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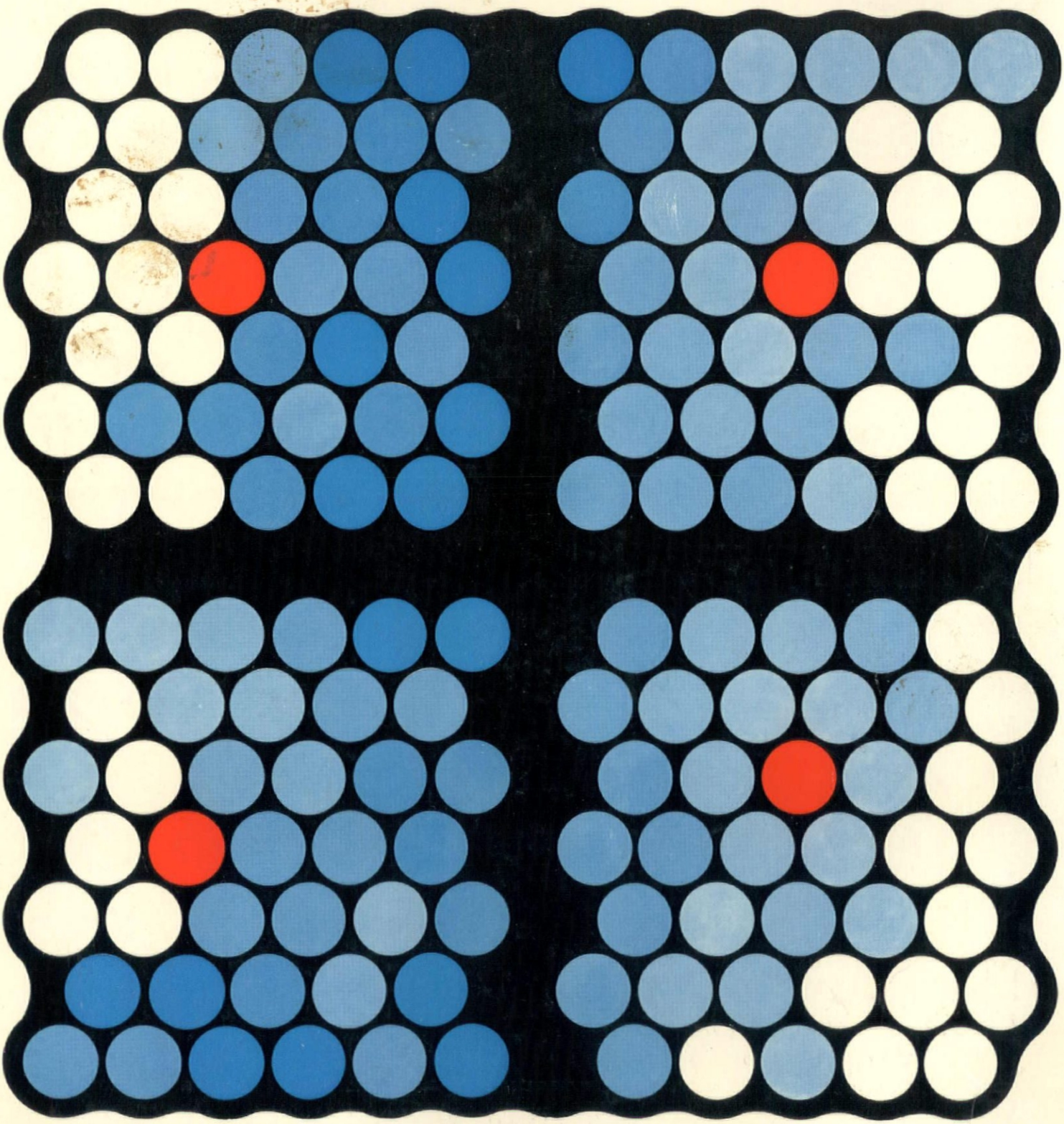

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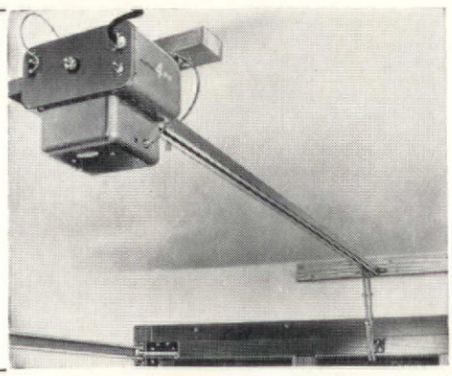

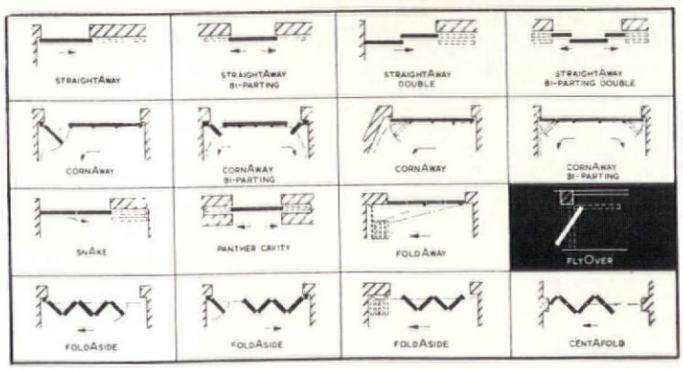

Volume XXXV
March 1965

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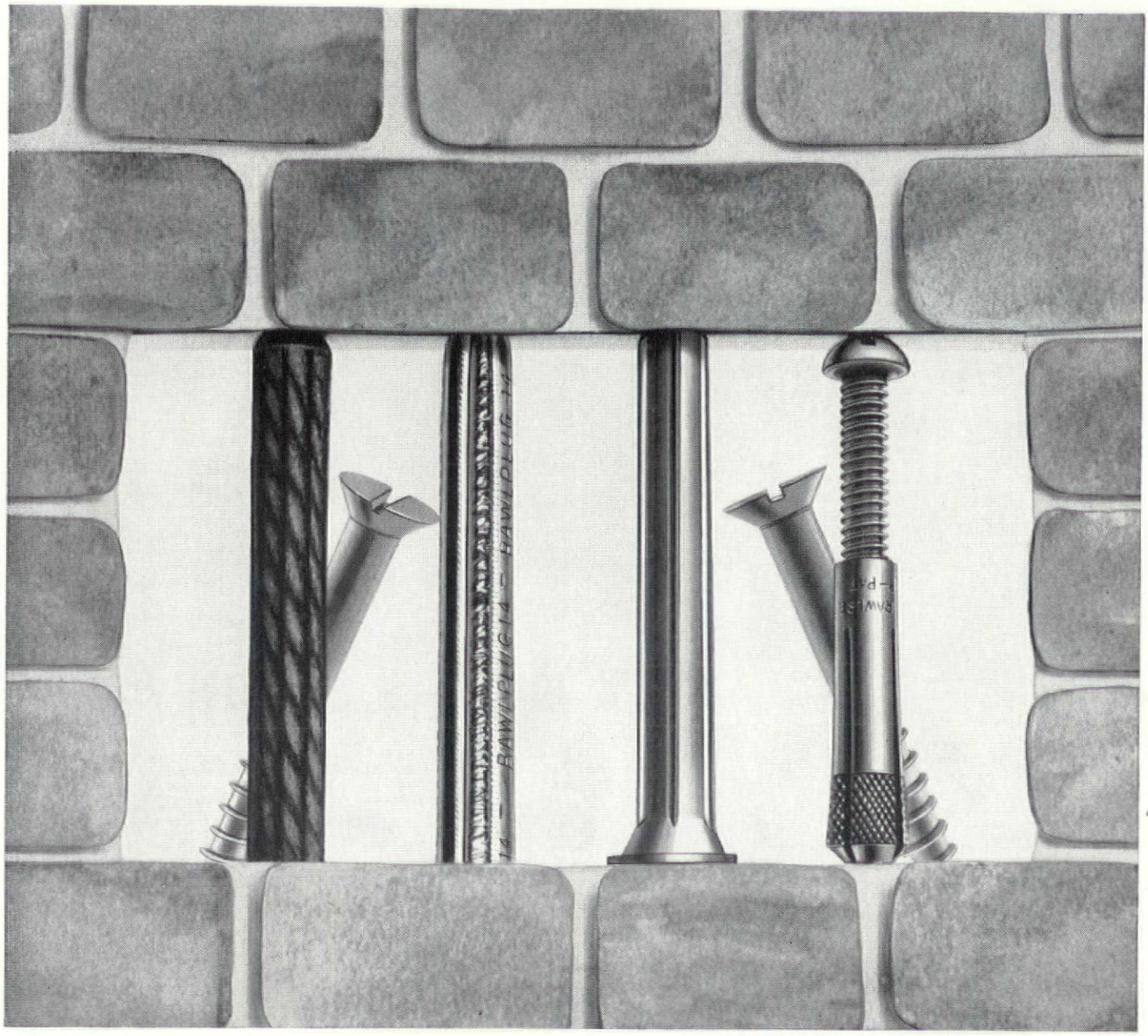

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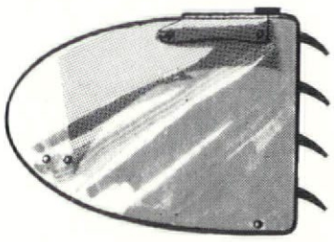
Open letter to an American student

from Colin St. John Wilson

Dear R.
I do not wish to go on raging at the latest phase of architecture in the United States. It seems that by now the conflict in judgment between European and American critics upon this subject needs understanding rather than exacerbation; and certainly as I sat and listened to the contributors to the Columbia symposium on 'The Thirties' I began to understand for the first time that there is a fundamental difference between the American and the European interpretation of the role of architecture in society. For the Modern Architecture of which these contributors spoke was almost unrecognizable to me. It was supposedly defined by some point of purely stylistic maturity called 'The International Style', deeply indebted to Neo-Classicism and quite detached from the problems of its society. No Athens Charter, no Ilot Insalubre, no echo of the cry 'Architecture or Revolution', nothing of the search for new standards, of the fervour of groups such as CIAM and MARS to bring architecture to the attention of the people: art for art's sake, amen.
Now in Europe the notion of a new architecture was always a polemical one in which, for better or worse, a whole body of ideas was at stake—social, technical and formal. In this body of ideas, all elements from door-handle to city plan were so bound together that the form of a chair could even project implications for the form of the city. Stakes of this order demand a kind of Hippocratic oath and this is to be exercised in a realm hard to define which borders simultaneously upon aesthetics, morality and politics and can best be described by the word 'probity'.
From this point the misunderstandings multiply. For whereas the members of the symposium finally agreed to exclude Corbu as typical of 'The Thirties' because of his stylistic versatility, I found that I was bound to speak of him as fundamentally typical precisely because of the force with which he convened this probity into an axis of intention which guided and unified two generations of younger architects. His forms were intellectual forms and projected above all else the image of a new way of living.
This raises a fundamental question in semantics. Since the forms were born from a set of intellectual objectives, is the reverse also true? Namely, that the forms so clearly carry information about their origin that they may be said to represent a culture, to enable a society uniquely to recognize itself in them? (Let us agree straightaway that this has nothing to do with sentimental notions of imagery such as 'the style for the job'.) Certain kinds of originality will be excluded: there will be an insistence upon certain norms. To disagree with the resultant architecture will not be because, as some of my American friends would say, one 'saw through all that talk' to a weakness in the form, but because one felt the intellectual basis to be incorrectly formulated and that the renewal of concepts must be continued.
Surely it was not on stylistic grounds that the Nazis closed the Bauhaus, and not for nothing did Corbu refer to 'ce futurisme bien dangereux'. For Corbu, as for the Nazis, forms contained dangerous implications of a way of life. Probity demands such recognition.
Now I will very soon / *Continued page AD7*



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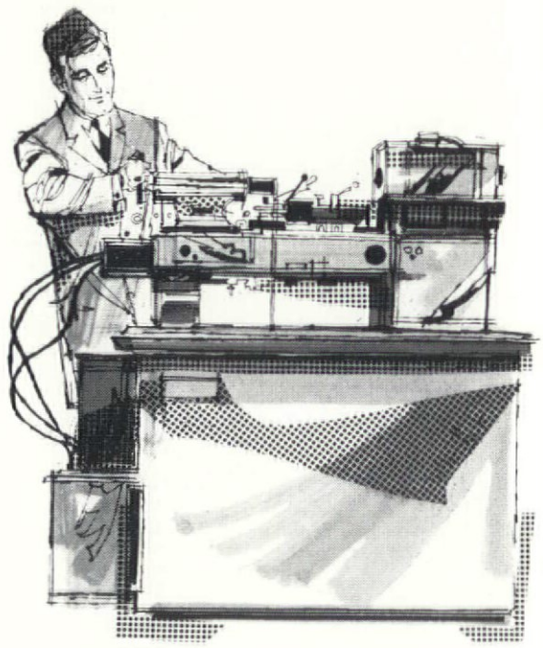

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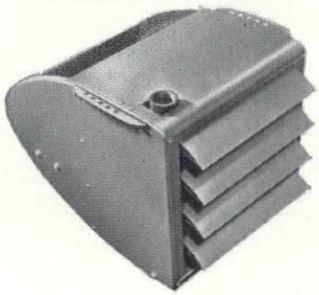

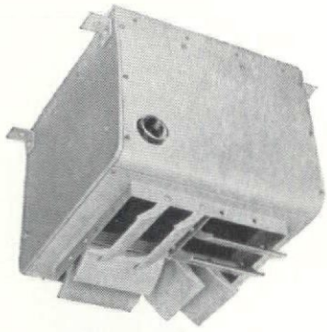

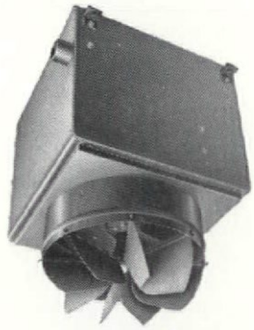

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Open letter / continued get out of my depth if I try to account for the anti-intellectualism of the American critics: I simply point to it as the major difference between us. In America today there is no public forum for the exchange of ideas, no group gathered around a common idea (and therefore no rebel groups), no discussion that is more than one man deep, no magazine that attempts to focus upon the state of current polemic. This is the starvation of thought. It has been suggested to me that this absence of intellectual debate is common to all fields of American life, that it stems from the notion that the revolution has already happened, long ago, that ideas are not to be dangerous anymore. . . . Of this I cannot judge. The fact, however, that you and so many of the young architects whom I have met deplore the absence of such debate encourages me to believe that the distinction I have made is correct. Only you can decide what action to take to achieve your object: but as to the nature of the object itself let me add this. James Joyce once defined the aim of his art in terms of the word 'epiphany'. By this he meant the understanding by which the most ordinary acts of men could be 'shown forth', a sudden focus into depth, into naked revelation, of what had seemed to be trivial incident. Similarly Van Gogh once wrote that he hoped by his art to give back to ordinary men 'that something of the eternal that the halo used to represent'. It would seem to me that the uniquely American contribution to architecture should be in some such direct confrontation with life, bringing new energy to that architectural moment of realization in which a frame for the actions of men suddenly focuses into a Place where those actions are not merely made possible but are made manifest, are made, perhaps for the first time, vivid and recognizable to themselves, and their meaning preserved against erosion by conflicting actions and occasions. This has nothing whatsoever to do with the search for the extraordinary, nor with the abysmal desire to please: it has much to do with the enlargement and the celebration of the powers of life and their embodiment.

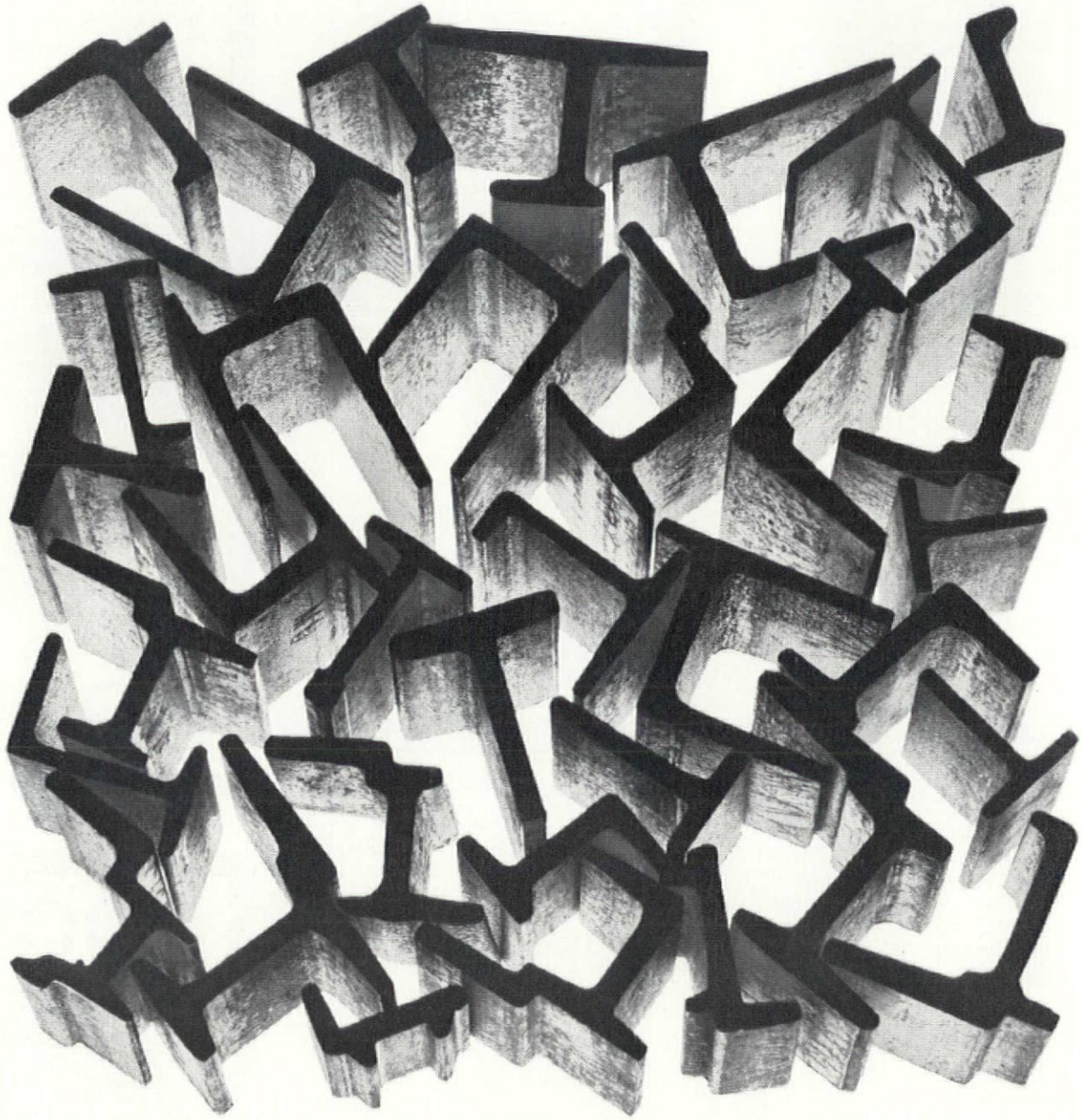
Reprinted from 'Program' No. 3. Published by the School of Architecture, Columbia University, N.Y.

