mm or 100 mm were generally used, for harder and weaker stones, respectively. Gravity supports were provided at vertical intervals of 3 to 4 m up the building, and comprised either corbal plates or brackets, particularly for the thinner stone, or concrete boot lintels (nibs) in the case of thicker stone. Wire ties or metal cramps and dowels were used to provide fixity and lateral restraint.
Stone courses were built upwards, with wooden wedges or lead shims being used to support and space each course of stones and to enable hard setting mortar to be trowelled into the joints. Either an opening cavity was left behind the stone, with mortar dabs to provide restraint, or the cavity was filled with a mixture of mortar and stone dust to provide additional bonding to the backing wall.
Fixing was done by hand from scaffolding and was labour intensive, and often involved additional on-



site cutting, shaping and drilling of the stone to make it fit. Workmanship was, therefore, an important feature of stone cladding curtain wall construction at this time.
Initially copper, then various types of copper/zinc alloy (brass and bronze) fixings were extensively used, until certain alloys were being shown to be susceptible to stress corrosion cracking. Only after about 1965 did stainless steel start to become more widely used as a fixing material. Guidance on the use of stone was initially very rudimentary. However, this was partly compensated for by the fact that stone cladding contractors were generally familiar with the use and performance of local stones. The early stone cladding industry was also very much craft based, and as such empirical rules and rules-of-thumb were widely applied.

Conceptions and misconceptions
The image of stone as a strong and long lasting material is largely a myth. Stone is not a single material, but comes in many different varieties. A varied mineralogy, coupled with an often complex history of formation, results in a wide range of physical and chemical behaviour. Limestones, for instance, which are composed of calcium carbonate are essentially soluble, particularly when exposed to acid. Limestone in urban areas attest to the effects of etching by acid rain and acidic gases in the atmosphere caused by past open burning of coal fires, and present day vehicle emissions. Salts also can cause surface decay of porous sedimentary stones, such as limestones and sandstones.
Marbles, especially, can be dimensionally unstable in temperate climates and can undergo considerable warping and bowing when used in thin cladding form. It is perhaps an indication of the way in which we often forget, or choose to ignore, the undesirable qualities of stone that bowing of marble, well documented in the USA in the 1920s, still continues to cause a problem.
Many stones, to varying extents, will lose strength with time and exposure to the elements. Even granite may experience loss of strength due to repeated changes of temperature, moisture and frost exposure. To increase the visual interest of



granites, often a variety of textural finishes have been used, that can induce or open up existing micro-cracks (an intrinsic feature of most granites) and thus weaken the stone both immediately as well as in the longer term.
Many sedimentary stones have depositional bedding features which can become weathered out. As a precaution against surface spalling, sedimentary stones were cut normal to the bedding and installed with the bedding horizontal. For many years this has also been 'conventional wisdom' in the stone cladding industry. However, with certain stones it can result in penetrative cracks developing through the stone, which can seriously affect the structural integrity of the cladding. In short, there are a myriad of ways in which cladding stone can misbehave and it is precisely in early curtain walls that such stone-related defects are most apparent.

Structural defects
Common durability defects that tend to occur in older stone claddings are surface spalling, an increase of permeability or porosity or the stone becoming friable. Common defects in structural terms are cracking, bowing and displacement. All of these can have various causes, and defect detection generally forms an important part of any detailed condition survey of the cladding.[1]
Apart from close visual inspection, a range of *in situ* tests can be carried out on stone cladding, varying from dye penetration testing to listening to the 'ring' of the stone. It is generally necessary to remove some stones which show obvious signs of distress or which will give a representative picture of the construction and condition of the wall, as well as to establish the type and condition of the fixings and the condition of the backing wall. It can be very instructive to examine the rear face of such stones, since cracking or joint failure allowing moisture through to the rear of the stone, will generally be evident.
Removed stones can be tested for a range of parameters, to detect loss of strength and durability compared to when the stone was first installed and the implications for longer term future performance. Comparison obviously depends on suitable control samples being available, for instance from unused replacement stone, samples from the source quarry or from less exposed parts of the building.
The results of such testing may be statistically questionable, but can be useful as a means of confirming and quantifying visible deterioration.
Building maintenance records can also provide a very useful complement to any condition survey. By assessing the performance of the stone in earlier forms of wall construction, it is often possible to obtain a greater insight into its longer term performance. Care needs to be exercised, however, in the application of such retrospective assessment, because of changing atmospheric conditions, differing run-off and moisture retention characteristics of blockwork walls compared to plain curtain walls, as well as because of the differing ways in which stone has been used.
A variety of structural defects can be induced in older stone cladding by external factors. Because of the very rigid arrangement and limited use of movement joints, stones are susceptible to cracking due to, for instance, differential settlement. Internal movement of the building can also lead to cracking or bowing of stone. Unusual wind loads can induce cracking and forward displacement of stones.

Appearance defects
Typical appearance defects which can affect stone cladding are streaking, bleaching, changes of surface texture and dirt accumulation. Mostly, these develop through a combination of environmental exposure, location on the building and intrinsic features in the stone.
Dirt discolouration and streaking is a common feature of porous sedimentary stones, particularly lighter coloured limestones and for instance Portland Stone. Air-borne dirt, especially the fine carbon particles from vehicle exhausts, tends to lodge on surface irregularities and be adsorbed onto the surface as water droplets soak into the stone. Streaking generally occurs where run-off is channelled down the face of the stone from window sills and parapets. Self cleaning is also often seen on walls which are more frequently exposed to driving rain, which are generally more noticeably etched than elsewhere as well. With time, many limestones will tend to develop a rougher etched and more porous surface due to exposure, and this may contribute to dirt accumulation. Granites and other low absorbency stones with a polished or honed finish, are far less susceptible to such processes.
Some sedimental stones, in which the colour is due to secondary iron deposition in the matrix of the stone can become streaked and/or bleached due to mobility of the iron. Acid washing, during cleaning, can accelerate this. Equally, stones may become stained as a result of contact to rusting metal. Staining due to migration of oil from mastic

Reuters Building in Fleet Street, London. The typical 'streaking' effect seen in Portland Stone, is due to general dirt discolouration and localised washing, where water runs down face of stone.

joint fillers is a common defect that can affect all types of stone, including granites. Efflorescence of salts can occur due to their original presence in the stone or their secondary introduction i.e. in the water used for cutting the stone or though chemical reaction, or due to a backing wall that frequently gets wet.

Renovation options

Various options for renovation of a stone cladding curtain wall can be listed in order of increasing alteration to the original wall appearance and construction, as follows: thorough cleaning, replacement of individual stones, individual face fixing and re-fixing, sealing or re-sealing joints, complete replacement using existing or identical stone, upgrading using identical or similar stone, upgrading using different stone, and, finally, complete overcladding.

A decision to employ one or more of those options will be technically complex, added to which will be considerations of cost, commercial issues and planning constraints, especially if the building is tenant occupied. Provided that the stone, the fixings and the backing wall are all in reasonably good condition and are not progressively deteriorating, preservation may well be appropriate. A critical question will be the future lifespan of the wall and the required cleaning and maintenance frequency.

Replacement using identical stone is frequently a viable option, because the majority of stones used in early curtain walls are still available today. However, if it is essentially the stone that has failed, then it will be more appropriate to use a similar looking but more durable stone; likewise, if the original stone is no longer available or cannot be traced. Matching of replacement stone needs to be done with care, particularly if part of the original stonework is being retained, since many stones subtly change their appearance with time on a building. Equally, the source material may have changed as the quarry has developed.

Upgrading the wall by introducing insulation and a vapour barrier will inevitably require a different fixing system to be used. A change in wall thickness will as well involve remodelling of window sills, etc.

However, depending on the type of stone and method of fixing used, it may be possible to use thinner stone than was originally used, thereby retaining the original wall thickness. Hitherto, requirements in Britain made it necessary to use granite as a thin stone replacement to thicker claddings in other stone. A 1994 revision to the British Standard now permits other types of stone, such as sandstones and limestones to be used in thinner section, if this can be justified by testing. This revision may help to encourage the use of similar stone for replacement cladding, and therefore a more conscious effort to retain the character of the original facade.

Overcladding has generally been done with lighter weight materials because of the added weight problem. The difficulty of positioning long anchors through the existing cladding has meant that a adjustable clip-on or cassette systems of fixing have often been employed. These lend themselves to the use of thin stone such as granite, which has been an additional factor in the move away from traditional stone.

The future for lightweight overcladding using traditional stone may well lie in this stone veneer of 5 mm or less, bonded to synthetic honeycomb or metal-glass backing panels. However, the tendency will surely be to use these space-age type materials in architecturally forward looking ways rather than in architectural preservation.

John Redding is an engineering geologist working for Ove Arup and Partners, London. Text shortened.

1. The original text is more specific than this shortened edition, and gives detailed information on various types of distress and repair options. See 'Seminar proceedings', p. 4.

Slovakia's first curtain wall

City Savings Bank (Juraj Tvarozek, 1930)

In 1930 a branch of the City Savings Bank was built in Bratislava, after a project by the Slovak architect Juraj Tvarozek (1887-1966). Although never graduated from any architectural university, Tvarozek significantly contributed to the introduction of modernism in Slovak architecture. This bank was the country's first structure featuring a steel and glass curtain wall: an unprecedented construction in prewar Slovakia. Assessing the qualities of the building, period literature concluded that 'the future belongs to functionalism'. At the time, it was considered to be the most progressive construction in Bratislava and it has therefore been crucial for the Modern Movement in Slovakia. Even today, the building still gives a fresh and modern impression on its urban context.

by Matús Dulla, Henrieta H. Moravciková and Elena Stolicná

In the mid-1920s, Tvarozek tried to introduce a Slovak national style, based on traditional architectural elements and decorations. In Bratislava, we can still find several of Tvarozek's buildings with painted vaulted portals. Also the first project for the City Savings Bank was based on classic forms. Disposition and mass structures within the building were quite strictly limited by the client's requests and urban architectural requirements. The lot was quite narrow and the new volume was supposed to include a deep passage also. The architect segmented the facade by small windows, framed by mouldings. The ground floor was the only part of the building to have some large openings, yet still designed in a traditional monumental style. The front side was decorated with an impressive cornice. This concept was very similar to solutions presented by the architects F. Wimmer and A. Szonyi, who also entered for the bank's competition in 1928. Tvarozek, the winner of the competition, however implemented a more modern concept in 1930 and

The present state of the City Savings Bank in 1995.

radically changed the idea of the facade. His solution of a curtain wall had never been used in Slovakia before.

Engineers aesthetics

The front facade of the City Savings Bank is a typical example of an engineer's aesthetics, when a professional from the constructional discipline creates a composition with a harmonious effect. The building's exceptional merit is anchored not only in pure technical solutions of high quality, but just as well in being the country's earliest example of the curtain wall system. The sophisticated simplicity of the construction perfectly met the special requirements posed by the bank's board in terms of hygiene and efficiency. The demonstration of progress in the facade expresses the young financial company's commitment to invest in experiments.

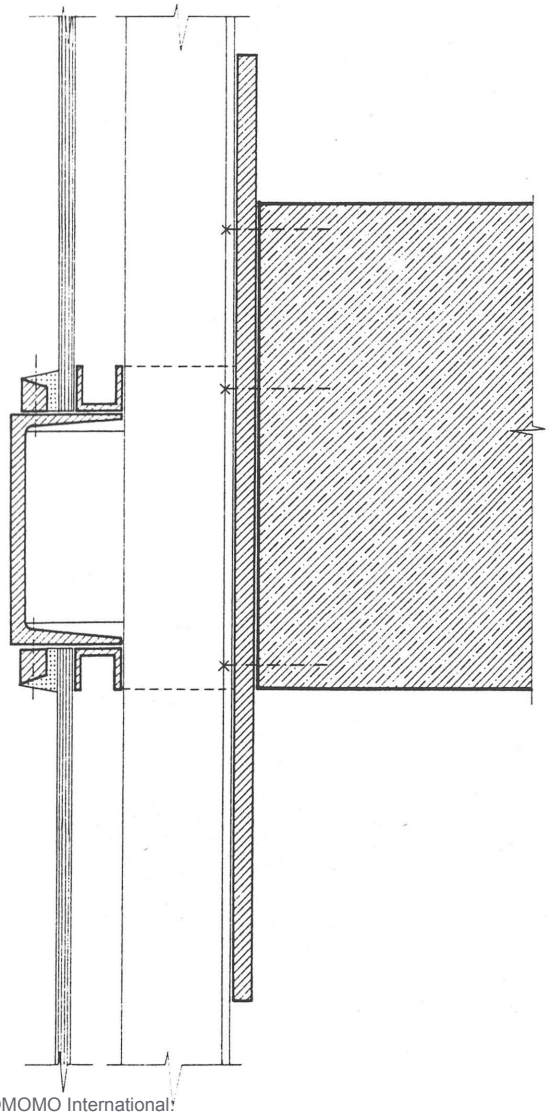
The loadbearing construction of the building consists of a plain reinforced concrete frame with rib-shaped floor slabs. The building's spatial firmness is secured by reinforcements and perimetral beams. Infills and partitions are constructed from Aristos hollow brick.

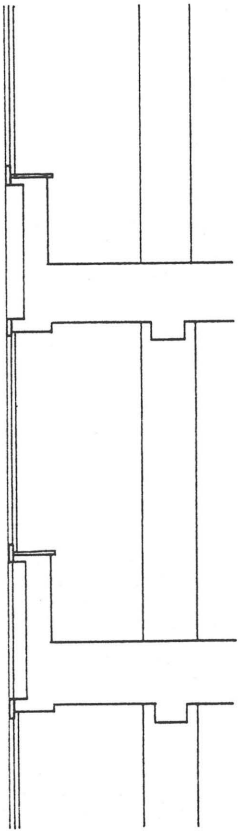
At the front side, a series of 1,15 m consoles project from the frame construction. The consoles, together with concrete columns between the windows and the brick infill for the parapets constitute the inner construction of the envelop. A steel framework on the outside has an infill of Miropax panels, a non-translucent, opaque type of glass. For the City Savings Bank, both white and cream coloured Miropax are used. In addition, the red-brown steelframe of the facade contains steel framed window sashes according to the Kraus system, a patent of Kraus and the architect Weinwurm, deposited in Bratislava in 1928.

Glazing changed

The steel frame of the curtain wall is suspended from the main construction. A primary structure of mullions consists of a series of double L-profiles 48x48x5 mm. In between the two profiles is a joint plate of 180x100x7 mm, that is welded perpendicularly to another steel plate of 410x110x8 mm. The latter are anchored to the concrete construction where the verticals meet the horizontal perimeter beams of the parapet. To the outer end of the joint plates, large U 100 profiles are welded horizontally. These transoms create a strong expression of horizontal segments in the facade.

The transoms receive the 6,2 mm Miropax glass





Left and bottom: Section of the main facade and a vertical detail of the anchoring of the suspended facade frame.
Drawings by the authors.

panes in a rebate that is created by welding smaller U profiles on the outside of the U 100. The glass is then fixed by small 11x14 mm beads. Despite its proper dilatation and the sophistication of the static solution, the facade of the City Savings Bank was damaged by chemical and mechanic forces in the course of time. The steel framework corroded and pollution caused the glass panes to break and fall down. In 1992, the glazing had therefore to be changed for new Chodopak panes, that have a similar appearance. The steel windows of the Kraus system had a non-traditional opening mechanism. They opened to their central axis and were fitted with a ventilation supply opening in the upper part. With the recent refurbishment the windows were substituted by PVC ones, that are optically similar. Although some construction details were changed, the framework that is so typical for the facade, remained the same.

Unique furnitures

In addition to the bank hall and office space, there were as well some rented shops and apartments in the building. The structure has six floors and a basement. The ground and first floors cover the entire lot and include a partly day lit passage over the full length of the building at street level. The passage led to the centre of the building and made the ground floor accessible to the public. Two higher volumes with office floors rise out of the lower section, one at the street side and another one in the courtyard. The day lit bank hall is situated in between them, on the first floor in the centre of the building. The hall is covered by an arched glass-concrete roof, that has been a typical feature of Central European bank architecture since the times of Wagner's Post Savings Bank in Vienna.

The interior of the building was decorated by unique furnitures of a simple modern form. The architect used thin panels of so called golden onyx as a component for banisters and as a cladding on one of the walls of the entrance staircase. When seen against the light, the panels create an impressive effect of yellow hues.

Passage reconstructed

The building still serves its original purpose although the City Savings Bank was transformed into the Slovak Savings Bank. The interior of the central hall has been refurnished with a new equipment in 1975. However, the original character has been relatively maintained by the architect S. Brezina.

The passage had to undergo the most radical reconstruction. The passage had never been extended to adjacent lots, as was originally intended, and therefore it was not used by the bank. After it had been closed for a long time, the passage was finally renovated by the architect J. Danak and returned to its original purpose in 1995. Some of the bank offices can now be entered through the passage. Still, this new architectural concept seems to respect the simple, but brilliant character of the original building and its interiors. Preparations for a reconstruction of the interiors and a construction of new rooms at the rear of the lot, designed by the architect J. Bahna, are currently taking place. This reconstruction is as well supposed to recover the original appearance of the main hall, as it was in 1930.

A noble experiment

At the time, the new building of the City Savings Bank was glorified by a professional press. The magazine *Slovensky Stavitel* ('Slovak Builder') presented a detailed review, emphasizing the fact that Slovak architecture succeeded to create the country's first modern building with functionalist features. According to the magazine, nobody had believed in such a project even two decades ago. In keeping, all pioneers of functionalism were mistrusted.

In his publication on the new building of the City Savings Bank author A. Horejs stated, that Slovakia successfully overtook advanced Czech architecture by this work and 'achieved the contemporary architectural image of the rest of Europe'. The City Savings Bank is compared to similar constructions built in the Czech lands, such as the Bata department store in Prague and the Avion Hotel in Brno, both by B. Fuchs, and the Morava Bank in Brno, that Fuchs designed with E. Wiesner. The building of the City Savings Bank is said to be a courageous and noble experiment, that 'helped architecture of one nation get very close to the newest creations by the rest of the world'.

Matús Dulla, Henrieta H. Moravciková and Elena Stolicná are all working at the Department of Architecture of the Slovak Academy of Sciences, and are members of DOCOMOMO Slovakia.

Literature:

- 'Mestska sporitelna v Bratislave' ('City Savings Bank in Bratislava'), *Slovensky stavitel*, 2, 1932, 3, p. 69-79.
- A. Horejs, Z. Rossmann and J. Tvarozek: *Stadtliche Sparkassa (City Savings Bank in Bratislava)*, Bratislava 1932.
- L. Foltyn, *Slowakische Architektur und die Tschechische Avantgarde 1918-1939 (Slovak Architecture and Czech Avantgarde 1918-1939)*, Dresden 1991.
- J. Bahna, 'Mestska sporitelna v Bratislave' ('City Savings Bank in Bratislava'), *Projekt*, 32, 1990, 4, 18-20.
- *Moderne Architektur in der Slowakei. 20-er und 30-er Jahre (Modern architecture in Slovakia. The twenties and the thirties)*, edited by S. Slachta, Bratislava 1991.
- DOCOMOMO Slovakia, *Top Register - Slovakia, 1st proposal*, edited by K. Kubicková, Bratislava 1994.
- S. Bartkova, 'Mestska sporitelna' ('City Savings Bank in Bratislava'), *Architektúra & Urbanizmus*, 29, 1995, 1-2, 54-59.