Book notes

Wiener Bauten 1900/heute Vienna buildings 1900 to today)
Prof. Karl Schwanzer. Austrian Building Center (Vienna IX., Fürstengasse 1)
Among the numerous publications, catalogues and prospectuses describing Vienna there exists till now no summarized review of buildings of our time. To help this need the above book has been published. It is intended as a guide for foreign visitors; but also serves as a review of the development of contemporary architecture in Vienna. It is divided into two parts; the first section deals with the period from 1900 to 1945 and shows Vienna's part in the development of modern architecture (Otto Wagner, Adolf Loos, Josef Hoffmann, etc.). In the second part, important buildings from 1945 till the present day are shown.
Two hundred illustrations or plans, with short captions in German, are included in the book. The sites of the buildings are indexed on an enclosed map.
Daily sight-seeing architectural tours are organized by the Stadtbaudirektion Wien (the municipal building department of Vienna), to help the visitor to see as many of the buildings as possible reasonably quickly.

Bauen in Berlin 1900–1964 (Buildings in Berlin)
Akademie der Künste (1 Berlin 21, Hanseatenweg 10)
An exhibition of the same title as this book was presented last autumn in West Berlin, by the Akademie der Künste, and the book is really its illustrated catalogue, with an introduction by Hermann Fehling.
The illustrations are shown in chronological order and include buildings from the whole city (east and west), very many of which were destroyed in the war. It also includes unbuilt designs by Taut, Mendelsohn, Mies van der Rohe, etc., as well as, by some poetic licence, a few of their buildings elsewhere (like the Tungendhat house or the Barcelona Pavilion).
It is a pity there is no indexed map of the city to guide the visiting architect who would like to study the development of Berlin architecture, but maybe this is because such a guide already exists in a separate book, *Bauen seit 1900,* by Rolf Rave and Hans Joachim Knöfel, published in 1963 by Ullstein.

Treppen
Franz Schuster. Julius Hoffmann, Stuttgart.
Once again German technocracy provides an exhaustive breakdown of all the technical possibilities yet developed by man for the act of ascent by stair. This in terms of materials is a non-denominational, up-to-date detail book, supplementing data already given in similar books, such as Hoffmann's 'Stahltreppen' or Reitmayer's 'Holztreppen'. This is the latest German on 'treppen' published unfortunately for us only in German.



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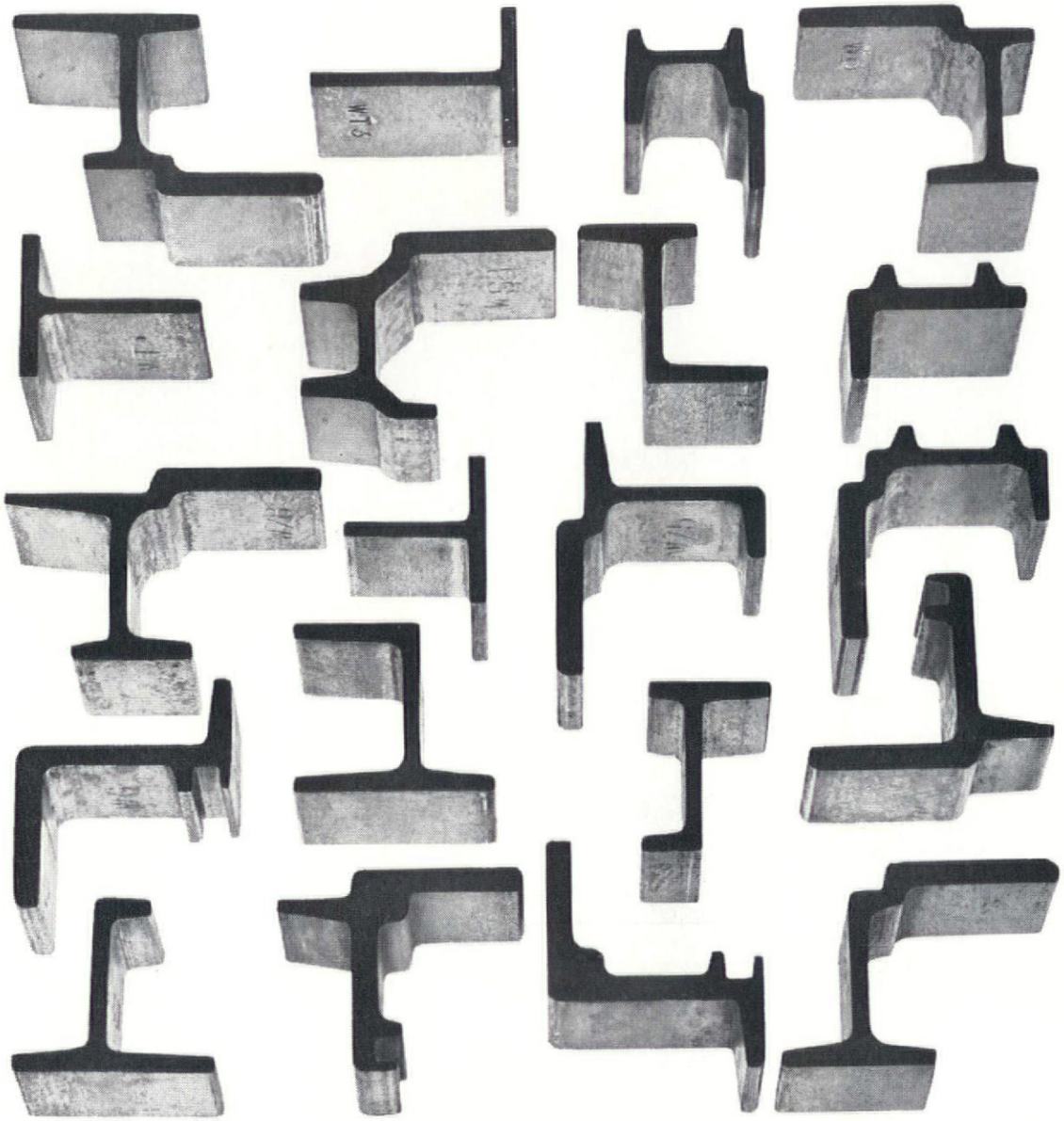

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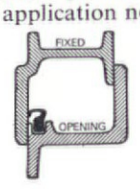

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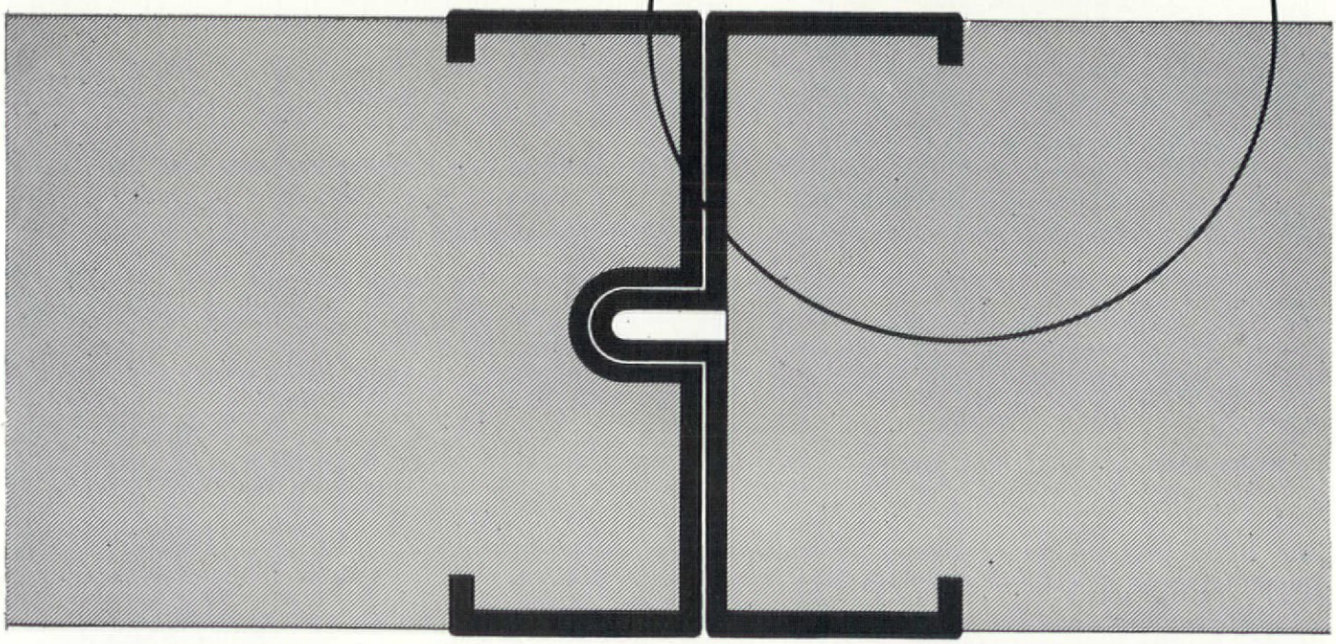

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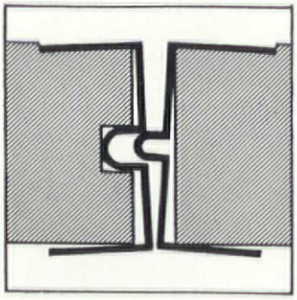

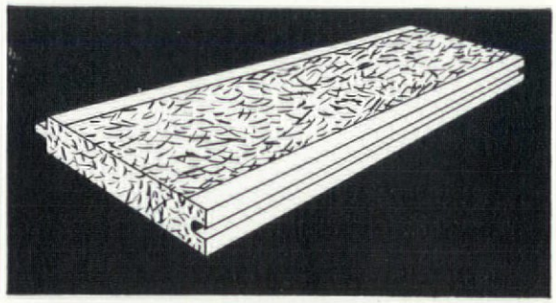

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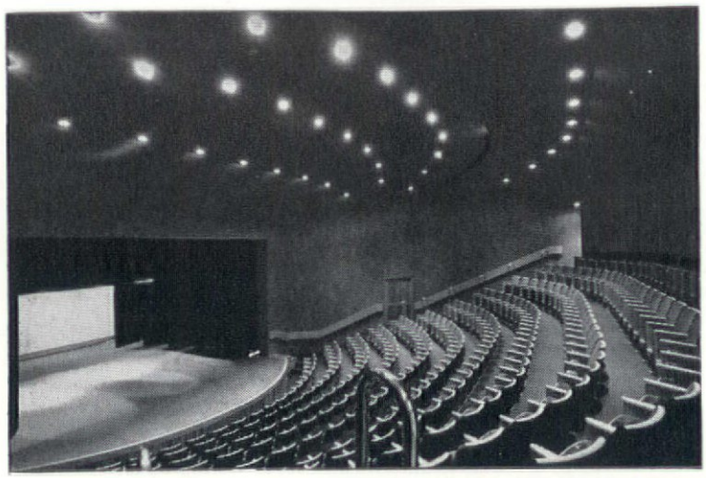

Vår Teater *one of the nine Childrens' Theatres in Stockholm. Described in* "Tabs" *Vol. 21. No. 1. A few copies of these back numbers are available on request.*

University of Waterloo Arts Building, Ontario
Architects, *Messrs. Shaw & Moffatt, Toronto.*
Details of this Open Stage appear in "Tabs" *Vol 21. No. 2.*

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2. **Stage Planning**
3. **Planning for New Forms of Theatre**
4. **Lighting for Entertainment**

The architectural features of new theatres in relation to the stage lighting, the production and the audience are regularly discussed in "Tabs" magazine published quarterly, and theatre architects are among the regular contributors. "Tabs" is recommended reading for every architect interested in theatre design and will be mailed free every quarter on application.

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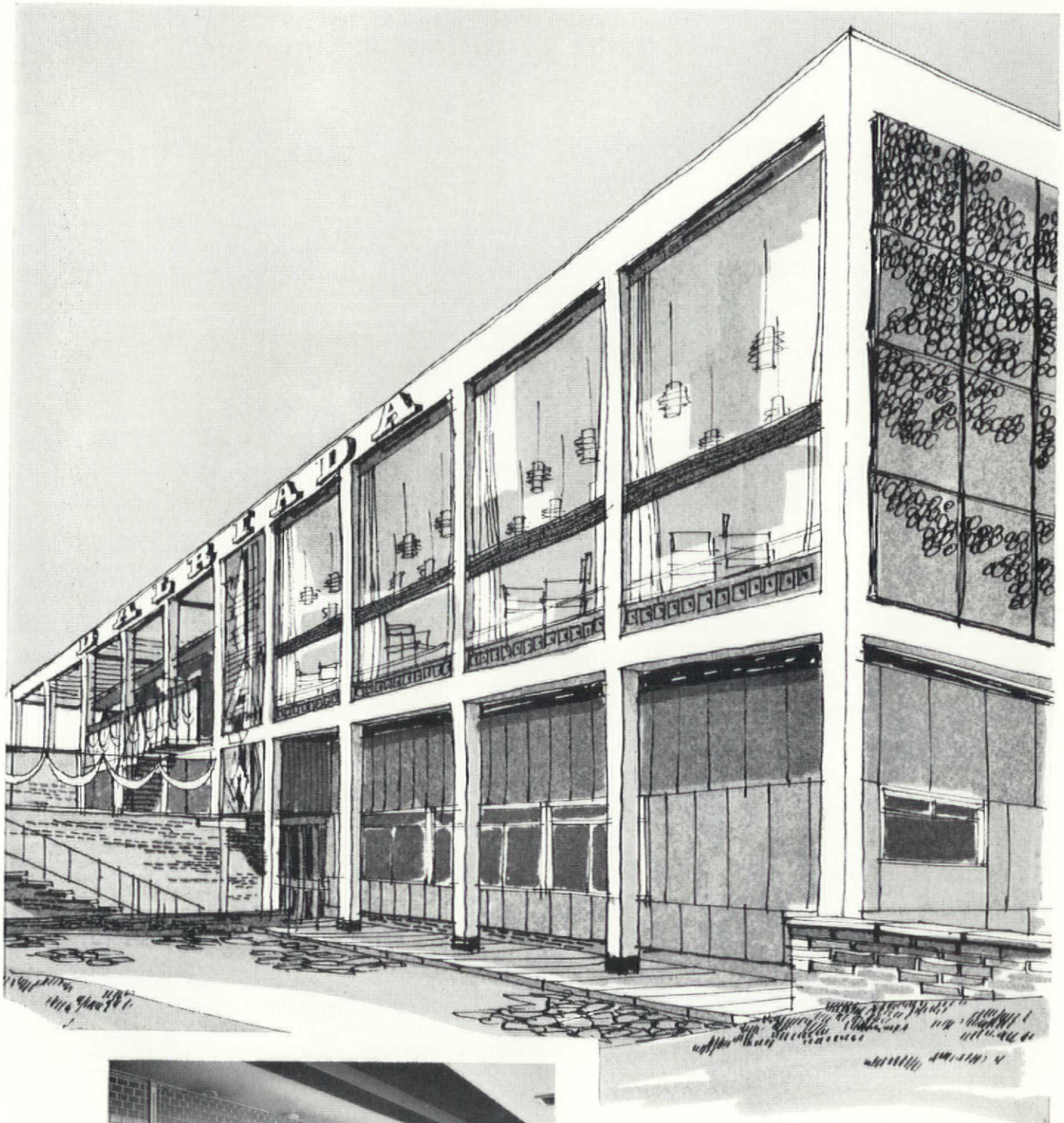

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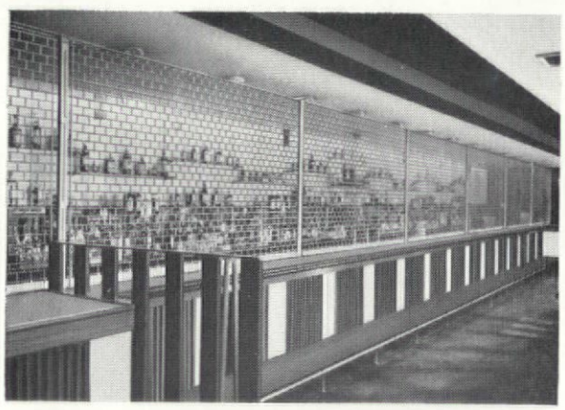

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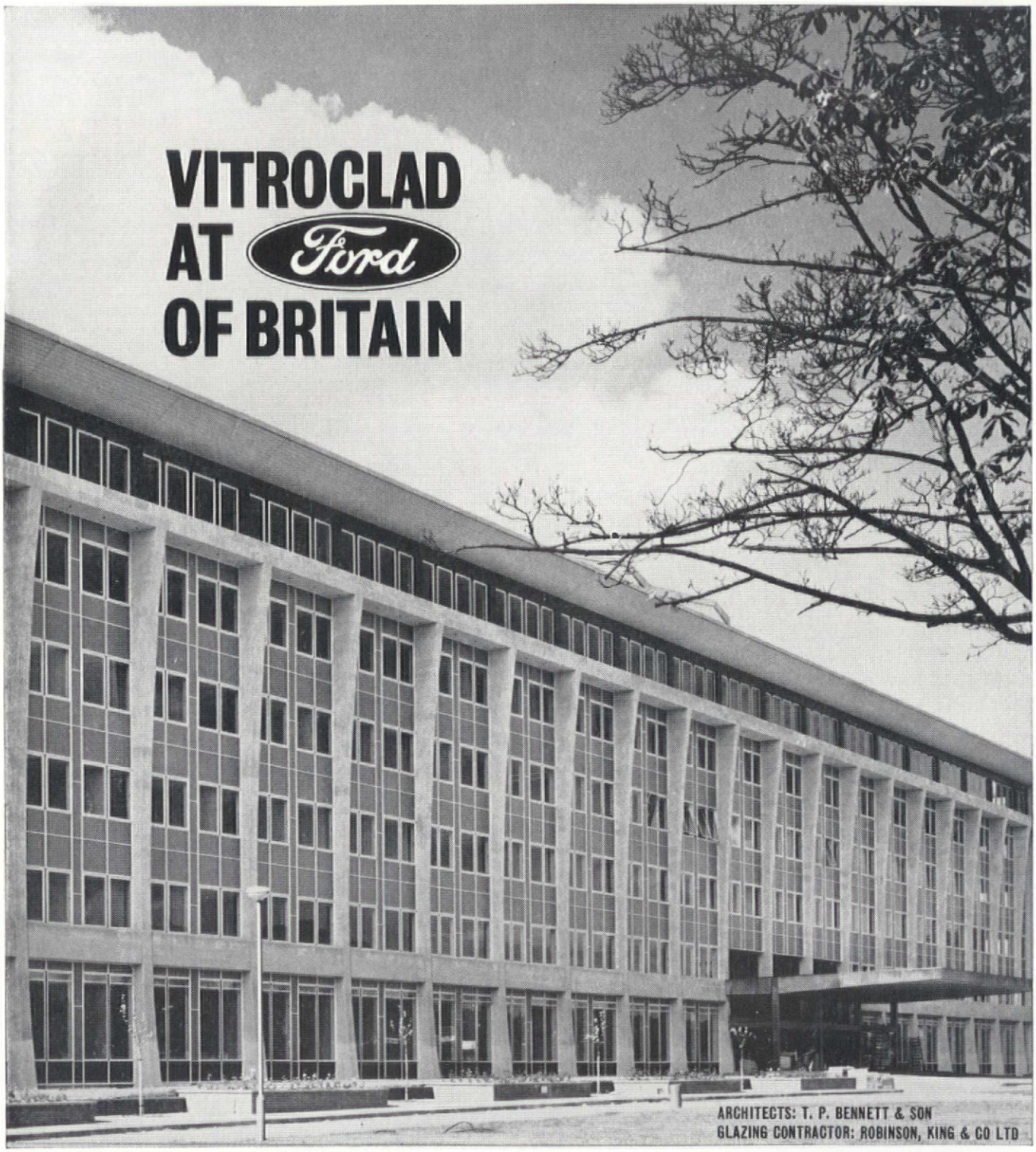

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Services Engineer	B £1600 - £1985
Surveyors Asst. Surveyors	II, III, IV, A or B £895 - £1985
Executive Officers	II £895 - £1125
Clerks	General Division

PROPERTY

POSITION	GRADE
Surveyor	H £2755 - £3260
Surveyors	B or C £1600 - £2155
Surveyors Assistant Asst. Draughtsmen	II, III, IV or A £895 - £1790
Investigators	General Division

The Building Surveyors section will deal with all structural maintenance of the Authority's public buildings, and their adaptation or alteration as required as well as all aspects of Improvement Grants, Standard Grants and Improvement Areas and conversion of Council properties for housing purposes.

The applicants for the post of Surveyor (Buildings) and for the posts of Building Surveyors must be members of the Royal Institution of Chartered Surveyors.

The applicant for the post of Chief Administrative Officer will be required to have outstanding vision and ability and to establish sound administrative practices in the various divisions of the Department and to study method by which good administration can assist in giving a more efficient professional service.

The Services Engineer must be a qualified member of an appropriate professional body and have considerable experience and knowledge in the fields of electrical installations, sanitary engineering, heating and ventilation engineering.

The Property Division will be responsible for all the Council's property interests, comprising acquisition by agreement and under compulsory powers for Central Area redevelopment, slum clearance and housing. Valuation will, in the main, be the responsibility of the District Valuer.

Duties will also include demolition contracts, building lease arrangements, loans for house purchase, fire insurance valuations, management of properties other than housing.

The Property Surveyor is required to be an Associate member of the Royal Institution of Chartered Surveyors with considerable experience in the above listed responsibilities. The Surveyors to assist him are equally to be Associate members of the Royal Institution of Chartered Surveyors.

from the Town Clerk, Municipal Offices, Peckham Road, S.E.5.

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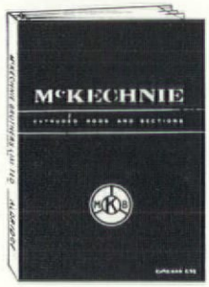

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Sunderland F.C. plan Super Stadium for 1966 World Cup

Roker Park has been one of the leading centres of soccer since it first opened its gates to League football in September, 1898. The selection of this ground to house the World Cup games in 1966 has given impetus to the development schemes which have been under consideration for a number of years. A new grandstand at the Fulwell end has been roofed with Fort Sheets, and will accommodate nearly 20,000 spectators in comfort, whatever the weather conditions.

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The Roofing Contractor:
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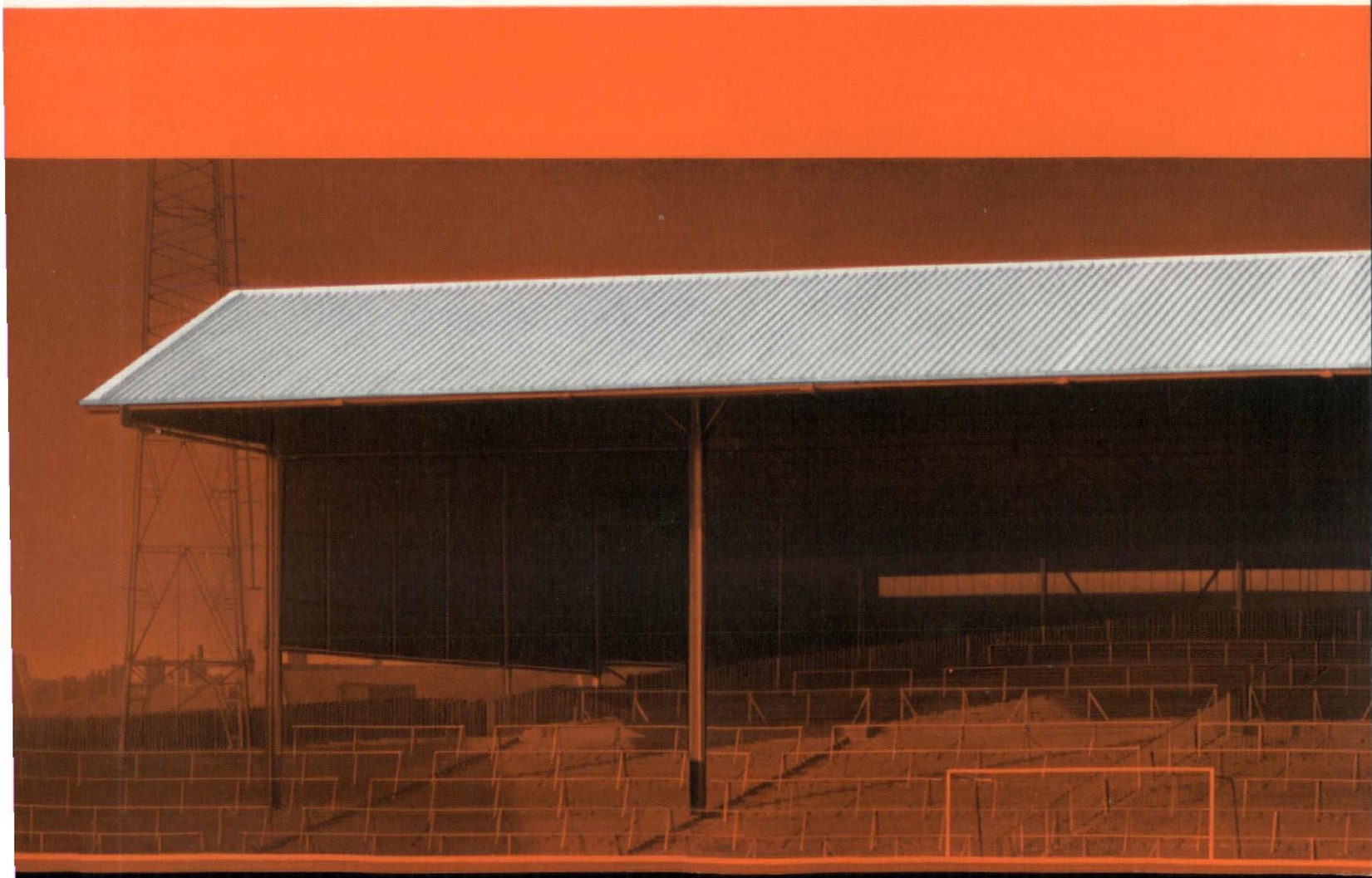

fort

makes a grandstand finish!

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Please make use of this service which is available to help you.

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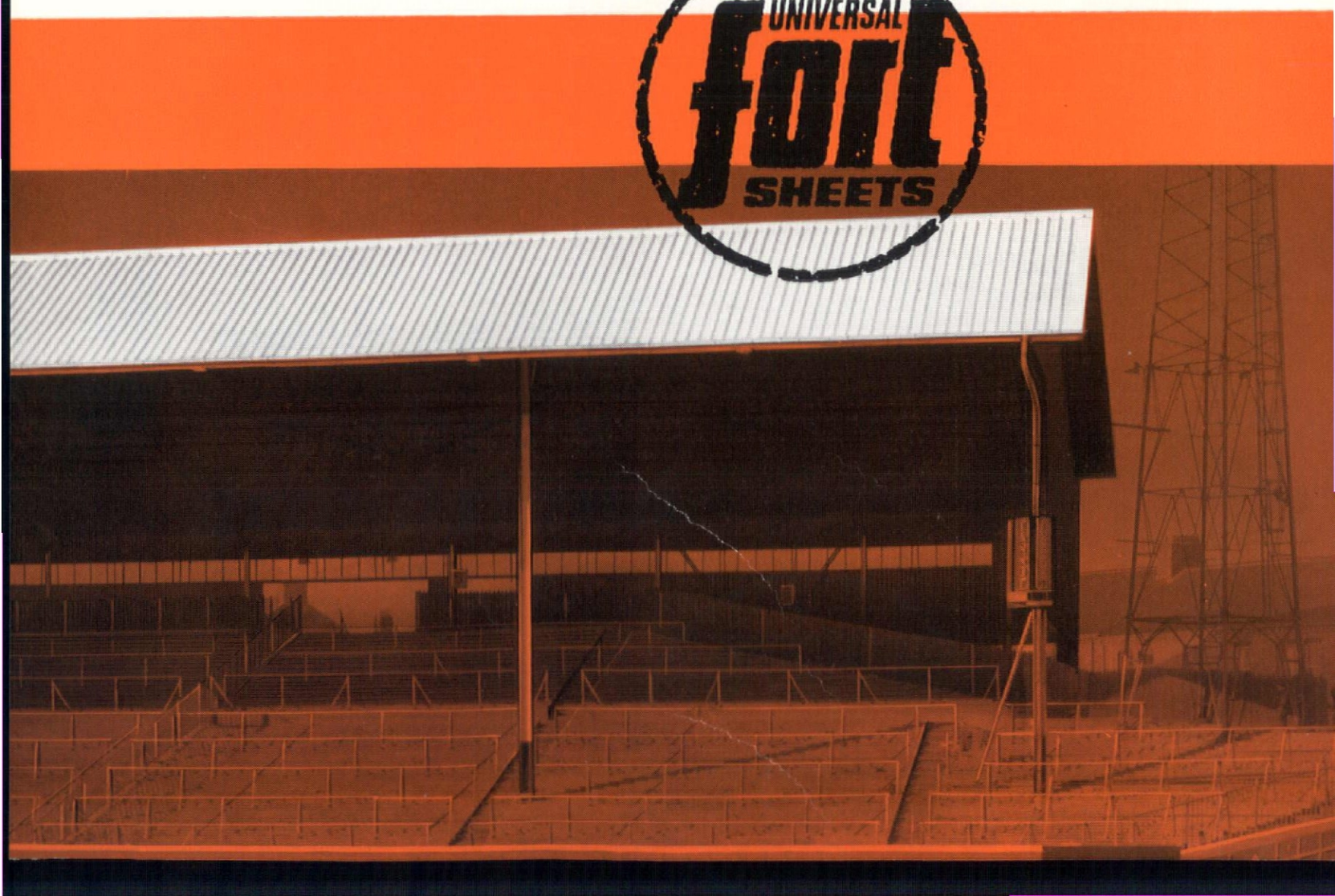

Amid the rubble and ashes of this gutted factory, the lift shaft still stands — protected by two RAX roller leaf fireproof steel shutter doors.

*These Rax doors were constructed in accordance with F.O.C. specification No. 19, providing fire resistance grade 'C' (2 hour duration).

Rax Approved Fireproof Doors and Shutters can be installed to give 2 or 4 hour protection to meet F.O.C. or L.C.C. requirements. The Rax Fireproof range includes sliding folding shutter doors, sliding steel 'M'-type 'Raxdor', armoured doors, steel plate doors and fire resisting rolling shutters, all available with fusible link gear. For fire-proof and fire-proved protection, you can safely recommend Rax.

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Barbour Index File No. 398

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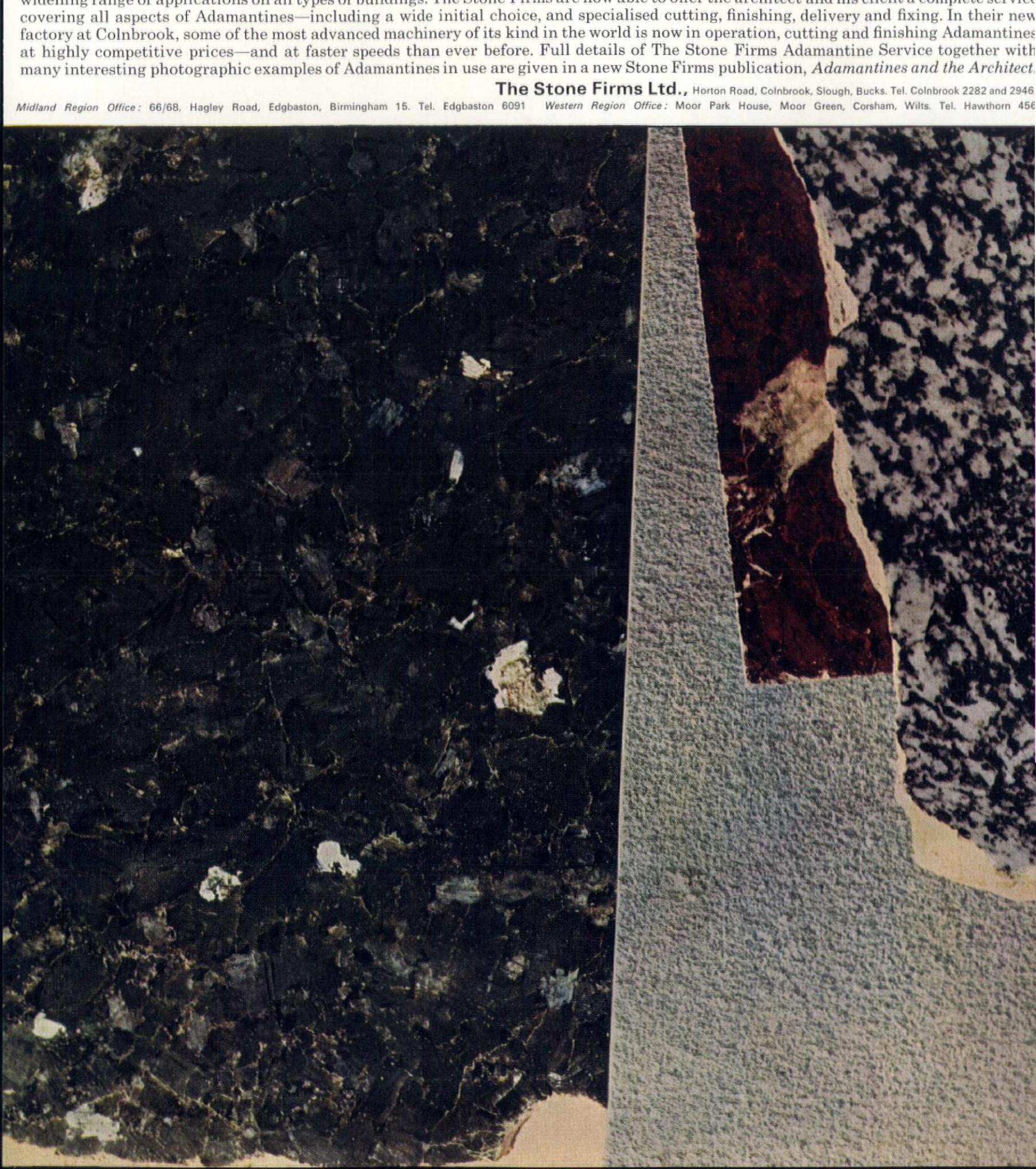


"Thus wall away doth go"

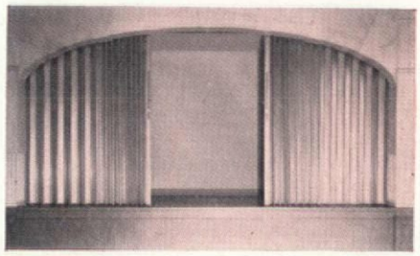
MIDSUMMER NIGHTS DREAM

The best that we may say about a wall
Is that, located where it is, it makes
A fairish compromise. But too few rooms
Would not be that much better if they were
A good bit larger; and the rub is here—
To make a larger room a wall must move
And thus another room will smaller grow.