An approximate image
The Rijnhotel in Rotterdam (Merkelbach & Elling, 1957)

The former Rijnhotel is one of the most outstanding examples of post war reconstruction architecture in Rotterdam, Holland's second large city that was heavily damaged in the first days of war in 1940. The building has been designed by Ben Merkelbach and Piet Elling in 1957 and is an outstanding example of 'het Nieuwe Bouwen', the Dutch interpretation of the Modern Movement. Apart from the hotel, the original complex accommodated as well a youth association in a separate wing, that has recently been respectfully refurbished.

by George Köhlen and Leon Wolters

The Rijnhotel is located on a remarkable site at the perimeter of the reconstructed city centre. Before the recent refurbishment started, the complex looked like a set of individual buildings designed by different architects, due to earlier renovation works. The original scheme consists of four components in a perpendicular lay out:
- to the north, a hotel in a 10 storey high rise, on top of a large substructure containing restaurants and conference facilities;
- to the east, a 3 storey volume with two service apartments;
- to the west, a 6 storey office block for the youth association AMVJ on a very narrow footprint;
- a long volume along the Mauritsweg to the south, for sports facilities and a theatre, today in use as a music library and a cinema.

The recent renovation works concerned the east and west wings of the building.

Historic perspective

The entire complex has a loadbearing frame of reinforced concrete. The original facades were constructed with a steel and glass curtain wall, that seems inspired by the Lever House of 1952. The proportions of the curtain wall were very characteristic for early post war architecture, with single glazed vision panels for the upper two thirds of each floor height, and a coloured glass spandrel panel for the lower third. The use of glass for the spandrels, before an insulated parapet of brick, created a sense of continuous transparency over the full surface of the facade.

By using outside glazing, the slender lines of the standard steel frames of the windows were very prominent, which gave the facade an open character and an outward orientation. The mullion profiles were a bit wider and projected outward. In daylight these vertical ribs created a very sensible articulation and accentuated the filigree character of the curtain wall.

The first floors of the various wings were connected. In the substructure along the main street, some space was left for a terrace and a side entrance for the offices. Therefore, access to the office building was provided without necessitating another entrance in the narrow end facade of the office block, that is set at a right angle with the street. This allowed the architects to

The west end facade of the office wing of the Rijnhotel after refurbishment. The filigree character could be recreated, including the loggias.
Photo: George Köhlen.

continue the facade construction over the full height of the building, including the ground floor. The end facade of the office wing is enclosing a series of loggias and therefore completely open. The loggias are trapezoid in plan and illustrate the conflict between the rational lay out of the building and the limitations of the extremely narrow site, and are therefore valuable in a historic perspective.

Contrasting views

The hotel wing had been renovated already in 1987, when the curtain wall had totally been changed. The proportions of the vision panels and the spandrels were reversed to reduce energy consumption. A new curtain wall has been constructed with flat profiles without any relief on the outside. Double glazing with a sun protective silvery coating almost matches the silvery finish on the metal spandrel panels, depriving the building of its transparency. The result is a closed and totally flat facade, that contrasted sharply with the original office wing.

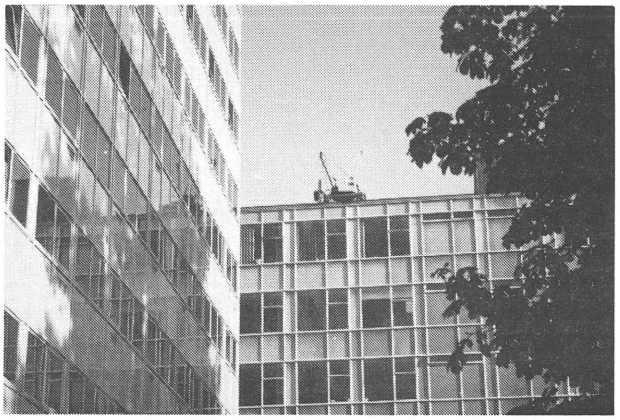
As refurbishing architects we had to take the present state of the hotel wing into account, because it is so prominently placed. The question was if it would make any sense to propose a conservative restoration for the office wing, when there had already been such radical changes elsewhere. Eventually, our conclusion was that this remarkable example of post war reconstruction architecture in Rotterdam had to be respected. It was therefore decided to restore the image of the original curtain wall. The idea was that two different views on refurbishment within one structure might create an interesting contrast just as well. The client could be convinced mainly with the argument, that this approach would give the best chance for short permit procedures.

An approximate image

The brief was to design a new facade proper for the building's commercial use, that would require a modest investment in order not to undermine the excellent market position as a building on a top location yet with a modest rent level. This meant

The Rijnhotel in 1957. The hotel wing is remarkably transparent, a quality that has been lost during a 1987 renovation. In the middle, the side entrance to the AMVJ offices. To the right, the theatre and sports hall.

that the thermal and acoustic performance of the building had to improve, and that double glazing was therefore required. Given the systems for curtain wall constructions available today, some ranges of aluminium profiles that are especially produced for renovations seemed the best choice. Although these profiles have a thermal break, they are still rather slender. Due to their typical geometry with a slanted front, their appearance reminds the old putty glazed fenestrations. In this phase, a facade construction company was involved in the planning process. We assessed our main task to arrive at a result, that could probably best be described as an approximate image.



Profile

For these purposes, aluminium has some decisive advantages over steel. The production of aluminium through extrusion ensures precise and stable dimensions, and allows for freedom and a high sophistication in geometry at relatively low costs. Air and water penetration can therefore be controlled easily in the rebates. Also the applied techniques for assembling and surface treatment of aluminium ensure reliability and a high performance over the years. The prerequisites for a successful refurbishment can be summarized as follows:

- the value of the property is recognized;
- an interactive process is initiated and sustained between supervising authorities, client, architect and facade designer;
- dedication, creativity, knowledge, perseverance and respect are beyond questioning;
- the property itself is large and has a sufficient degree of regularity to allow for custom solutions at reasonable costs.

Yet, it is obvious that exact imitation of an original steel curtain wall in aluminium is an illusion.

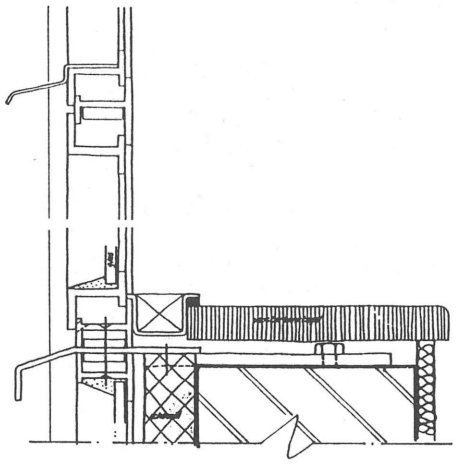
A suitable profile series was selected according to the following criteria:

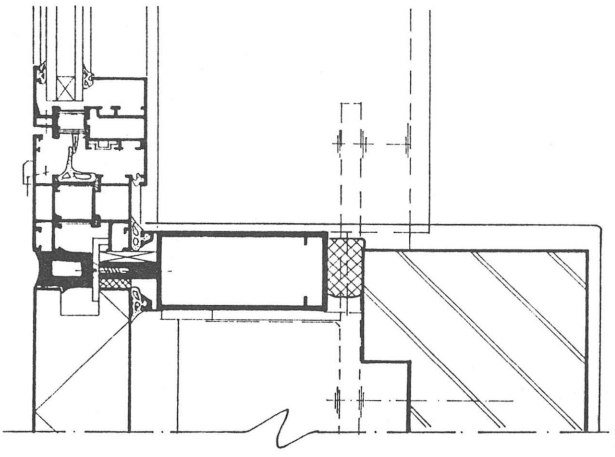
- visual similarity with the original steel windows;
- technical similarity with current systems to ensure easy production;
- suitability for large casements;
- proven quality and availability;
- support by provider in view of guarantees etc.;
- flexibility to respond to custom requirements.

In view of the last item, some specific circumstances had to be taken into account for the project, for instance at the loggias and for the sunscreens. Outside glazing is today unusual for high rise buildings, but decisive for the appearance of the Rijnhotel. This required a specific geometry of the section.

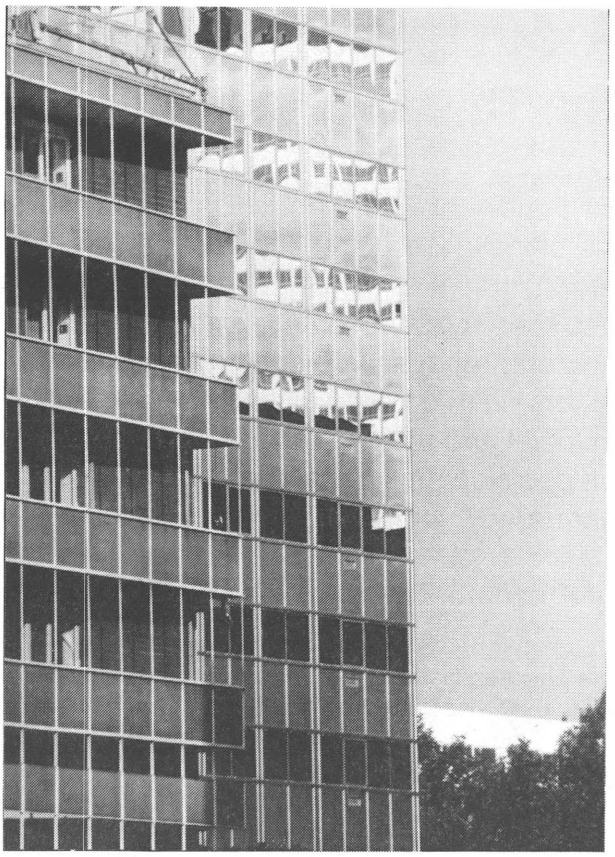
A darker shade of grey

For the architecture of the new curtain wall two aspects were of prime importance. The first was to maintain the continuous band of parapets, defined by horizontal lines at floor level and at the window sills. The other main concern was to keep the

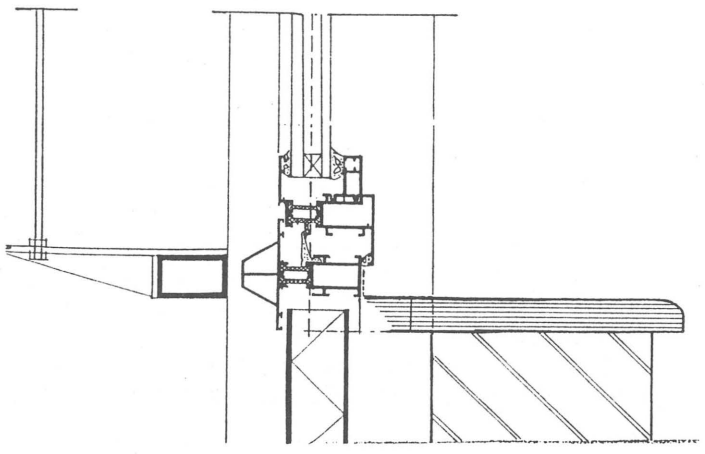




Left: The original facade was very open, with two thirds transparent glass, and one third coloured glass for spandrels. The 1987 curtain wall, to the left, is extremely flush and has only third vision panels. Photo: Wessel de Jonge.
Right: The original loggias in the foreground, compared to the 1987 facade in the background. Photo: Wessel de Jonge.
Bottom left to right: Vertical section through the sill of the original facade of 1957, the 1987 renovation, and the recent refurbishment. Drawings by the editor.



vertical ribs that create the filigree like appearance of the facade.
A conflict with the client arose as he required to have the loggias closed to avoid pollution by the pigeons. Fortunately, we arrived at an agreement with him and the municipal Review Committee for Architecture and Conservation, by closing off the loggias at the east end of the block, but leaving them open in the much more prominent west facade. The open loggias posed some very specific technical problems as some facade elements had to be left unglazed.
By choosing for clear glass and keeping two thirds of the facade for vision panels, we could recreate the original transparency, but we had to avoid overheating by the sun at the south facade.



Therefore, the Venetian blinds that were installed there had to be redesigned to improve their effectiveness. The suspended construction for the sunscreens made custom made solutions necessary.
To avoid early effects of pollution, the original white colour of the steel profiles was changed to light grey. In order to maintain the original graphic effect, the spandrels had to change from light to a darker shade of grey.

It looks the same to me...
As a whole the job was an exercise in sustaining a subservient attitude, which is in our opinion a necessary condition when dealing with such architecture. When our client visited the works one day, he asked: 'what exactly did you do, it looks still the same to me.' Of course we took it as a compliment.
We hope that the results of our work will serve as an inspiration to again refurbish the hotel wing in a similar way as we did with the office block. Then, the centre of Rotterdam will again be enriched with the full qualities of Merkelbach and Elling's architecture of the 1950s.

George Köhlen is an independent architect in Maastricht, the Netherlands. With Leon Wolters, director of ASW Facade Constructions in Weert, the Netherlands, he has been in charge of the refurbishment of the Rijnhotel. Text rewritten by the editor.

A curtain wall replaced from head to toe
The Thyssen Haus in Düsseldorf (1957)

For the city of Düsseldorf it is a landmark, and for architects probably the best known high rise office in Germany: the 96 m. high Thyssen Haus. Recently, the complete refurbishment of the 24 floor building has been completed.
Also the Thyssen high rise became well of years and repairs became frequent. At a certain moment, repairs were no longer sufficient and the building had to be renovated from the bottom up in order to secure its durable preservation. Apart from the more common financial and technical issues, questions of architectural history played an important role in the decision making for the renovation of this icon of postwar modern architecture in Germany.

by Eberhard Zerres

The Thyssen Haus was built in the late 1950s and soon, the Düsseldorfers lovingly nicknamed it the Three-Slab-Building ('Dreischeibenhaus'). Even after 40 years, the high rise with its steel-and-glass elevation appeared ultimately modern. But time had not passed by without leaving its traces. A professional diagnosis was not quite encouraging. The facade did not meet current standards as regards building physics nor technology. Loud raps made one aware of the thermal expansions in the facades. After forty years, the air-conditioning system nor the fire security system came up to present requirements.
Moreover, there were two complicating factors that were decisive in the preparation and execution of the renovation of a commercial building like this. The first was, that the works were to be executed while the building would be in use. The other was that the demands of the Department for Conservation had to be respected, since the building is listed as a historic monument. Permit procedures were therefore complicated and strict, but adequately anticipated while planning the project.

Historic elements
The elevations, the false ceilings with continuous ribbons of lightfixtures, the colour shades of the columns as well as the appearance of the entrance hall of this commercial building could not be changed as a result of its designation: a true challenge for any architect.
The renovation works were planned by the architect Thomas M. Fürst of Hentrich-Petschnigg & Partners KG from Düsseldorf, the firm that had originally designed the Three-Slab-Building in 1957. The ideas and architectural conceptions that had produced the original building were carefully traced back. Drawings were recollected from the company's archives and extensively studied. The aged architect who had originally designed the Thyssen Haus provided a unique source of information through a series of interviews.
On the other hand the range of defects that occurred in the building were recorded and analysed. The performance of the structure was compared to the various technical standards of today, that have gone through enormous changes since 1957. It turned out that windows, air-conditioning, interior partitions, the complete systems for electricity and communications, as well as the underground parkings were completely to be renewed.

Functional environment
The renovation could only be successfully achieved by matching innovative technology with creative architecture. The integral design of the project allowed for an interaction between architecture and technology.
Modern technology allowed all participants to take part in the planning process right from the start, without restricting the architects in their creative process. Their engineers calculated the light capacity, thermal balance as regards heating and cooling, and the conditions to maintain a comfortable interior climate, and provided the architects with the essential data to decide for a further increase of the building's functionality.
To ensure the appropriateness of numerous individual solutions, a series of detailed computer calculations and experimental tests were necessary, amongst others to verify the energy efficiency of the new facade. As a part of the test programs also the expected air circulation in the rooms was determined, as well as the temperature gradients, heating and cooling capacities, and so on. The engineers figured out how to design the infrastructure of the office floors in such a way, that office space might be rented out in small units in the future, without necessitating extensive changes in the building's energy and communicational systems.

Constructional defects

The steel frame of the building adds up to a total of 2,400 tons. Above all it is the way that the slender and tall structure, that has to withstand enormous windloads, is stabilized that stands out still today as a masterpiece in architectural and constructional terms. The 1,200 tons windload on the 8,000 m^2 main facades are transmitted to the foundations by cross-braces in the building's steel skeleton. These statically vital features have now been fire proofed with F90, a special product that is commonly used in offshore structures.

For the renovation, the complete structure was dismantled with the exception of the loadbearing steelframe and the four elevator shafts. By then, it was clear that both the steelframe and the reinforcement in the concrete floorslabs showed little corrosion, despite the far reaching carbonatation of the concrete and the resulting loss of a basic environment for the rebar.

Still, the anchors attached to the concrete floors showed serious corrosion, most likely due to the occurrence of condensation within the facade construction.

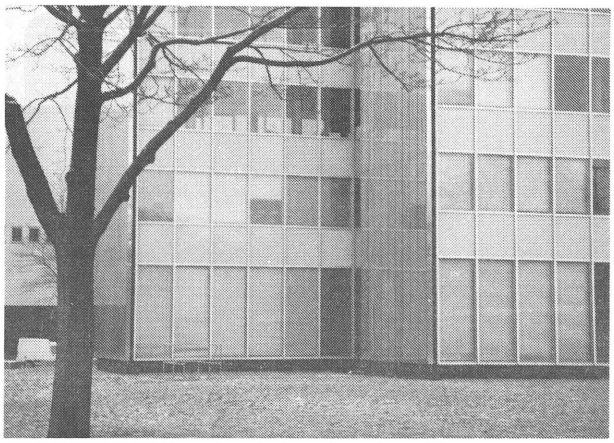
With the restoration continuous vertical sticks have been mounted instead of the facade posts. When it had been calculated that these came up to static requirements as regards windloads and so on in accordance with German Standards DIN 1055 File 4, the newly designed facade construction could be installed unconditionally.

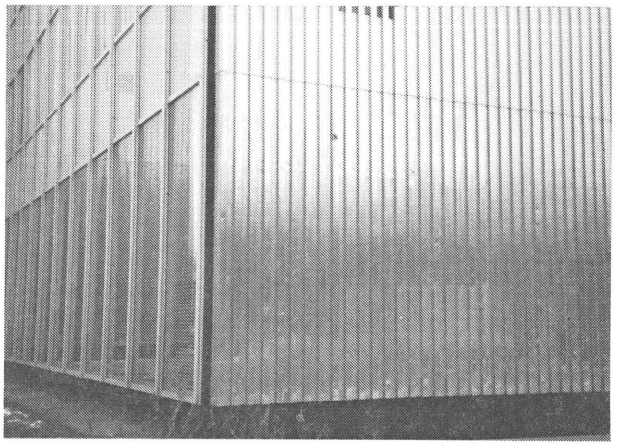
The loads on the new posts are transferred to an existing secondary construction, that was occasionally reinforced where tensions were expected to exceed the tensile strength of the member concerned. The dimensions of the existing construction could then be verified and appeared to be sufficient as regards deformations of the posts through temperature changes and windloads, even if the avoidance of disturbing noises through deformations had to be taken into account. As a result, the occasional corrosion of structural elements could no longer affect the general stability of the building to a significant extent.