For many years the architects have sighed
Like Pyramus and Thisbe, for a wall
That does not stand immovable, nor yet
Doth make a barrier for ever more.

But Modernfold! Ah, here is such a wall
With attributes that rigid walls have not;
Not only is this wall retractable,
But elegant it is, its texture fine,
A wealth of splendid colours for your choice.
All Modernfold dividers are so made
That they are draughtproof;
and for those who wish,
A wall may be provided that is called,
"Soundmaster"—and it keeps the noise outside.

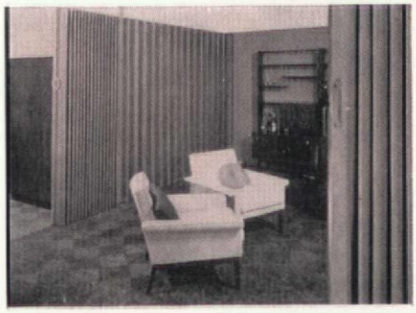
A triumph of construction are these walls,
Mechanically sound and beautiful;
In Modernfold we offer such a wall
As will enhance interior decor
In every noble edifice you draw.



SPLENDOOR installation at Napier Hall, Hide Place S.W.1.

MODERNFOLD CURVED TRACK installation at the White Hart, Portchester, Hants.

MODERNFOLD doors in series in the West End Showroom of A. Rosner & Sons Ltd.



WALLFOLD installation at Trend House, Wolfe & Hollander's Bradford Store.

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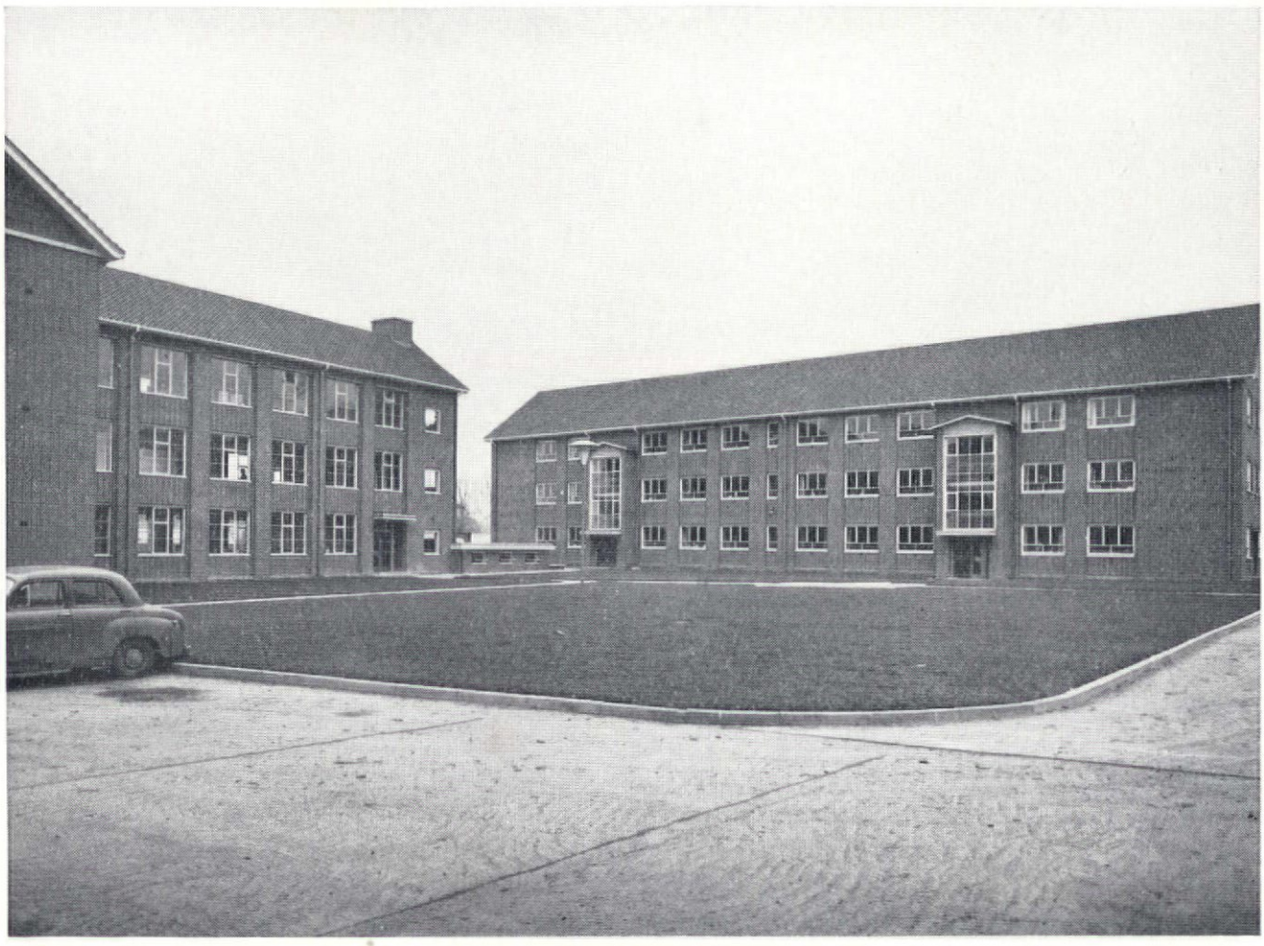

The bricks: Ibstock red sandfaced wirecuts
The building: St. Paul's Training College Newbold Revel, nr. Rugby

Architects: Harrison & Cox, 49 Frederick Road, Edgbaston, Birmingham 15
Contractors: H. Clarke & Sons Ltd., Coronation Road, Coventry

See the permanent exhibition of Ibstock and Himley machine and hand made bricks at the Ibstock showrooms, 29 Crawford Street, London, W.1.

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Subsidiary company: Himley Brick Co. Ltd., Kingswinford, Brierley Hill, Staffordshire Kingswinford 3118

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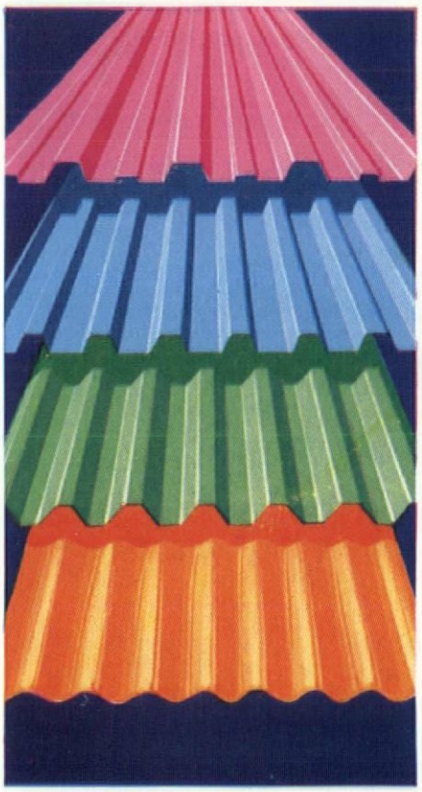
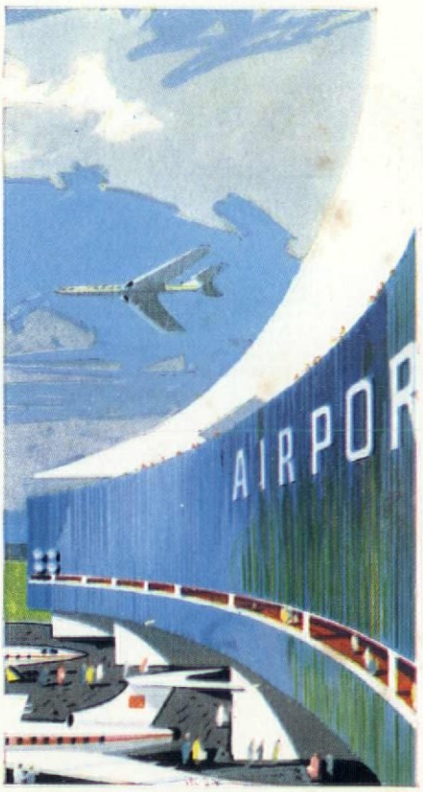
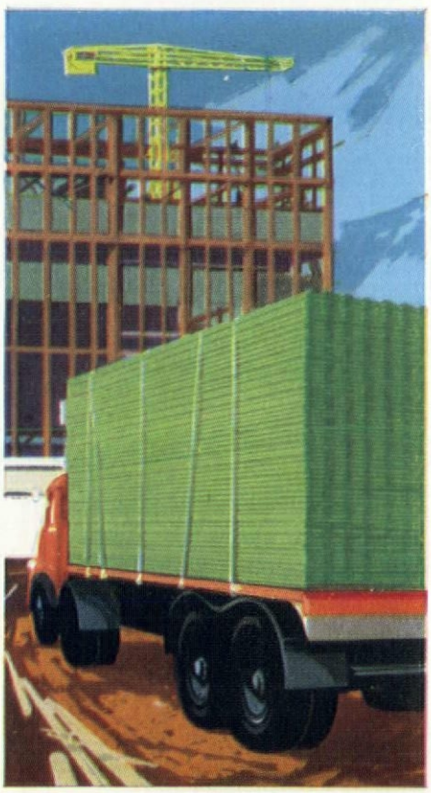
Colourful reasons



Exciting reasons



Rapid reasons



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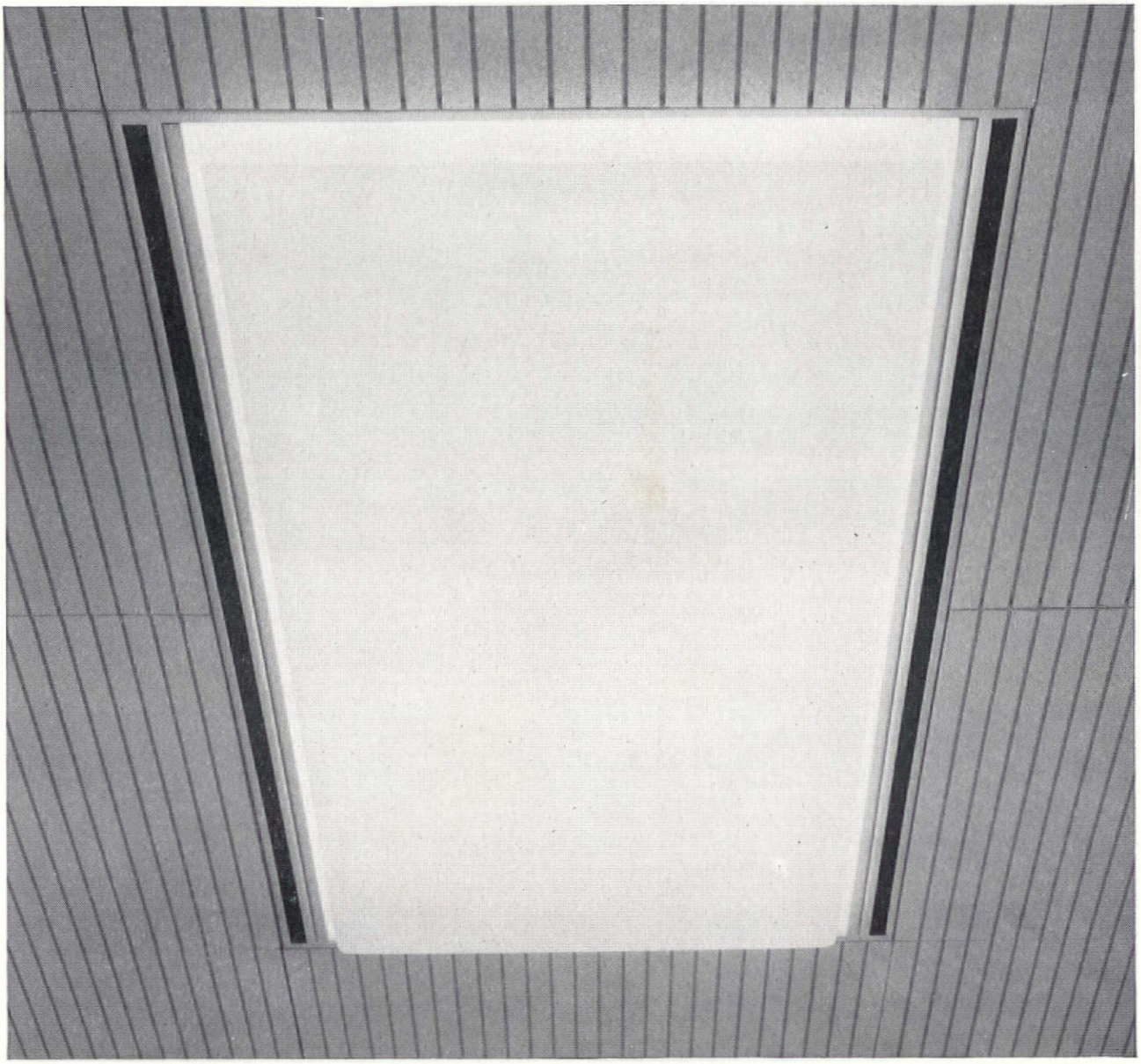
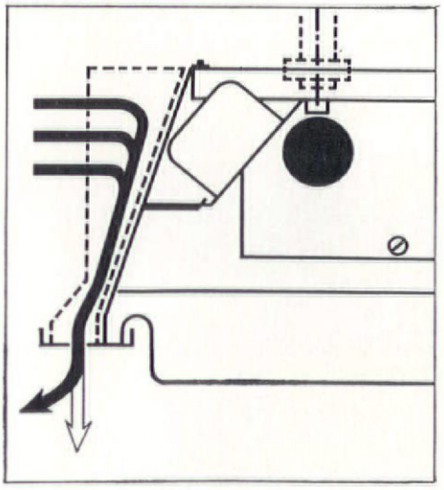


New 'Air-Lume' system combines ventilation with fluorescent lighting



With the introduction of 'Air-Lume one system can now serve the dual purpose of lighting and ventilation. This enables the architect to integrate still further his ceiling design. The Atlas KVD series of air-handling recessed fluorescent fittings has been designed to accept a number of specialised air diffusers either on one or both of its long sides. The fittings can also be supplied to suit the specific requirements of clients.

The fitting is compatible with most suspended ceiling systems and it is important to note that the sequence of installation can be varied to suit the two trades involved and the site conditions.

The Atlas KVD series of fittings are available in the same length and wattages as the standard Atlas Modulite range.

Companies which have installed, or are about to instal Atlas 'Air-Lume', include Messrs. Cadbury Brothers Limited and E. S. & A. Robinson Limited.

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A 'concrete' example . . .

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One of the great advantages of STRAMIT roof-decking is the speed and ease with which the slabs can be fixed to all kinds of framing, including precast concrete sections. For this concrete-framed factory at Wallasey, the slabs were secured to the purlins by STRAMIT special fixing clips fabricated to suit the purlin profile and speed up the operation. The ends of the slabs were supported in steel tees, the whole forming a rigid, durable structure with excellent thermal insulation properties and a high degree of fire-resistance. When weathered with built-up felt of a green mineral finish, the "U" value of the roof was 0.23. Full technical information available on request. Ask for Technical Brochure STC 1004 (or see Barbour Index File No. 225 or Gorco Bureau Section 20/14).

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Lumenated Ceilings offer a standard range, and design and manufacture any type of ceiling to special requirements. Heating, ventilation and sprinkler outlets can be incorporated. Ceilings can be integrated with demountable partitioning. Advisory Service. Please write for full information.