Facade

The facade had to be completely renewed. The entire construction of the new facade has been designed to meet strict requirements as regards building physics as well as the historic value of the building. The Thyssen Haus now features a completely new, flush aluminium-glass curtain wall composed of stick elements, with a structure and appearance that strongly refers to the design of the original facade. Vertical sticks in a rectangular pattern again form a primary grid for the curtain wall, while a secondary aluminium-glass construction has been applied as an infill. The aluminium construction of the facade has been designed with profiles with a thermal break and vertical tracks for the suspended scaffold of the window-cleaning installation. The existing

The Thyssen Haus in Düsseldorf, built in 1957, before refurbishment. Photo: Thyssen AG (1987).





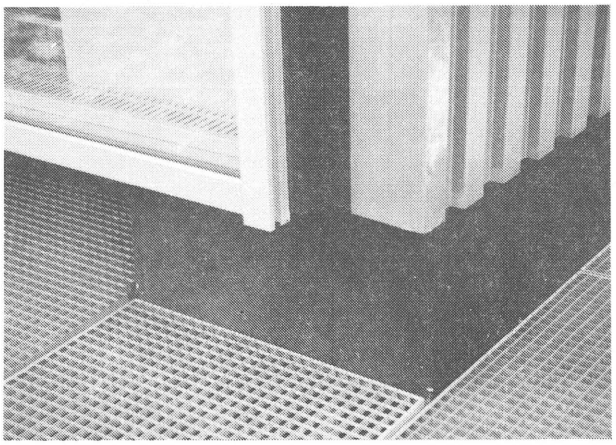
installation for window-cleaning could be kept, although now the tracks are integrated in the mullions of the curtain wall.

Glass

The functional requirements for the renovation project meant, that a type of glazing had to be applied that would allow a minimum of solar incidence to enter the building. Yet it was agreed that the usage of a reflective coating should be avoided, in order not to disturb the architectural features of the original building.

The vision panels of the new curtain wall have been fitted with double glazing, the outer panel of which is heat protective Climaplus N with K = 1,7 W/m^2K. The spandrels have been fitted with enamelled float glass, that was furnished with a special coating according to the results of a so-called Heat-Soak-Test. Before the glazing has actually been put in place on site, an extensive computer simulation programme had again been passed.

The end facades of the building's three slabs are clad with Remanit, a relatively light yet durable metal alloy. Remanit is highly resistant to weathering and immission, and it is easy to maintain. Even after forty years of service, the condition of the corrugated cladding was satisfactory and replacement was therefore unnecessary. The steel cladding has been taken off, and reinstalled after extensive checks and minor repair work. Today the minor dents in the remanit panels add an appealing flavour of authenticity to the perfect shape of the exterior of the renovated Thyssen Haus.



Climate systems

The sophisticated facades of the Thyssen Haus respond to changes in the outside climate, to optimize internal conditions for the users of the building. As a result, it is expected that also productivity will increase, while energy savings are anticipated to be significant due to a reduction of emission through the glazing.

The built-in ventilation supply-system features exchange of thermal energy between fresh and exhaust air, which again results in high energy savings in case of extreme climate conditions in summer and winter. The built-in control units, that allow for individual operation, proves to be a great advantage. In addition, relatively small inlets at the windows allow for individual ventilation of which the energy loss is beyond control. This system ensures an easy and intelligent operation of the systems for heating, ventilation and cooling.

Thanks to the sophistication in facade technique and climate control, an optimal balance was established between measures as regards weather-proofing, energy saving, sunshading and natural light, as well as the systems for heating, ventilation, air conditioning and lighting. Only this way, a comfortable interior environment can be provided, with lighting conditions that are suitable for working at screens, a minimal energy consumption and a maximum acceptance of the building by the users.

In order to achieve this, some of the already existing technologies as regards building components and service systems, such as the sunshades, the ventilation, the heating and cooling systems, have been functionally refined.

Facility management

A vital issue in the whole process of rehabilitation was to secure the added value of the investment as regards the service and maintenance of the technical systems, but just as well with respect to the functional use of the house, that could only be accomplished through Facility Management.

Typically, the costs of technical systems and services today add up to 40 % of the total investments for any building. These sophisticated features will only be worth the investments if they are carefully and regularly serviced, in other words: if they are continuously monitored by a professional party. Today, Thyssen's custodian is no longer in charge of monitoring, inspection nor the management for maintenance of the building. Through the outplacement of these 'alien' activities, Thyssen opted for the only proper solution and decided to leave the service systems to external professionals.

Video documentary

A rigid time schedule for the works could be adhered to, thanks to some special methods for mounting and finishing on site, that allowed for a careful planning of these works. Mounting time on site, which due to its dependence on weather conditions is one of the most risky stages in construction, was reduced to a minimum through a high level of prefabrication of components.
The high level of automation and quality that can be achieved under controlled conditions in workshops is another advantage of prefabrication. Also, it helped to reduce costs for packaging and transport, as well as to minimize storage on site.
The project management of the renovation was commissioned by Thyssen AG to Thyssen Rheinstahl Technik, a division of Thyssen Handelsunion.
A rather unique decision was made by the contractor Hochtief to have the planning and execution of the works documented by means of a video documentary. This short visual report gives a stunning impression of the sophistication of the works in terms of logistics and professionalism in execution.
As a result of the renovation, the 'Dreischeibenhaus' regained its original splendour as well as a large appreciation by its users. Both are indispensable for a durable future for the building.

Eberhard Zerres is the project manager of Thyssen Rheinstahl Technik in charge of the renovation of the Thyssen Haus. Text translated from the German, supplied and edited.

Top, left: The replaced glazing features a reflective coating, but still displays a similar transparency as compared to the original facade.
Top, right: The dented Remanit panels on the end facade are witnesses of the past and add a pleasant flavour to the renovated Thyssen Haus.
Bottom: A corner detail displays the careful work of the renovation architects HPP from Düsseldorf.
Photos: Wessel de Jonge (1996).
Right: Despite a complete renovation of the building two years ago, this icon of postwar modern architecture still radiates its original splendour.
Photo: Thyssen AG (1994).

Chicago's marble landmark
Recladding of the Amoco Building

In the USA, Chicago's second tallest skyscraper is the Amoco building which was constructed in 1972 in accordance with the plans and specifications drawn up by the New York architect Edward Durell Stone. Once completed the 82 story, 350 meter, Amoco building was the tallest marble clad structure in the world. It utilized a rather new construction technique: thin cut stone as a curtain wall material which first made its appearance in the 1960s. This thin marble ultimately failed to stand up to the rigors of the Chicago weather, which led to a total recladding of the tower.

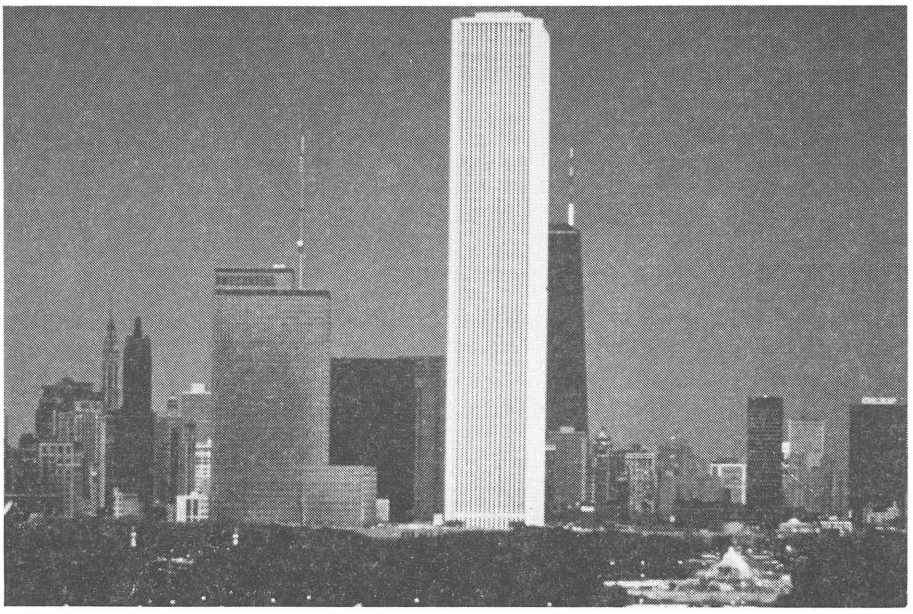
by Ian R. Chin and Jack P. Stecich

Groundbreaking for the Amoco building was in 1970, and the completed structure was occupied in 1972. The building is a steel tube structure with a center core design and column-free space between the core and exterior walls. The exterior wall was originally clad with 44,000 pieces of Alpha-Gray marble quarried in Carrera, Italy. The average marble panel was 127 cm high by 107 cm wide by 3 cm thick. The marble panels were suspended from the columns by a series of galvanized clips and stainless steel shelf angles. Kerfs were cut into the edges of the marble panels to engage the support angles. Each piece of marble was thus independently supported. The joints between the marble panels were sealed with sealant.

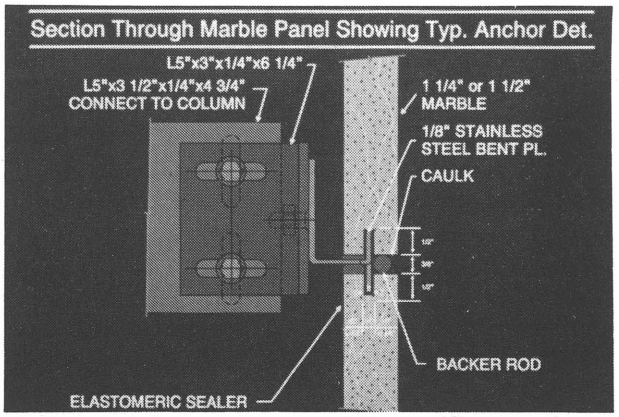
Accelerated distress

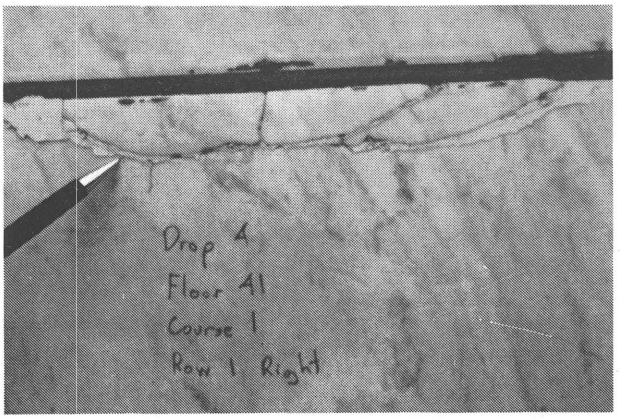
After the building was occupied, the building cladding was regularly maintained by Amoco personnel. The maintenance of the marble panels consisted of inspection of the panels, replacement of deteriorated sealant, and repair of cracks that developed in the panels. All work was performed from a suspended scaffold that could engage into vertical tracks that were incorporated into the facade. In 1979, the Chicago based consulting architectural firm of Wiss, Janney, Elstner Associates, Inc. (WJE), was hired by Amoco to perform an inspection of the exterior facade of the Amoco building in accordance with the City of Chicago's building facade inspection ordinance. During this inspection, all of the marble panels on the building were inspected. This 1979 inspection revealed the following:

1. Crescent shaped cracks at the kerfed connections in approximately 230 marble panels.
2. Vertical, horizontal and diagonal cracks emanating from the kerfed connections in approximately 1,800 marble panels.
3. Outward displacement of seven of the marble panels at corners of the building. The outward displacement averaged about 1.3 cm.
4. Lengthening of some of the cracks in the marble panels that had been previously repaired.
5. Outward bowing of some of the panels. The



Left: A view of the Amoco Building from the south.
Top left: Marble panels suspended from the columns by a series of galvanized clips and stainless steel shelf angles.
Top right: One of the marble panels with crescent shaped cracks at the kerfed connections.
All photos by Wiss, Janney, Elstner Associates, Inc.





maximum outward bow was about 1 cm.
The extent of the distress in the panels was not considered to be extensive in 1979. However, between 1979 and 1985, Amoco personnel observed that distress of the marble panels was continuing to occur at an accelerated rate. As a result of this observation, WJE was again hired in 1985 to perform an inspection of the marble curtain wall.

Exposure to sun

The 1985 inspection revealed the following:
1. Crescent shaped cracks in marble panels at connections in approximately 2,780 of the 44,000 panels on the building. This represented an increase in this type of distress by 1,100 percent since 1979.
2. Vertical, horizontal, and diagonal cracks in marble panels emanating from connections in approximately 12 percent of the panels on the building. This represented an increase in this type of distress by 190 percent since 1979.
3. Outward bowing of marble panels of approximately 1.3 to 2.9 cm. This represented an increase in this type of distress by 200 percent since 1979.

Approximately 80 percent of the significantly bowed panels were located on the south and east elevations of the building, which, unlike the west elevation, have no adjacent structures to block exposure to the sun. The marble panels on the north elevation exhibited the least amount of outward bowing.
The marble primarily consists of calcite crystals which are anisotropic.[1] This phenomenon is called hysteresis, and it often results in a permanent deformation in marble and an accompanying strength loss. Hysteresis can cause marble panels such as those used on the Amoco building to bow when one of the faces of the panels is heated to a higher temperature than the other. This effect would cause the exterior side, which is exposed to the sun, to expand more so than the interior side. It was, therefore, not surprising to find that the vast majority of the significantly outwardly bowed panels were located on the sides of the building that were exposed to the rays of the sun, and that the panels with the least amount of outward bowing existed on the north side of the building that was least exposed to the rays of the sun.

Comprehensive investigation

The 1985 inspection confirmed the observations of building personnel that cracking and bowing of the marble panels on the building were accelerating at a rapid rate. When this information was presented to Amoco, it was decided to perform an investigation to determine the causes of the cracking, the effects of the cracking on the ability of the panels to support design loads, and to recommend remedial action.
The investigation consisted of laboratory testing of 96 marble panels removed from the building, laboratory testing of 10 original panels that had been stored in the basement of the building and never installed, and *in situ* testing of 48 panels on the building.
One of the objectives of laboratory testing performed on marble samples removed from the panels was to obtain a basis for estimating the present and future flexural strength of the marble. The laboratory tests included petrographic examination to determine the mineral composition; flexural and connection testing on full sized panels; testing of panel connection kerfs; flexural strength tests on rectangular prisms (ASTM C880)[2]; compressive strength tests on cores (ASTM C170); permeability testing of samples; and absorption and specific gravity testing (ASTM C97).
Another testing procedure was laboratory-simulated accelerated weathering test on rectangular prisms cut from the panels. This testing consisted of submerging the outside 1.3 cm of the prisms in 0.01 molar solution of sulfurous acid to simulate acid precipitation and exposing the prisms in this condition to 100, 200, or 300 cycles of an air temperature range of -23 degrees to 60 degrees C.
The laboratory tests revealed that the marble had lost and would continue to lose significant strength due to its exposure to heating and cooling cycles, and that a marble panel with a large bow tends to have a lower flexural strength than a marble panel with a small bow.
In situ load tests were also performed on 48

marble panels on the building. The panels tested were selected based upon their location and extent of bowing. The purpose of the *in situ* load tests was to assess the ability of the marble panels and their connections, in their condition at the time of the tests, to support outward wind load. The *in situ* load tests revealed that under design wind loads the marble panels on the building did not have an adequate factor of safety.
The results of the investigation revealed that the marble panels could not support the design wind load with an adequate safety factor and that the marble panels would continue to lose strength due to exposure to weather. It was decided to remove all 44,000 marble panels and reclad the building.

Cladding options
As architect of the recladding project, WJE studied various potential recladding materials and systems from aesthetic, material, structural, and durability points of view. Among cladding options that were studied were panels of aluminum, marble, and granite. It was determined that granite quarried by the North Carolina Granite Company at their Mt. Airy quarry in the USA would be used. This granite, unlike marble, does not exhibit hysteretic behavior. It was also determined that the stone panel thickness would be increased 5 cm and a special surface finish was developed to enhance the white color of the granite.
A comprehensive structural analysis of the building structure was performed to evaluate the effects of the increased cladding weight. In addition, wind loads specified by the current City of Chicago Building code were higher than wind loads specified at the time the building was designed. At the time the building was originally designed, the structural analysis was performed on a mainframe computer at the Massachusetts Institute of Technology. Using state-of-the-art computing at that time, engineers were able to model only one-quarter of the building. Because of improved computer technology in the 1990s, the analysis was performed on a model of the entire building using a desktop computer. The analysis revealed that seven columns at the lower levels on the north face were slightly overstressed when subjected to the most severe wind case. It was decided that these columns would be reinforced by welding new steel plates onto the existing columns.

A view of the Amoco Building during recladding.

Conclusion
As the recladding project proceeded, constructability, structural performance, and aesthetics were evaluated by the owner, architect, engineer and contractor on a weekly basis. Extensive testing of marble materials, connections, hardware, and of a fully assembled mock-ups of the recladding was performed. The testing performed was so extensive as to lead to improvement in standard ASTM testing procedures. Construction logistics were carefully planned to allow undisturbed occupancy of the building and to provide a safe work environment 350 meters above Chicago streets. The project ultimately led to the use of a strong, stable cladding material with a bright appearance for a major Chicago Landmark and world corporate headquarters.

Ian R. Chin and Jack P. Stecich are respectively vice president and senior consultant, and senior consultant at Wiss, Janney, Elstner Associates, Inc., Chicago.
Text edited by Stephen J. Kelley from the Proceedings of the Seminar on the Recladding of the Amoco Building in Chicago, Illinois, *edited by Ian R. Chin, Chicago Committee on Highrise Buildings, Chicago 1995.*

Notes:
1. Anisotropic means that when the calcite crystals are heated, they expand in different amounts in different directions, and when they are subsequently cooled, they cannot return to their original position because the crystals interlock.
2. The American Society of Testing and Materials (ASTM) is a voluntary standards organization which is the basis for the majority of specifications for building construction.