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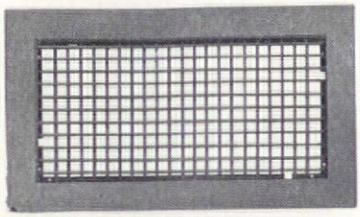
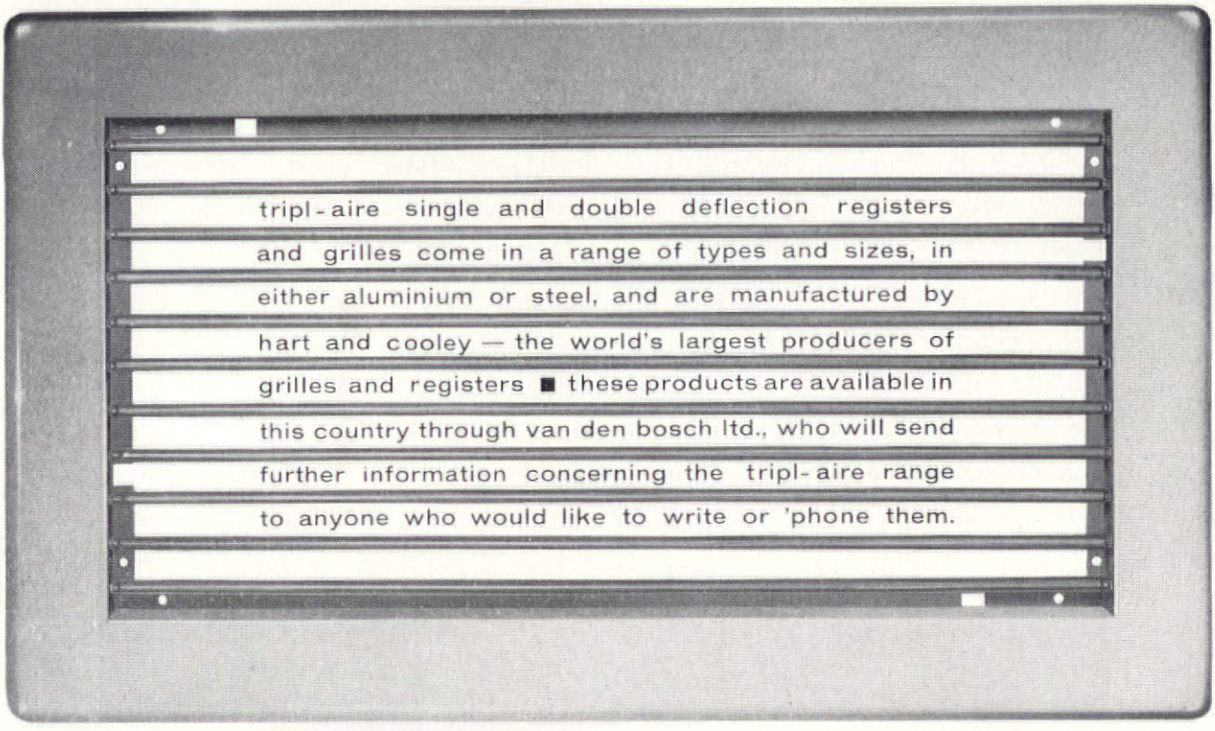


Reading between the lines



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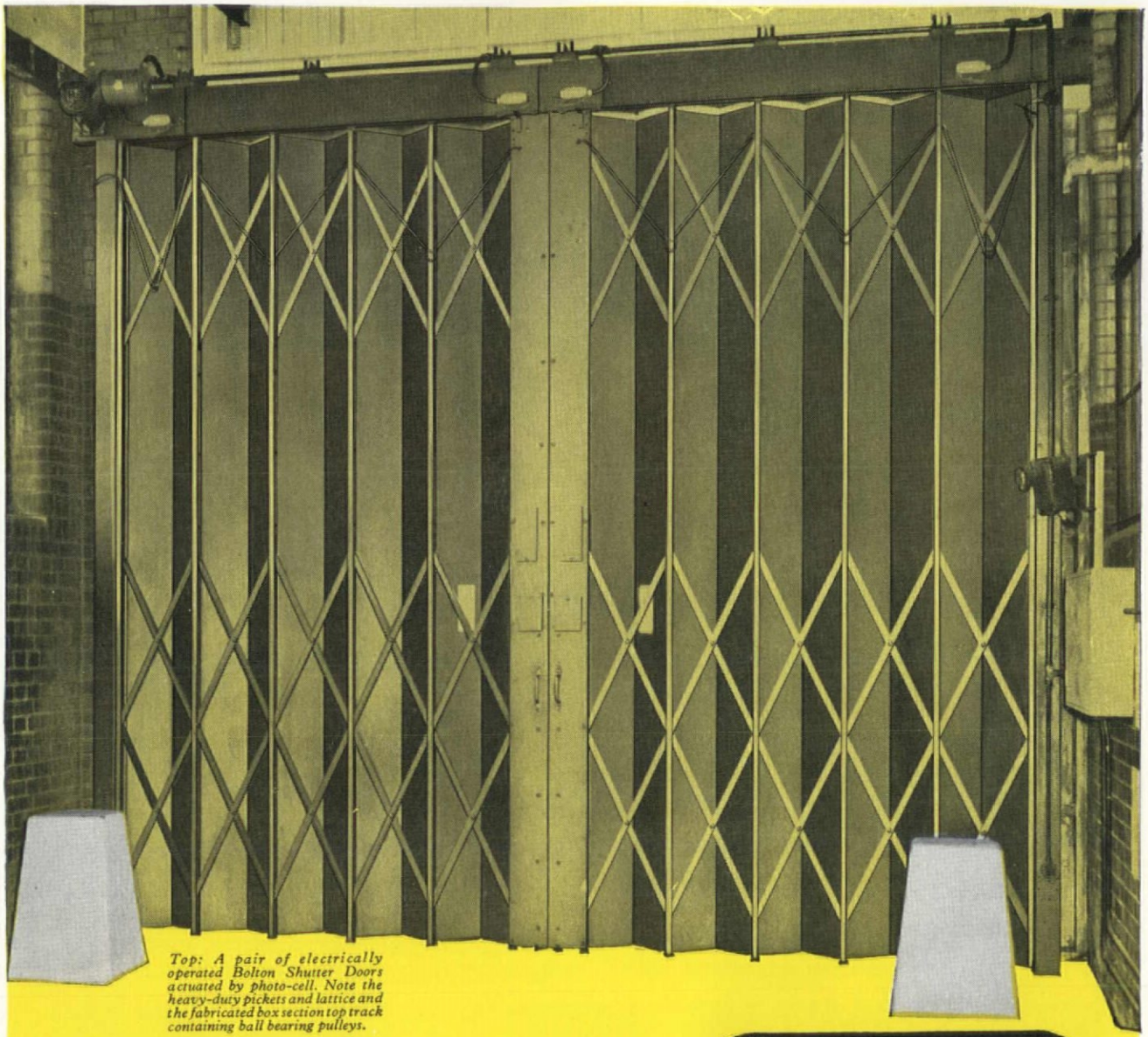

Top: A pair of electrically operated Bolton Shutter Doors actuated by photo-cell. Note the heavy-duty pickets and lattice and the fabricated box section top track containing ball bearing pulleys.

Bottom: A run of Bolton Shutter Doors with shutter leaves, cover plates and shutter fronts of aluminium alloy.

Benefit from **BOLTON** GATE CO LTD

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SfB 32

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SHUTTER DOORS
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- ★ Bolton Shutter Doors are built in any size up to 45 ft. high and 200 ft. wide. They are also available in standard sizes from stock!
- ★ Shutter leaves of 16's gauge steel rust-proofed by the Sherardising process—superior to other methods because the surface is penetrated by the zinc coating. Ends of leaves rolled round $\frac{1}{8}$" reinforcing wire providing great vertical strength and perfect hinging.
- ★ Manufactured only from top-quality tested materials, Manganese bronze or aluminium alloy hinging strips. Doors built on $\frac{3}{4}$" to 1" steel pickets and $\frac{3}{4}$" x $\frac{1}{4}$" to 1$\frac{1}{4}$" x $\frac{3}{8}$" lattice. End panels, where required, fabricated from $\frac{1}{8}$" sheet steel.
- ★ Ease of operation and minimum maintenance ensured by totally enclosed, fabricated box-type top track and self-cleaning bottom track. Ten times faster in operation than other types of door.
- ★ Hand or power operated—a variety of push-button, floor pad and photo cell control systems are readily installed.
- ★ Available in a wide variety of finishes from cellulose to stelvetite plastic coated leaves. Remember, too, that Bolton Shutter Doors form a dust-resisting, draught-resisting and fire-resisting screen.

1 *A pair of electrically operated Bolton Shutter Doors more than 32 ft. wide and 17 ft. high at a bus depot.*

2 *A pair of Bolton Shutter Doors at Waterloo Station.*

3 *Two pairs of Bolton Shutter Doors at a British Railways maintenance depot — note the track clearance.*

4 *A Bolton Shutter Door on a private garage—arranged to bunch in either direction or to the centre.*

5 *Bolton Shutter Doors at Sutton Fire Station, Surrey. All the doors open automatically in seconds—actuated by a signal transmitted from the switch board receiving 999 calls.*

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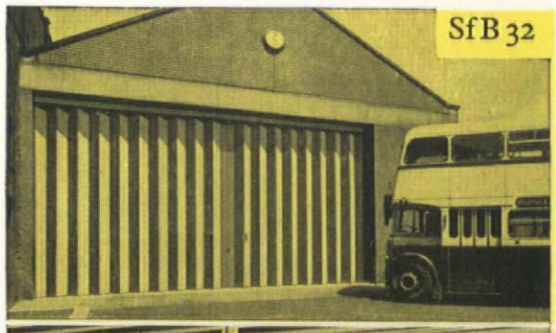

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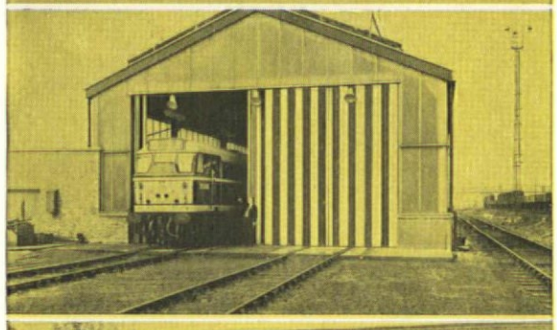

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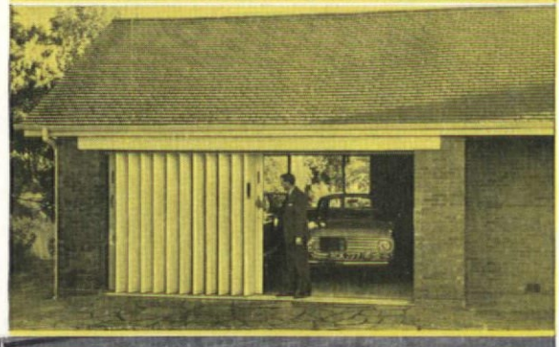

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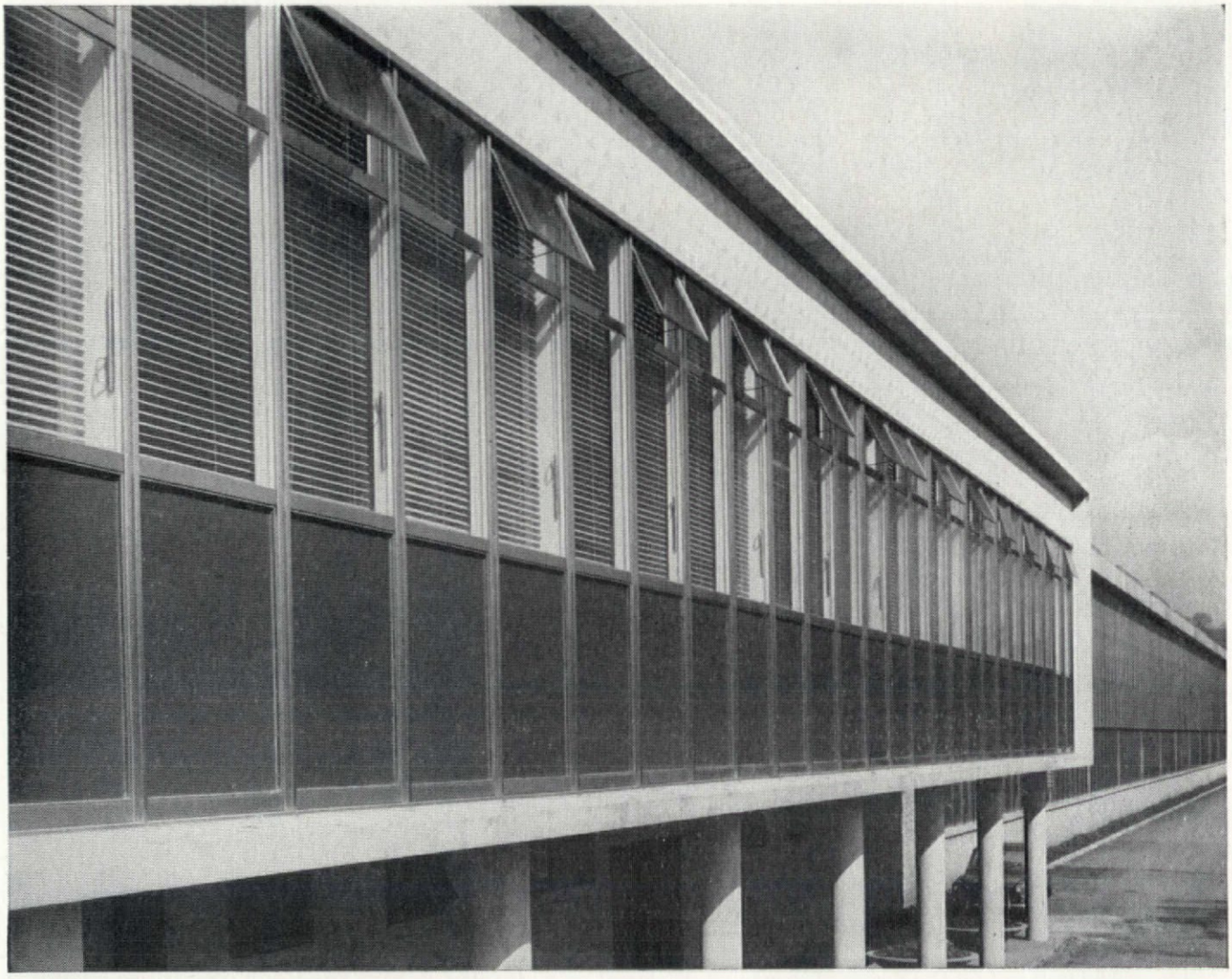
BG535



SPEEDY ERECTION OF STAINLESS STEEL WINDOW WALLING

Morris Singer Holoform Mark II window wall system has been applied to the Wire Department of Samuel Fox & Company Limited. The system consists of pressed "Galvatite" sections clad externally with stainless steel. The transoms are secured to mullions by a device which compresses a butyl rubber gasket between the two members. To speed erection, mullion and transom assemblies were delivered to the site in ladder form. Glazing is secured by means of internal "Galvatite" glazing beads. The top-hung open-out ventilators are in stainless steel and are operated by Arens Controls.

"Escol" infill panels, secured by means of external stainless steel glazing beads, have been used in this instance to provide a colour contrast, but polished stainless steel could have been an effective substitute.

Write for a copy of "Stainless Steel in Architectural Design" (60 pages).

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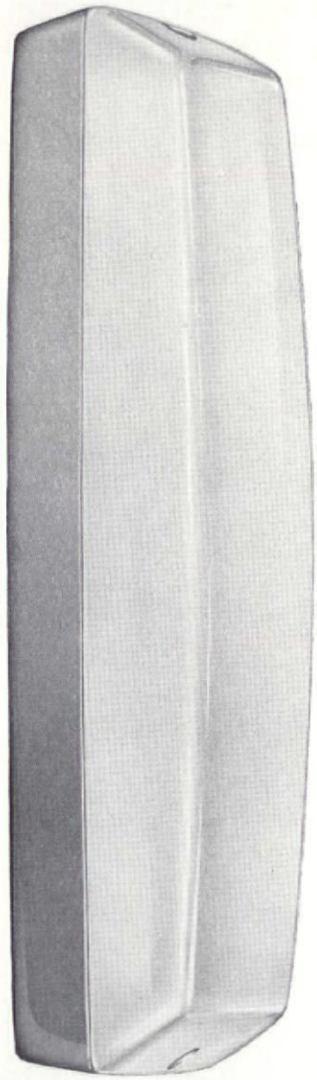
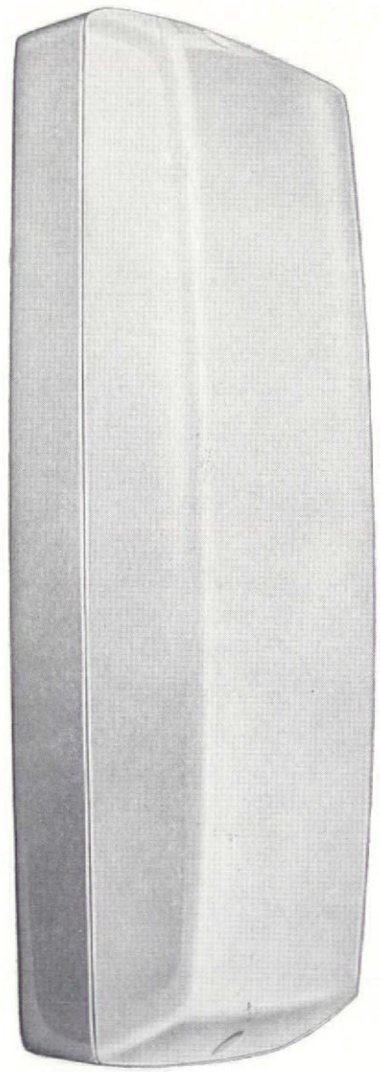
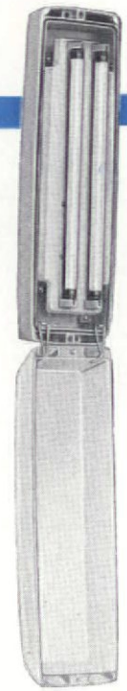




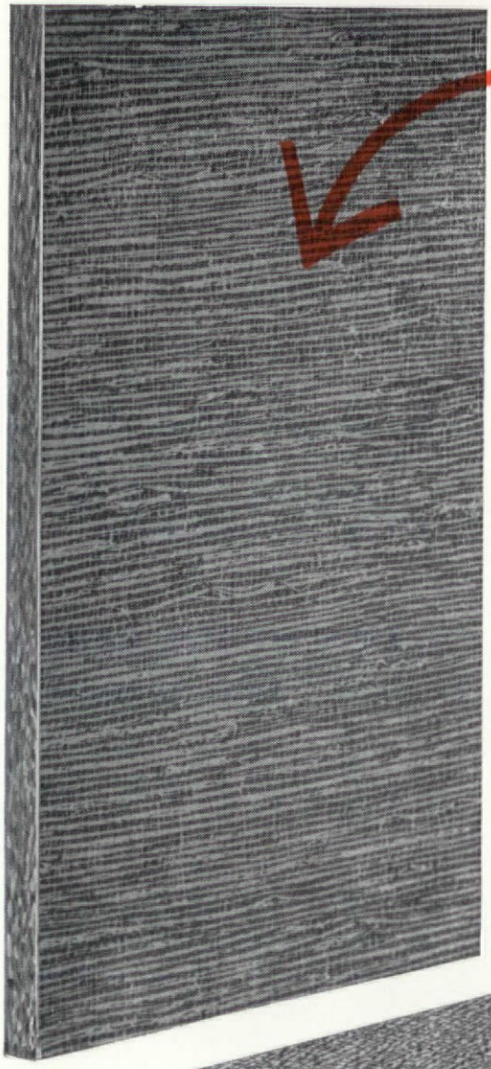


SFB. 16
for two 8w. Tubes

The exclusive features of these new fittings are fully described and illustrated in Leaflets 25/c and 27/c available on request.

Designed and Produced by J. & G. COUGHTRIE LTD., HILLINGTON, GLASGOW, S.W.2

decorative boards for many a purpose



This is

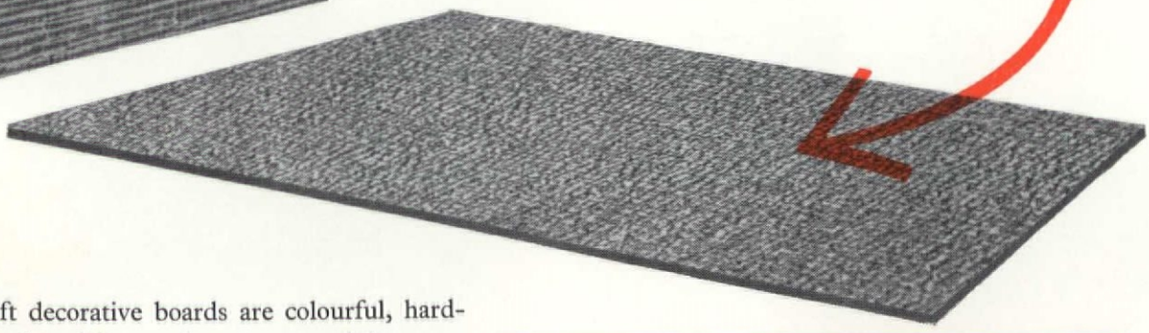
weydec

12 and 18mm Weyroc, with a hard-wearing melamine surface on one or both sides. Ideal where structural boards with integral plastic surfaces are required, as in shop and bar fitting and furniture making. Particularly suitable for fitments in hospitals, catering establishments, schools and laboratories.

This is

hardec

⅛in selected hardboard, with an integral hard-wearing plastic surface on one or both sides. Excellent for wall linings, sliding cupboard doors, door and bar facings and other applications where hygienic plastic surfaces integrally mounted on non-load bearing boards are required.



Both 8ft x 4ft decorative boards are colourful, hard-wearing, scratch and heat-resistant, non-staining, easy to clean, maintenance-free and permanent. Both are economical—costing less than board and surfacing material purchased separately.

Barbour Index File No. 252.

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AP301

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"And up . . . and down . . . two, three, four . . . Listen to the music . . . three, four." Belles on their toes want no clangour in their ears. And the first steps should lead to Cullum who sell and fix most leading brands of acoustic tiles. Cullum are feet on the ground experts on acoustic ceilings. Have been for over 30 years. Ask us to trip over and see you.

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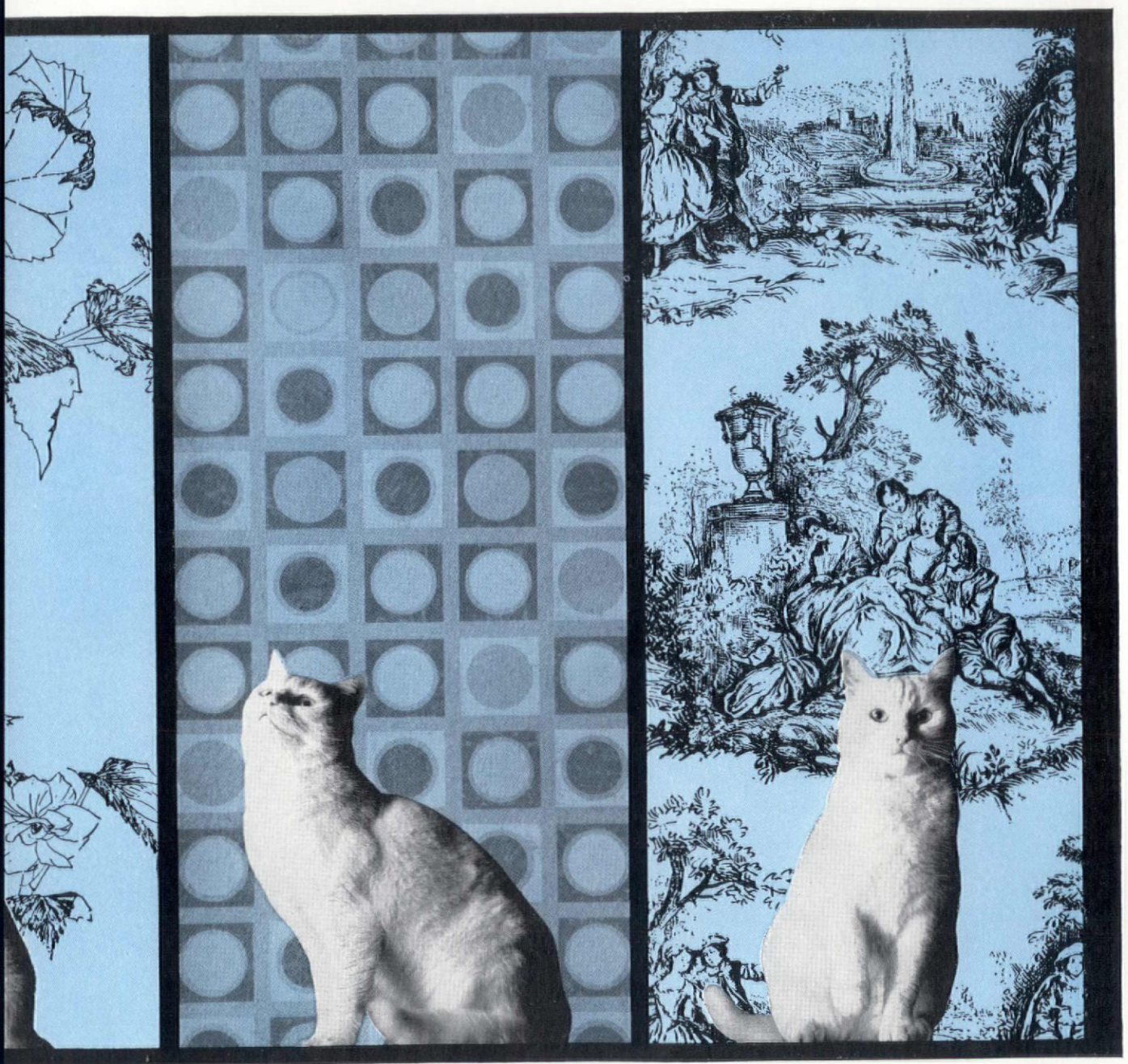
New from ICI makers of DULUX

DULUX—a reliable, durable range of finishes, undercoats and primers designed to suit all building surfaces. Unsurpassed for durability and available in a range of modern colours extending from the most brilliant whites to the BS2660 range. DULUX is backed by the considerable technical know-how of ICI.

New V

YMURA

wallcovering—with as many lives as a cat!



VYMURA—a new idea in wallcovering. Original in design and texture and with a touch like fabric, yet VYMURA is tough enough to be scrubbed repeatedly. VYMURA offers exciting new possibilities for the decoration of public and domestic buildings. VYMURA is a tough p.v.c. coating on a paper backing, it hangs easily like wallpaper, and comes pre-trimmed in standard sized wallpaper rolls.

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44 STANDARD STOCK SIZES OF PILKINGTONS'

4" x 40 3/16" 24" x 44 3/16" 27" x 40 3/16" 30" x 44 3/16"
" x 40 3/16" 33" x 44 3/16" 33" x 40 3/16" 37 1/2" x 45 3/4"
1/2" x 27 3/4" 43 1/2" x 33 3/4" 43 1/2" x 21 3/4" 43 1/2" x 45 3/4"
1/2" x 27 3/4" 49" x 33 3/4" 49 1/2" x 45 3/4" 30 3/8" x 42 3/4"
9/16" x 46 15/16" 39 1/8" x 21 7/8" 40 3/16" x 22 15/16" 40 3/16" x 46 15/16"
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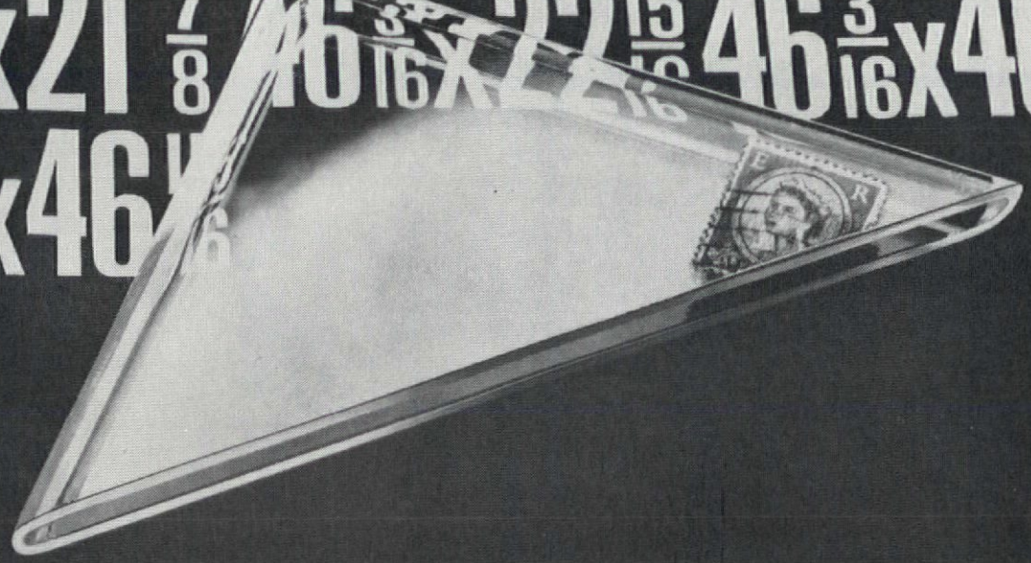
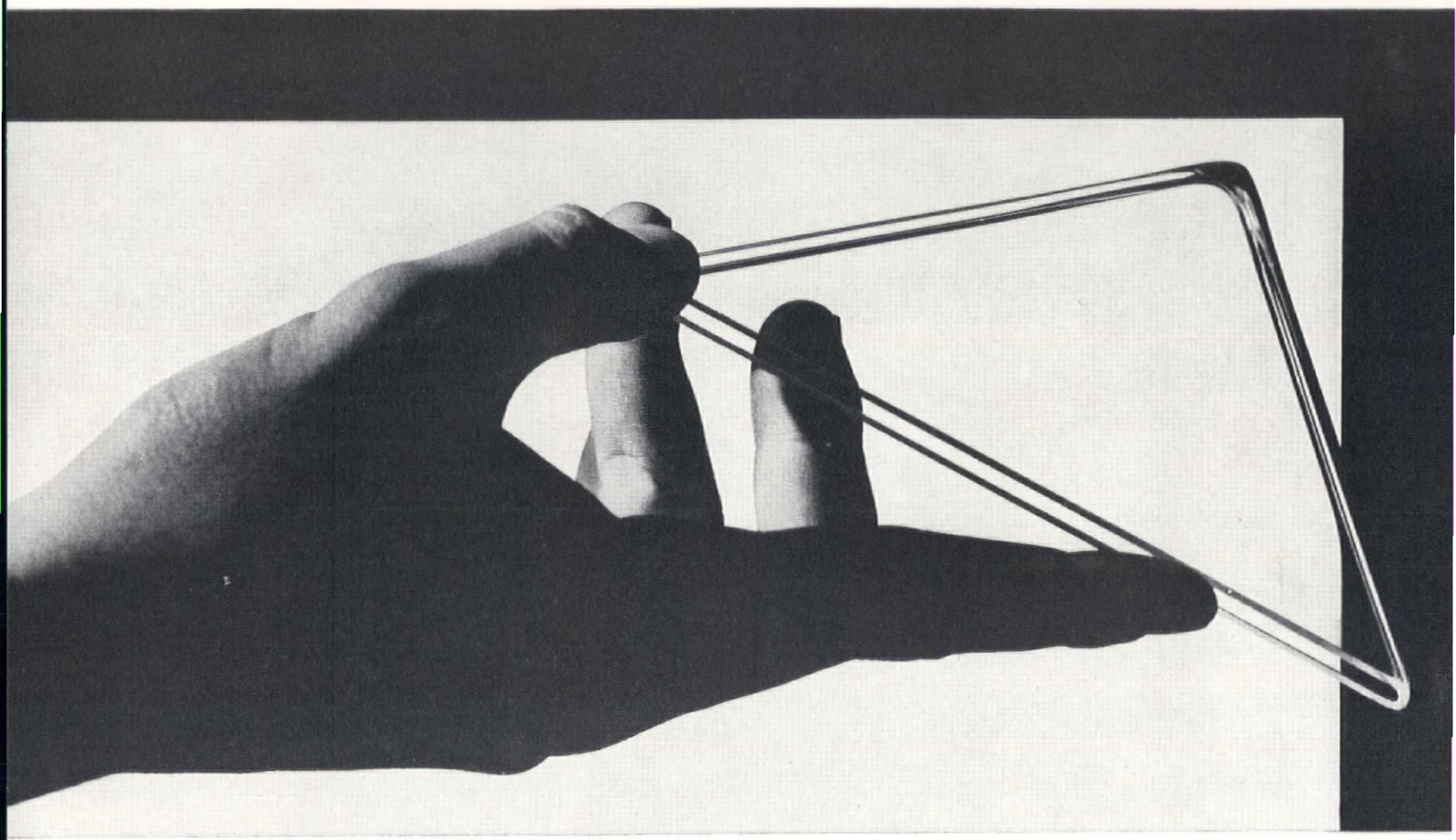


NEW 'INSULIGHT' GLASTOGLAS DOUBLE GLAZING UNIT



THE NEW GLASTOGLAS UNIT HAS ALL-GLASS PERMANENT SEAL

Pilkingtons' new 'Insulight' Glastoglas double glazing unit—the unit with the all-glass seal—is now available for delivery in standard stock sizes. The range is continually being increased and will include units to fit the new Module 4 standard steel windows. Pilkingtons' new Glastoglas 'Insulight' unit makes the double glazing of large numbers of standard-sized windows easier, surer. The unit is of all-glass construction. Two panes of 24 oz. Sheet Glass are spaced $\frac{3}{16}$″ apart and the edges are fused together to make a permanent seal. Neither special frames nor complicated glazing techniques are needed. Glastoglas units are made in two ranges of stock sizes from 10 x 16 inches to 32″ x 38″ and from 18″ x 39″ to 50 x 70 inches. Purpose-made sizes can be supplied when 200 or more of the same size are ordered.

Sizes now available for delivery from stock are:

Height	Width
10$\frac{1}{4}$″	× 21$\frac{7}{8}$″
11$\frac{1}{4}$″	× 22$\frac{13}{16}$″
21″	× 32$\frac{3}{16}$″
21″	× 36$\frac{3}{16}$″
21$\frac{7}{8}$″	× 21$\frac{7}{8}$″

Height	Width
22$\frac{13}{16}$″	× 22$\frac{13}{16}$″
24″	× 28$\frac{3}{16}$″
24″	× 32$\frac{3}{16}$″
24″	× 36$\frac{3}{16}$″
24″	× 40$\frac{3}{16}$″

Height	Width
24″	× 44$\frac{3}{16}$″
27″	× 32$\frac{3}{16}$″
27″	× 36$\frac{3}{16}$″
27″	× 40$\frac{3}{16}$″
28$\frac{1}{2}$″	× 22$\frac{13}{16}$″

Height	Width
30″	× 32$\frac{3}{16}$″
30″	× 36$\frac{3}{16}$″
30″	× 40$\frac{3}{16}$″
30″	× 44$\frac{3}{16}$″
30$\frac{3}{4}$″	× 42$\frac{1}{4}$″

Height	Width
33″	× 40$\frac{3}{16}$″
33″	× 44$\frac{3}{16}$″
33$\frac{1}{2}$″	× 21$\frac{7}{8}$″
34$\frac{3}{16}$″	× 22$\frac{13}{16}$″
34$\frac{3}{16}$″	× 46$\frac{13}{16}$″

Height	Width
37$\frac{1}{2}$″	× 21$\frac{7}{8}$″
37$\frac{1}{2}$″	× 27$\frac{1}{2}$″
37$\frac{1}{2}$″	× 45$\frac{1}{2}$″
39$\frac{1}{4}$″	× 21$\frac{7}{8}$″
40$\frac{3}{16}$″	× 22$\frac{13}{16}$″

Height	Width
40$\frac{3}{16}$″	× 46$\frac{13}{16}$″
42″	× 42$\frac{1}{4}$″
43$\frac{1}{2}$″	× 21$\frac{7}{8}$″
43$\frac{1}{2}$″	× 27$\frac{1}{2}$″
43$\frac{1}{2}$″	× 33$\frac{1}{4}$″

Height	Width
43$\frac{1}{4}$″	× 45$\frac{1}{2}$″
45$\frac{1}{4}$″	× 21$\frac{7}{8}$″
46$\frac{3}{16}$″	× 22$\frac{13}{16}$″
46$\frac{3}{16}$″	× 46$\frac{13}{16}$″
49$\frac{1}{2}$″	× 27$\frac{1}{2}$″