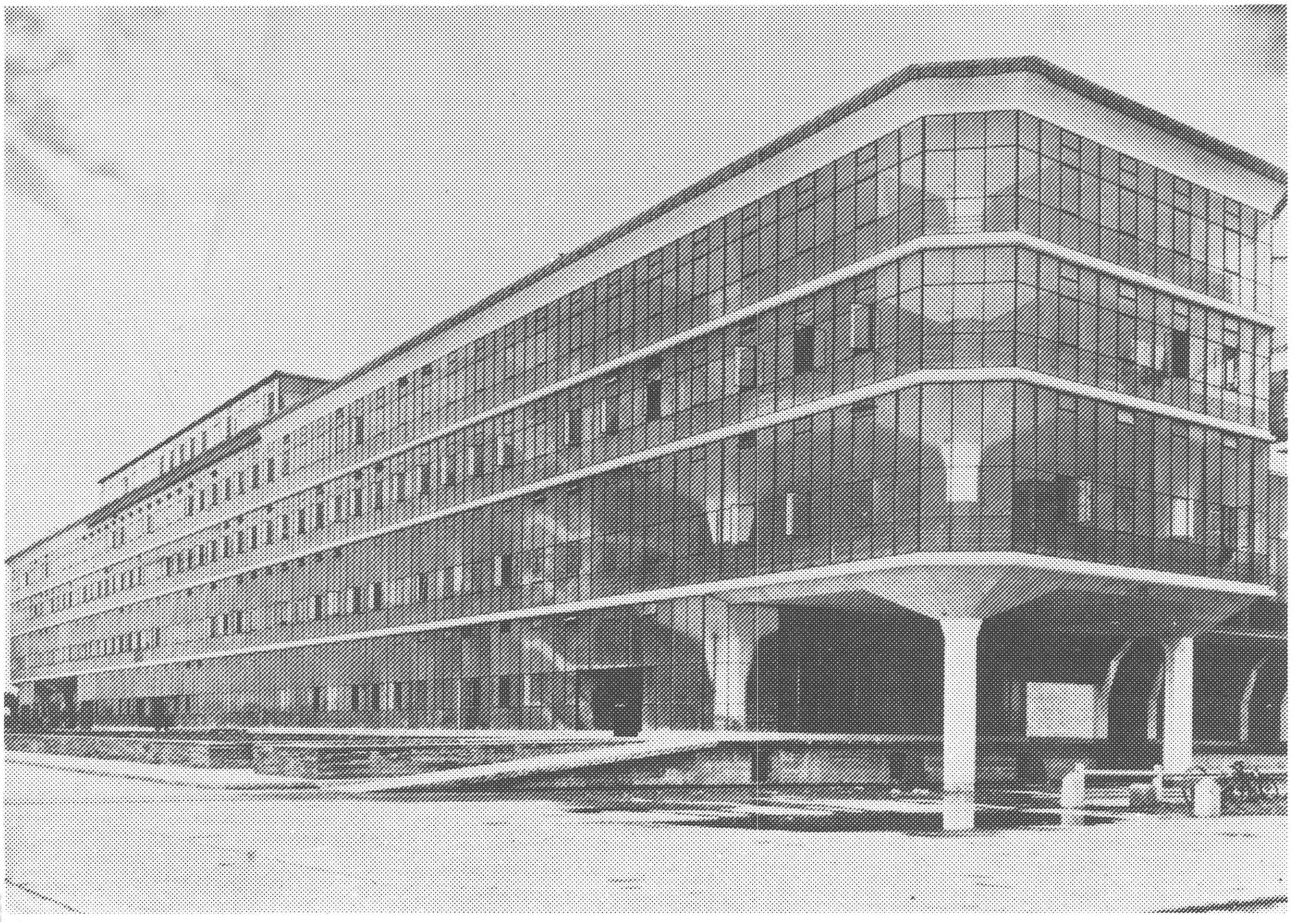
Careful medication for a curtain wall
The Boots Pharmaceutical Factory in Beeston (1932)

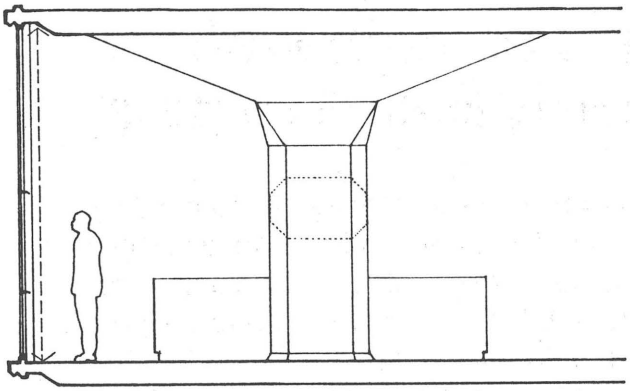
In 1989, the Boots Company set up a study to see how Owen Williams' D 10 building of 1932, could be refurbished to meet their future manufacturing requirements and the new EC standards for pharmaceutical production. It is now seven years on, and John Barks, manager of the Boots project team, and consultant AMEC, must be congratulated on receiving the Europa Nostra conservation award for the project.
However, to reduce solar gain the instalment of slightly sunreflective glazing could not be avoided. A significant loss of transparency is the side effect of a careful medication.

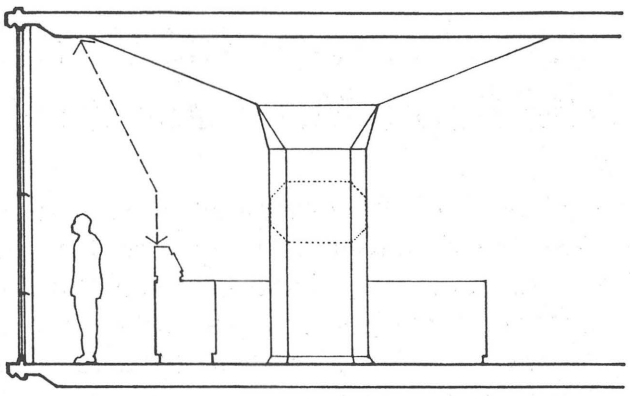
by James Strike

In the *Architects Journal* of 3 November 1994, Peter Fawcett, Head of School and professor of architecture, University of Nottingham, describes that 'the icon status of 'D10' stems from its progressive structure and the uncompromising curtain wall to its west facade': he comments that 'the restored facade is an unqualified success'. However, the refurbishment was not easy: Jan Sosna, Chief Architect of the AMEC team, recalls how 'it was the replacement of the fenestration that became the key issue with English Heritage'. This article looks at the story and the details of this replacement glazing.

Hard edged meetings
Conservation of Modern Movement factories has its share of indifferent results and out right failures. It is therefore good news for the conservation lobby that this project work out well. The process of working on historic buildings takes account of the need to record before the changes are made, and to record the end product: a recognised system in archaeology. What is now clear is that the details of getting to the end product is also an interesting part of the process, but one that is not often adequately recorded. Perhaps we need a recognised system for recording for posterity, the







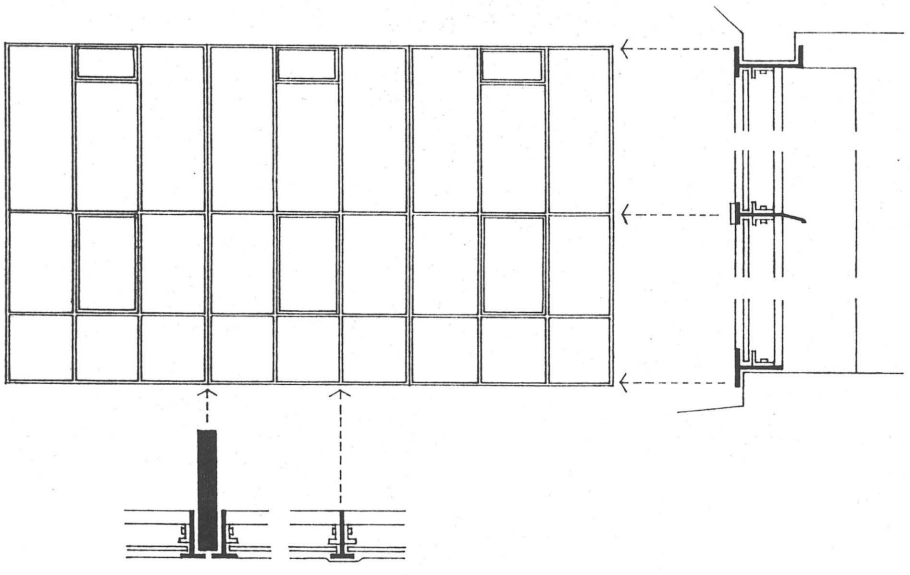
actions of the design meetings, and the decisions taken on site. It is salutary to recall the meetings which lead, eventually, to the reglazing of the 'D10' facade. The early meetings were professionally hard edged. The optimum solution for English Heritage was to retain the original fabric, Boots required an efficient and practical solution, and AMEC wanted to solve the problem.

Continuity and transparancy

Historic fabric is irreplaceable, and this glazing was particularly interesting in the way that Owen Williams used Crittall's standard range of 'medium universal' steel window sections to form storey height panels with minimal flat glazing bars to the external face. The 20mm wide T-bars, with small aluminium angles to fix the glass, gave minimal sight lines, portraying what Walter Gropius had described earlier as 'dematerialisation of the walling'. The glazing allows Owen Williams' large span flat concrete-slabs and supporting columns with mushroom heads to be clearly perceived through the external enclosure. The original storey height panels were fabricated in three window widths with a 100mm by 18mm structural steel mullion between the panels at 2.34m centres. Metal sections were at that time assembled with hammered tenon joints and the 4m high panels of the 'D10' building lack sufficient rigidity to withstand strong gusts of wind, often leading to cracked panes of glass.

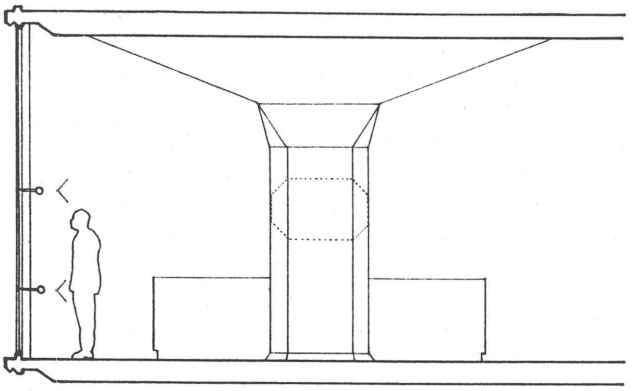
Several initiatives were explored to save the glazing. Full conservation was examined. Anything is possible, but the cost of treating such large areas of rusting and warped glazing with the necessary studio based 'museum artifact' approach would have been exorbitant. Public opinion is undoubtedly moving in favour of such buildings and we may well need to consider such duty of care in future projects. A parallel problem in conserving the original glazing was the need for a satisfactory warranty; more of this later. The debate also confronted authenticity. It is common practice to conserve historic fabric 'as found', on the basis that the evolution of the building is part of its history. In the case of 'D10', this evolution consists of repairs, alterations, blank panels, and the random addition of extract fans and blinds. The important characteristics of this building, however, is in the edited simplicity of the structure and the continuity and transparency of the glazing; and this has to be demonstrated through an unsullied and coherent whole. Conservation of the original glazing would therefore require the removal of these many alterations and the use of patch repairs to the original profiles.

Secondary internal glazing was considered to overcome heat loss and the EC requirement of



Original glazing with opening lights and structural mullions between the three window bays.
Drawing: James Strike.

Far left: Existing glazing conserved and upgraded with the introduction of internal secondary glazing. Left: The environmental requirements of the building provided with the introduction of a glazed screen to the machinery or work benches. Right: New glazing based on standard W 20 sections with horizontal structural bars. Drawings: James Strike.



dust penetration. Owen Williams designed the original glazing with the glazing beads and transom bar projections on the inside as part of the designed simplification of the external facade. Consequently, secondary glazing had to be movable or demountable to allow for internal reglazing the original system. However sophisticated, this additional line of secondary mullions would have created an unwelcome 'double image' of vision into the building. An alternative system was considered as modern glazing set back to the line of the machinery or laboratory bench. This could be perceived as part of the design language of the machinery, an overtly modern screen, visually separate from the historic fabric. The specific problems of this scheme, particularly in avoiding the structural mushroom column heads, prevented a satisfactory simple practical solution; however, the approach may be useful for some other project.

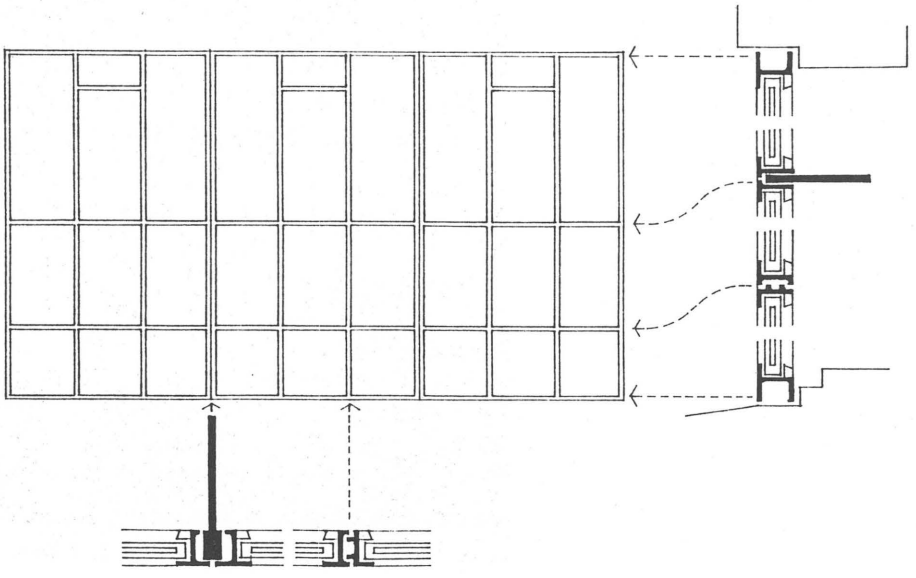
Two trial panels

At the same time, designs were produced for replacement glazing. One advantage of a new scheme would be a clean and consistent glazing plane; the fabric may be lost but the original coherent design would be retained, and even enhanced. It was established from the start that the new EC pharmaceutical standards would best be met through the introduction of internal air conditioning, and that opening lights would not therefore be required. Early criteria for the new glazing were to emulate the appearance of the original glazing, to reduce heat loss, and to overcome the wind loading. Two trial panels were constructed in a loading bay at the end of the building. The first used Crittall standard 30mm T-bar sections, which are just deep enough to accommodate a double glazed panel, and vertical steel joining members between each window to give the required structural strength. The result was clean and coherent, it reflected the design ethos of minimal glazing but did not follow Owen Williams' solution. The second used larger Mellowes sections. This followed the original patten of the three window panel and the opening lights, but was thicker and visually more intrusive.

Crittalls standard sections

The meetings were becoming less productive, and we needed to reflect on our opinions. The schemes were presented at English Heritage, to an invited group of people experienced in the history and conservation of Modern Movement buildings. Boots took the unusual step of producing a professional video showing the problems and solutions, and this, with a formal paper, were submitted to English Heritage Historic Buildings

Final scheme as constructed, with structural mullions between three bay windows, made of standard sections which incorporate a horizontal structural bars. Drawing: James Strike.



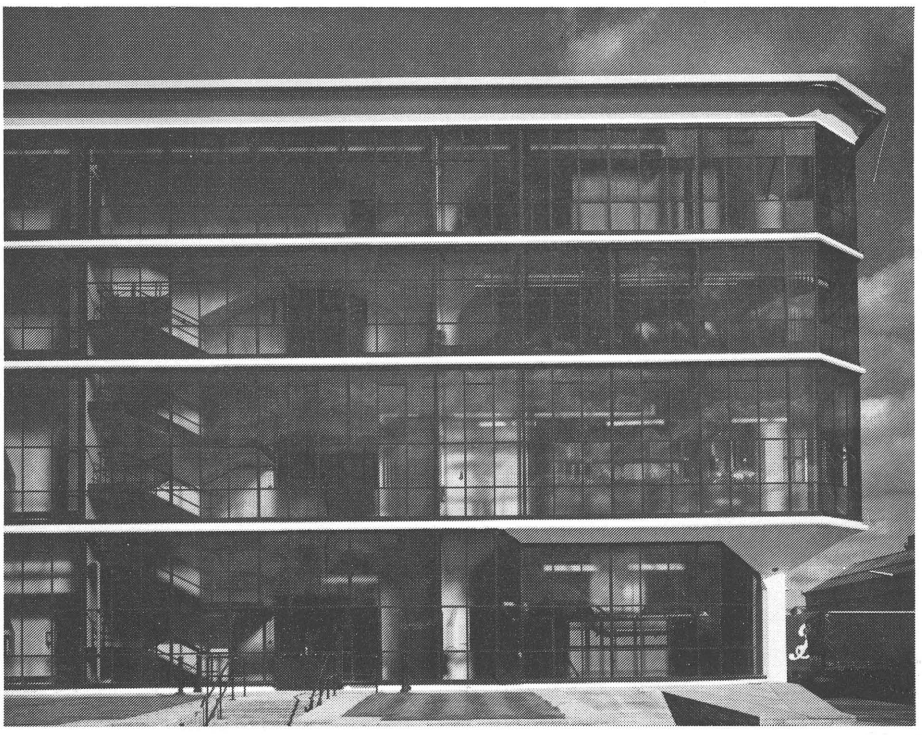
Advisory Committee. The advice was to retain the original three bay panels and the pattern of opening lights, and to seek the most suitable lightweight glazing system.
Crittalls were appointed to develop their thin standard sections into a three window structural panel between structural mullions. The problem of hot galvanising such a large panel was also explored. The 30mm T-bar was reconsidered with new internal rails configured as a structural horizontal trusses spanning between the structural mullions. The final solution was visually and structurally more simple, with the introduction of a 90mm horizontal steel plate between standard Crittalls W20 window sections, and a 130mm steel mullion between the panels.

Duty of care

The steel work was hot dip galvanised and polyester-powder coated in dark green (RAL 6009) to match the original design. It is interesting to observe how the glazing bars have diminished in comparison with the recent white paint. The double glazed panels are 4mm-6mm-4mm to fit into the available internal width of the Crittall sections, fixed with snap-on beads. The vision panels have Pilkington *HP Neutral* outer glass and clear float inner glass, the lower and upper panels have Pilkington *Vellum* inner. Externally the system was treated with feathered black silicone pointing.
AMEC were faced with the difficult problem of the tolerance between the glazing and the concrete slabs which varied up to 50mm. Pressed steel sections with adjustable plates were made to restrict the silicone pointing to 20mm.
The question of warrantees for work involved in saving these buildings has to be addressed. The conservation of a medieval cathedral or a vernacular timber barn would not be covered by a warranty. The boundaries are blurred, and the ownership of the duty of care for the historic fabric seems to change with the age of the building. Fortunately, a solution was found for the 'D10' building which used new standard, and proven, sections to overcome the problem. But the question is asked; would the conservation 'Authority', which requires the retention of historic fabric, take on such a warranty?
The whole story evolved over many months; it was frustrating and time consuming. It is interesting to see, now, how it followed the familiar patten that the design process takes in many fields, in that the elegant solution developed slowly out of many long discussions and abandoned drawings.
Boots were wise in their request for minimum publicity during the development stage; you need to be able to explore unproven ideas. It was particularly useful that Boots were willing to set up the trial panels and the video, to prove and disprove the issues. The scheme demonstrates the duty of care required, and hopefully, moves forward the level of expertise and expectation for the conservation of such Modern Movement buildings.

James Strike was the advisory architect to the Inspector for the refurbishment of Owen Williams' 'D10' Boots Factory in Nottingham. He now runs the Masters course in Building Conservation at Bournemouth University. He is author of Construction into Design, *Butterworth Architecture, and* Architecture in Conservation, *Routledge.*

Page 61: Period photo of the Boots Factory with original glazing, with opening lights and structural mullions between the three windows bays.
Photo: Crittall Windows Ltd.
Right: The completed scheme. The sunreflective glazing has a neutral grey tone of only 10%, but still results in a significant loss of transparency.
Photo: Martine Hamilton Knight, courtesy of the Boots Company.



International Secretariat DOCOMOMO:
prof.ir. Hubert-Jan Henket
ir. Wessel de Jonge
Eindhoven University of Technology
BPU Postvak 8
P.O. Box 513
5600 MB Eindhoven
the Netherlands
tel.: 31-40-247 24 33
fax: 31-40-245 97 41
e-mail: docomomo@bwk.tue.nl