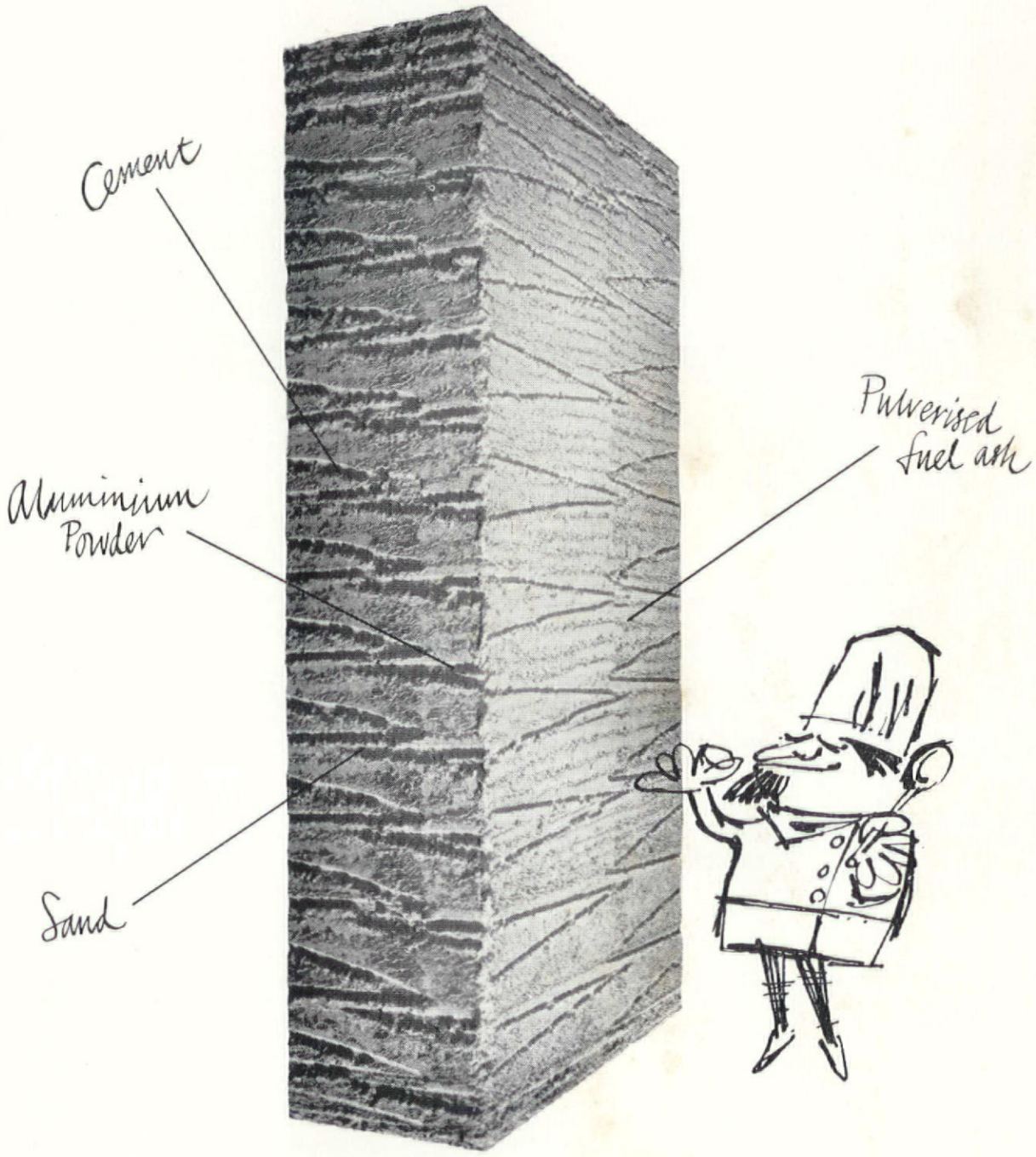
Height	Width
49$\frac{1}{2}$″	× 33$\frac{1}{4}$″
49$\frac{1}{2}$″	× 45$\frac{1}{2}$″
57$\frac{13}{16}$″	× 22$\frac{13}{16}$″
57$\frac{13}{16}$″	× 46$\frac{13}{16}$″

THE MK. VI 'INSULIGHT' UNIT with the metal edge

For larger units or where the added brilliance of Float Glass is required specify 'Insulight' MK. VI metal-edge units. These are purpose made, and are available up to a maximum superficial area of 34 sq ft in 32 oz. Sheet Glass, 84 sq ft in $\frac{1}{4}$″ Float, and much larger sizes in $\frac{3}{8}$″ Clear Plate. In these units a metal spacer is used between the two panes of glass, and the unit is triple sealed. If required MK. VI units can be made using a wide range of glasses. Please submit enquiries. For full details and sizes of both types of Pilkingtons' 'Insulight' Double Glazing Units, contact your nearest Pilkingtons' office or depot. Supplies are available through the usual trade channels.

PILKINGTON 'INSULIGHT' DOUBLE GLAZING UNITS

Pilkington Brothers Limited, St. Helens, Lancashire. (Telephone St. Helens 28882)
London Office and Showrooms: Selwyn House, Cleveland Row, St. James's, S.W.1 Telephone WHItehall 5672



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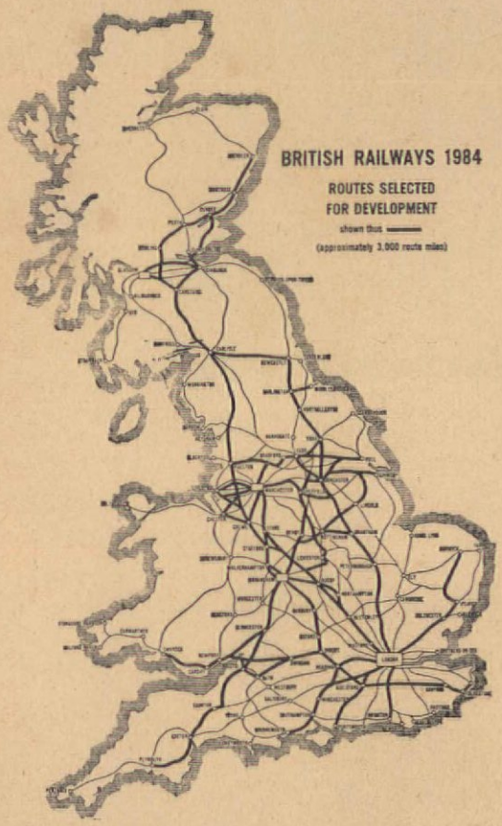
UK News

Terence Bendixson

Beeching Euroway 1

Doctor Beeching's second report on the reshaping of the railways is important not for the lines it obliquely says should be run down, but for the ones it recommends for development. Of these, the key route is the Aberdeen, Glasgow, Liverpool/Manchester, Birmingham, London area and channel tunnel line. This of course is a Euroway and it is interesting that it should have been identified as such by the country's arch computer-figure.



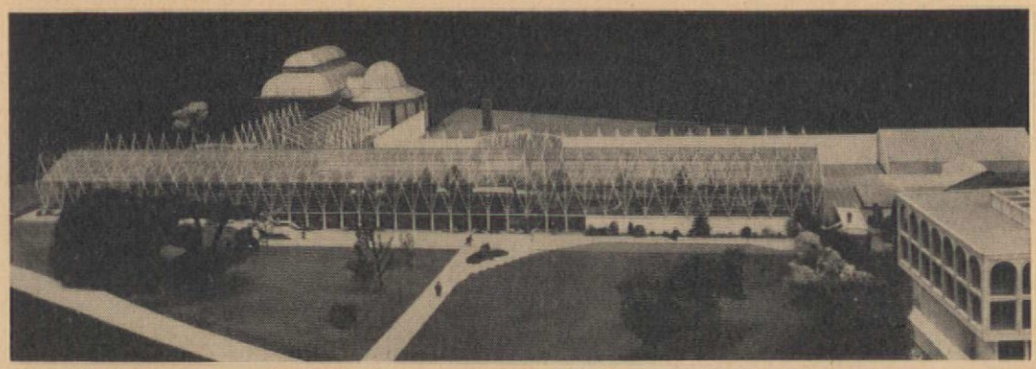
1

Floral space frame

Edinburgh, a city not yet forced to burrow in order to keep on moving, will soon have a glass house in the best Paxton tradition **2.** Glazing over a space measuring 420ft × 60ft will be suspended from tubular steel space frames by $\frac{3}{8}$in stainless steel cables **3.** The resulting column-free interior will be divided by glass screens into five informally planned and climatically different gardens. One of the sections will have a glass walled underground tank to enable visitors to see the roots of water plants. A smaller greenhouse of similar design will link the big one to an existing palm stove. These delicate suspension structures which will be built in the Royal Botanic Garden, are designed by G. A. Pearce in the Edinburgh office of the Ministry of Public Building and Works.

Heavyweight humanities

Manchester University's recent buildings have been pretty shudder-making. The burly new humanities building by Grenfell Baines and James Bannister of Building Design Partnership is a welcome change **4.** Nearby at Liverpool, Frederick Gibberd's Roman Catholic cathedral is going up amid a jungle of formwork **5.** The glazing of the lantern is currently going on.



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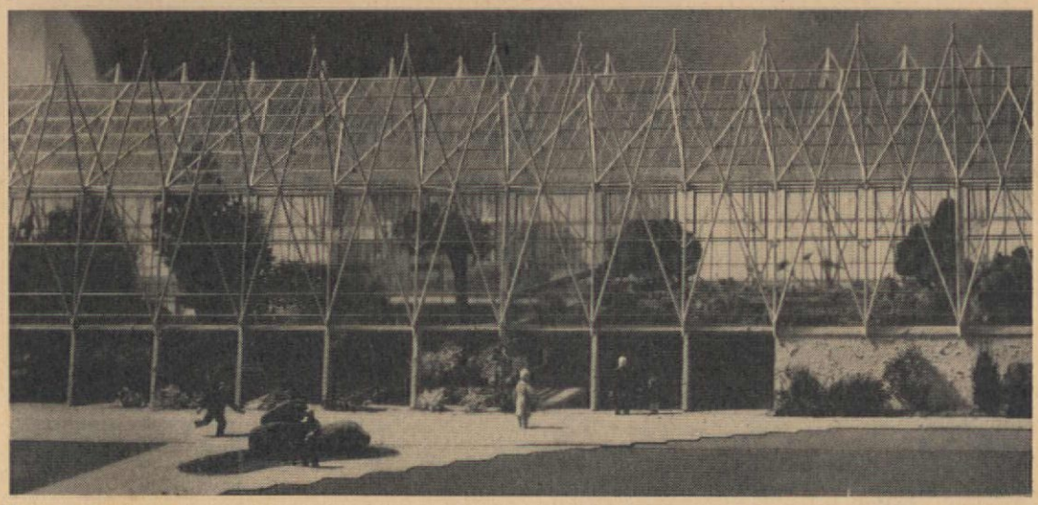

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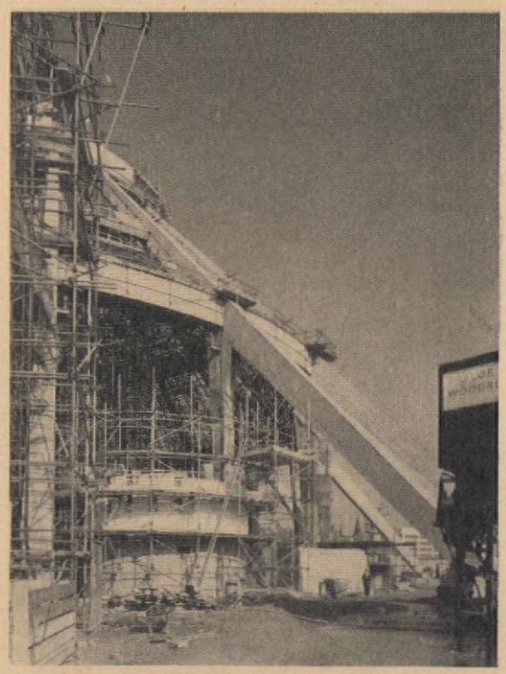


5

Pamphleteers

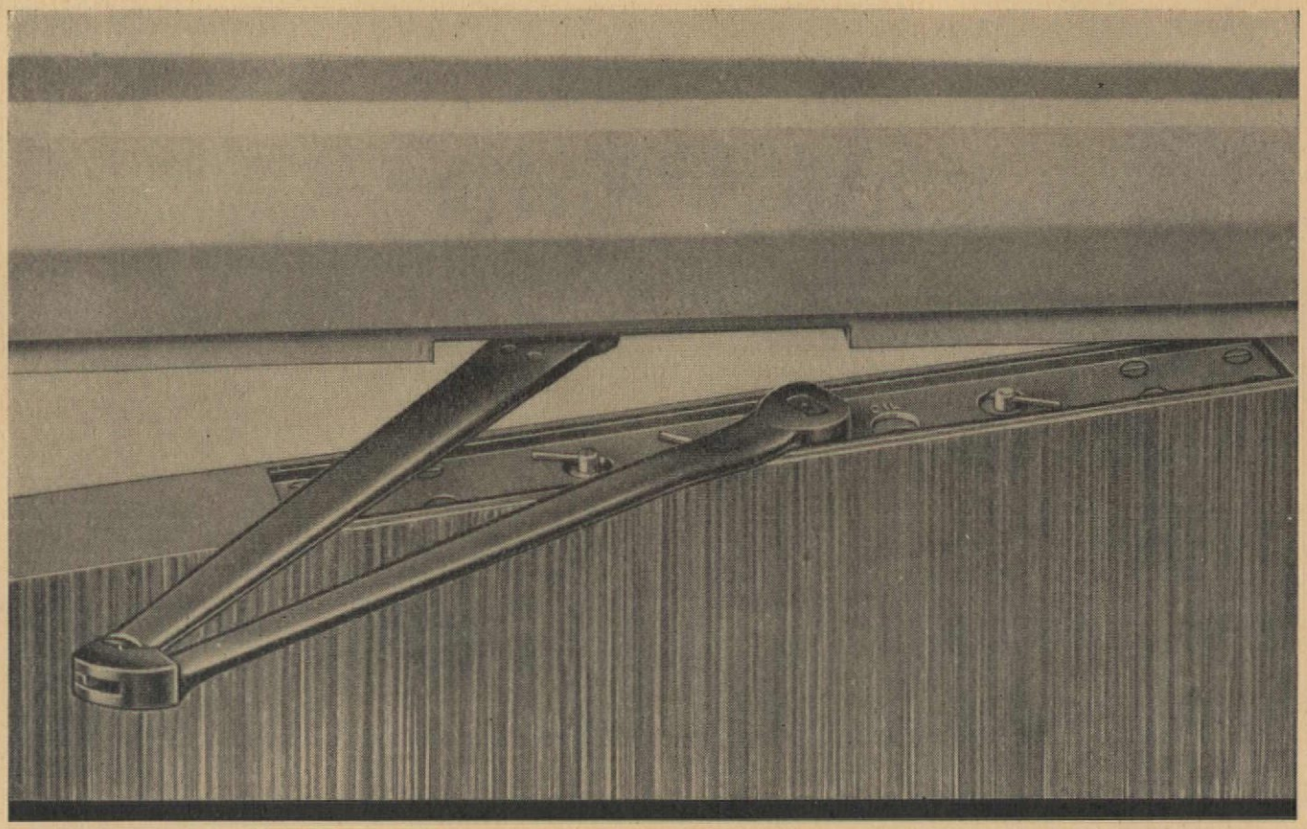
Michael Dower's booklet *Fourth Wave* (a Civic Trust reprint from the *AJ*) shows a variety of British and foreign recreational facilities from the local to the regional scale. The idea of organizing for leisure is repugnant, but if the alternative is filth behind every hedge, there is not much else to do.

The Nursery School Association of GB and N Ireland has published some *New Thoughts on Infant School Playgrounds*. There are occasional bits of authoritarian nonsense—'A tap . . . can be used by the children for water play of various kinds . . . It is *not* used for drinking.' Come off it! But the general gist is excellent and there are useful pictures and plans.

ICOGRADA (the graphics boys), of 9 Clifford Street, London W1, have published a catalogue of 300 journals dealing with graphics—price £1.

Glasgow

Things are really on the up in Glasgow these days. Towers of flats are being extruded from the ground with startling speed. How Glaswegians take to the extrusions remains to be seen, but



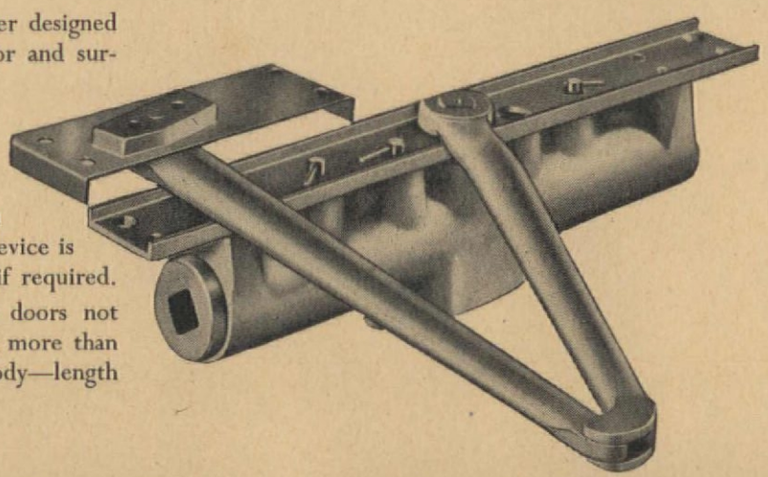
Behind every well-closed door...

The Briton 500 is a concealed door closer designed for use when the appearance of the door and surroundings are of first consideration.

It has a smooth and silky check action that completely eliminates bounce.

An opening of 90° up to 180° can be obtained, depending upon the position in which the closer is fixed. A hold-open device is incorporated to be brought into action if required.

The Briton 500 is suitable for interior doors not exceeding 7′ 0″ x 3′ 0″ and not weighing more than 112 lbs. Overall dimensions of Closer Body—length 13″ width $1\frac{3}{8}$″.



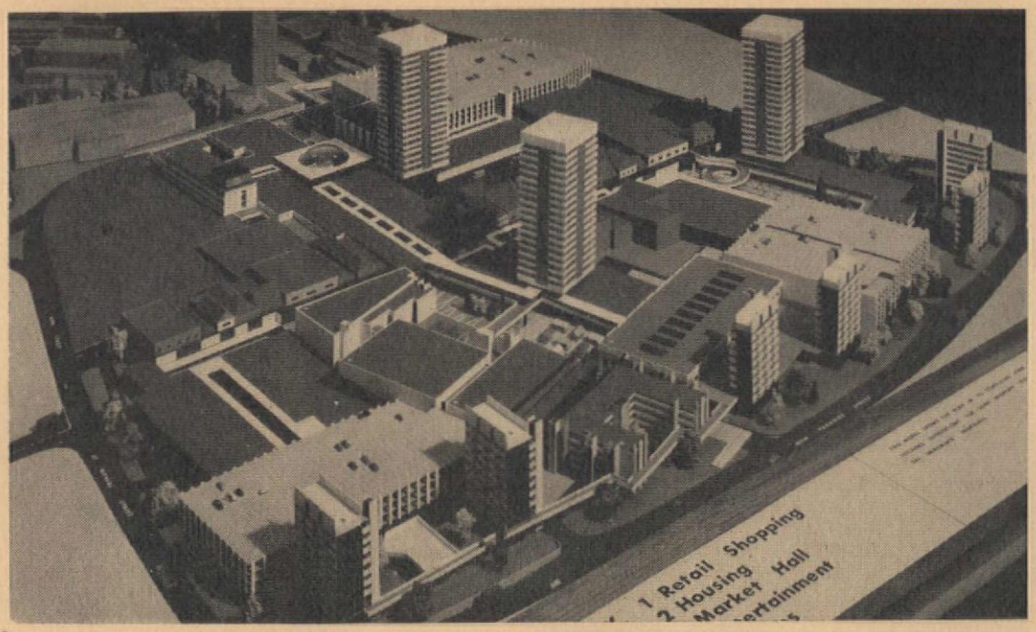
BRITON 500

See our exhibits at the Building Centres, London, Birmingham, Manchester and Glasgow. All details can be found in the Barbour Index File No. 53, and the Gorco Bureau File No. 44/3.

CONCEALED DOOR CLOSER

NEWMANS

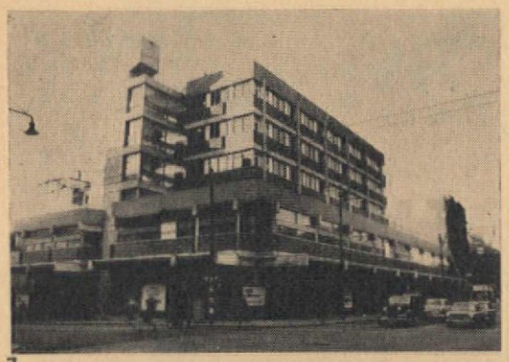
WILLIAM NEWMAN & SONS LTD., Hospital Street, Birmingham, 19



6

UK news/continued

there is always Cumbernauld where houses are now being built at the rate of 1000 a year. Commercial development proceeds at a slower pace and not much of it has the directness of this exposed concrete frame and blue engineering brick office and ship building by Covell, Matthews and Partners **7.**



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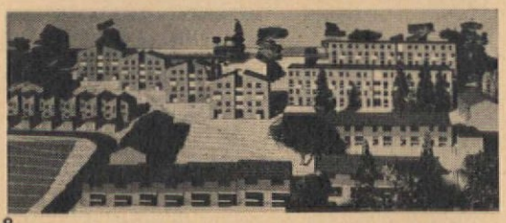

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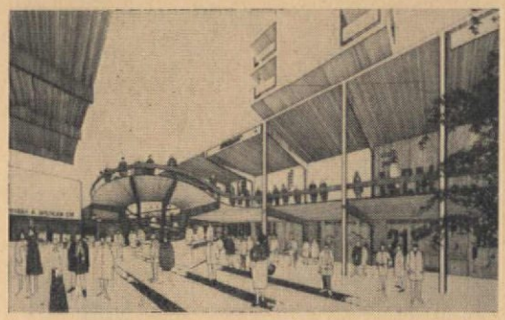
Richmond housing

A pleasant neighbourhood of houses and maisonettes has been designed for the Borough of Richmond, Yorkshire, by Godsmark and Miller-Williams **8.** The site which slopes sharply southwards contains a number of mature and statutorily preserved trees. Pressing for higher standards, the architects are recommending their clients to adopt warmed air heating, sink waste disposal units and paper bag rubbish sacks.

West Bromwich centre

West Bromwich is where the M1, M5 and M6 will meet in the 1970s. Commissioned by the County Borough, John H. D. Madin and Partners have produced a three-dimensional master plan for the heart of the town which promises, by contrast with the approach motorways, some intimate spaces **6, 9.** Many such schemes fall flat on their faces between conception and



9

subsequent execution in diluted form by developers and their architects. In this case great care will have to be taken if the flat-dwellers are not to look down on an aesthetic desert of tank rooms and tatty gravel chippings.

Corrections

AD January, 1965/French number

Monsieur Michel Ecochard has asked us to publish the following corrections relating to the article concerning ATBAT (pages 21–24):

1. *Morroco.* Mr Bodiansky, Director of ATBAT consulting engineers, was entrusted by the Direction of Housing with a study of vertical dwellings based on a programme, for the re-housing of the inhabitants of shanty towns, elaborated by Mr Ecochard, Director of Town-planning and Architecture in Morocco. The theory of 'housing for the greatest number', the town-planning and all the social and economic studies and enquiries on which they are based, were the work of Mr Ecochard and his assistants at the Direction of Town-planning and Architecture.

2. *Kuwait.* Mr Bodiansky did not in any way take part in the conception of the design. The only claim he has for introducing his name are based on a few conversations held in Mr Ecochard's office.

3. *Fria-Sabende.* Mr Ecochard was the only town-planner of Fria and Mr Bodiansky had no part in the planning of the town. He therefore had no right to publish the plans. He was nominated, on Mr Ecochard's recommendation, as technical consultant exclusively for the buildings, which of course gives him no authority to publish photographs of these buildings designed by Messrs Lagneau, Weill and Dimitrijevic.

Ekistics

International seminar

The first of an annual series of International Seminars on Ekistics and the future of Human Settlements will be held in Athens, Greece, from July 20th to July 24th, 1965, organized by the Graduate School of Ekistics. The major theme of the 1965 session will be:

Human Settlements: The Ekistic View.

Sub-themes:

Man and His Settlements.
The Century Ahead.
The Human Community.

The Seminar:

Is designed as an extensive brief educational experience in Ekistics for those concerned with the development of human settlements, as practitioners, administrators, educators and researchers.

Will provide an opportunity for interdisciplinary exchange and discussions on growth and change in human settlements, with particular emphasis on future developments.

Will be conducted in English by the faculty of the Graduate School of Ekistics together with experts of international repute. Among those included in 1965 are: C. A. Doxiadis, Buckminster Fuller, S. Giedion, Lester B. Granger, Edward T. Hall, Sir R. Matthew, Harvey S. Perloff, A. J. Toynbee, C. H. Waddington, Barbara Ward (Lady Robert Jackson), and others.

For information and application forms please write to Dr D. Iatridis, Director, International Seminar on Ekistics, Athens Center of Ekistics, 24, Strat. Syndesmou Street, Athens 136, Greece.

World Society for Ekistics

In addition to the annual seminars announced above, a group of participants* in the Delos symposion decided at a meeting last month in London to take the initiative in the creation of a World Society of Ekistics. 'It is already evident that wrong projections of urban development produce inexcusable waste. The absence of realistic forecasts leads to chaos in the cities . . . Thus the need for mobilization of all concerned to bring about rational and dynamic evolution of human settlements both now and in the foreseeable future is inherent in the urban situation today.'

The World Society for Ekistics will bring together people from all disciplines and nations, and will form a forum for thought, a world voice, and a platform for action.

Membership numbers will be restricted and will comprise only individuals actively engaged in the development of human settlements. The Executive Committee will consist of six people who will each hold office for one year and the Secretariat expenses will be defrayed at first by the Athens Technological Institute. A centre is to be established shortly, though it is not yet decided in which country, and the first meeting will probably take place in about six months' time.

* A. B. P. Brohi (Pakistan), Dr C. A. Doxiadis (Greece), Prof Buckminster Fuller (USA), Prof Jean Gottmann (France), Prof J. R. Lasuen (Spain), Lord Llewellyn-Davies (UK), Sir Robert Matthew (UK), Dr W. Nielsen (USA), P. Psomopoulos (Greece).

† See *AD* 1964, page 425

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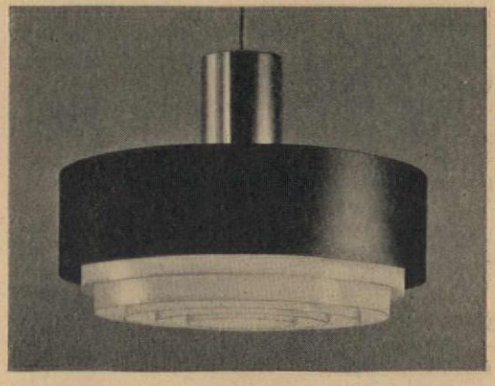

Barbour index file No 263

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World news

John Donat

Holland

L'Ecole Technique Auditorium, Delft **2, 3**

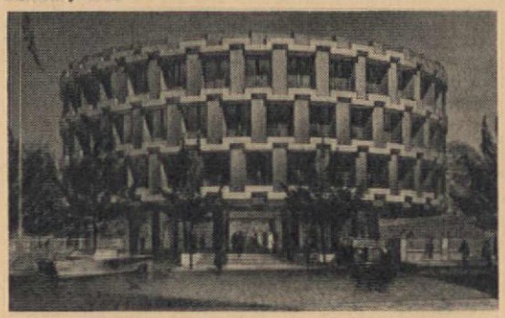
Van den Broek and Bakema have combined five auditoria in one building, one seating 1500, two of 350 and two of 250, with a Council chamber in the centre. The plan is strictly formal and symmetrical, but, combined with a lively section and a highly complex structure, it creates a vigorous and arresting image. Slabs and staircases are punched out through glass walls to demonstrate the section.

Denmark

Arne Jacobsen **4–7**

Six recent projects by Arne Jacobsen are featured in *Arkitektur* including a dramatic belvedere restaurant **4** that commands a magnificent vista across the seventeenth-century baroque Herrenhäusergarten in Hanover. On the site of the old palace, the restaurant is raised up to command a view of the whole garden. Twin shells of lattice steel covered with a thin plastic skin are supported on two concrete walls. An Art Gallery **5** (also in Hanover) has top lighting and side lighting combined in a structure similar to the dining hall at St Catherine's—and as environmentally barren. In the Sportshall project for Landskrona in Sweden **6, 7,** Jacobsen has excavated the arena and the spectators seating around it so that a light steel superstructure hovers low over the space which is simply enclosed with glass. As refined and elegant as anything Jacobsen has done.

Arkitektur, May 1964. *Bauwelt*, April 1964. *Domus*, January 1965



1

Spain

British Embassy, Madrid **1**

Anyone who thought that the appointment of the Smithsons to design the British Embassy in Brasilia signalled a ray of light penetrating the dark corridors of the Ministry of Public Building and Works, will be confounded by this latest product by the Ministry's own Assistant Chief Architect—the embassy in Madrid **1.** Recipe: take the designs of the American Embassies in London, Dublin and Oslo; programme their most bizarre features into a primitive computer; pastiche guaranteed.

One step forward—two steps back.

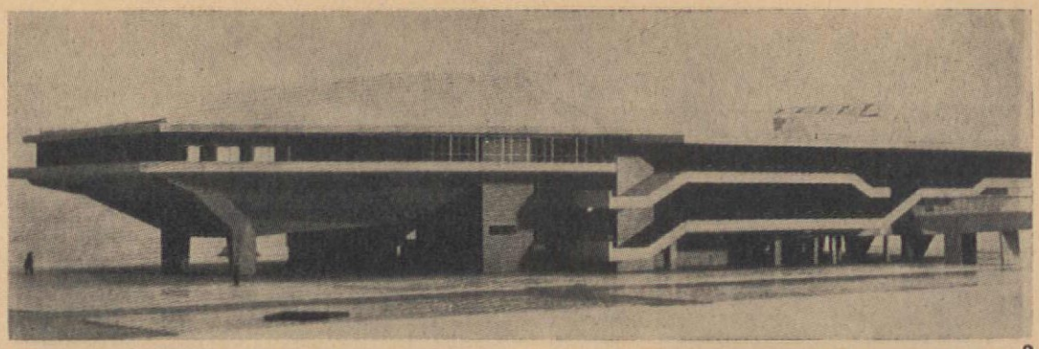
USSR

Spherorama **9**

Theatre in the Sphere by E. Venturelli and J. Polieri (one up on theatre in the round, two up on Boullée and Ledoux), an engine which rotates, tilts, raises and lowers the audience. An example of mechanical ingenuity solving imaginary problems in this issue of Russian Architecture which, in an article on diverse trends in theatre design, illustrates a dozen other less fantastic solutions.

Architecture USSR, August 1964

See also *Aujourd'hui*, May, 1958 and October, 1963



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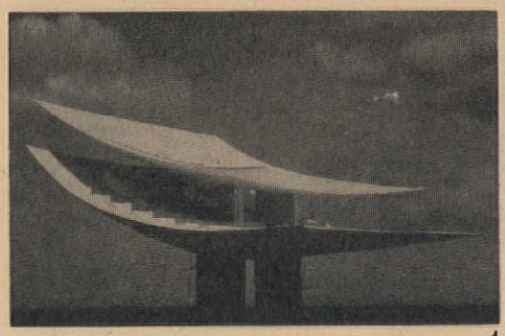

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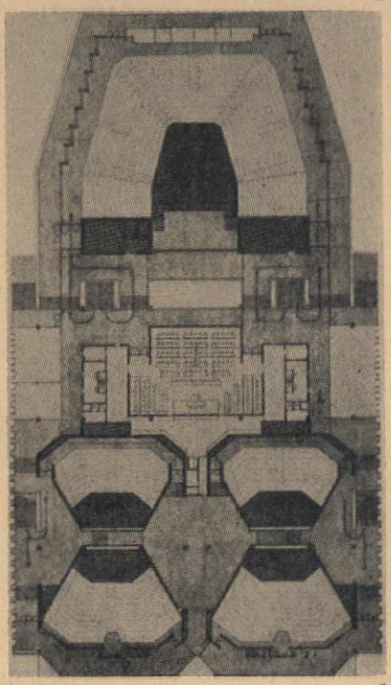

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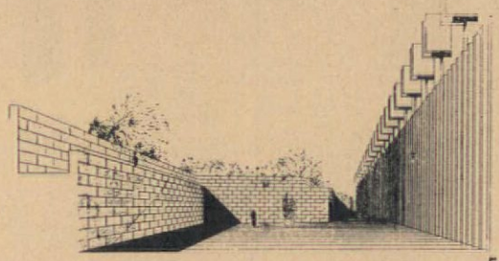

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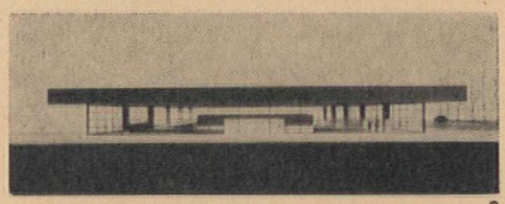

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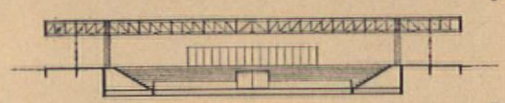

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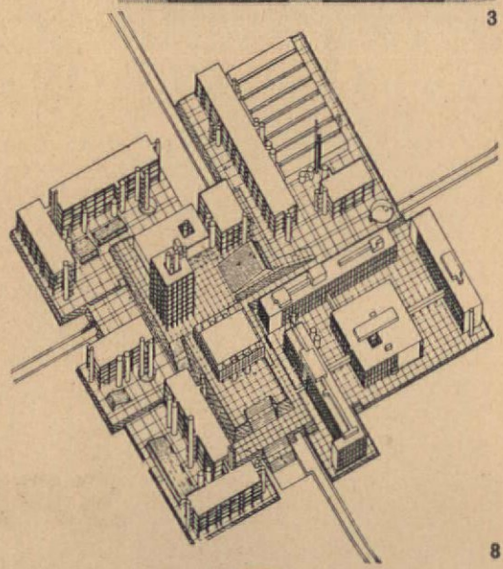
Japan

The work of Kurokawa **7**

The September 1964 issue of *Kenchiku Bunka* carries a review of the work of Kurokawa, including his project for the recent Dublin University competition. This scheme develops further his notion of the building as the continuation of the 'road' and the 'route' (see *AD*, December 1964 pages 603 and 604).



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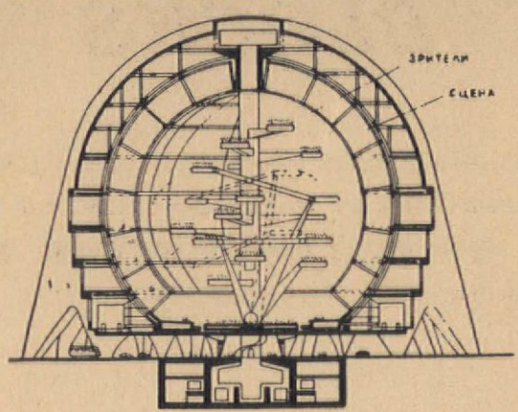

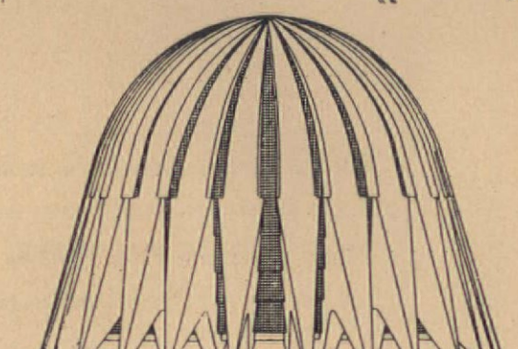

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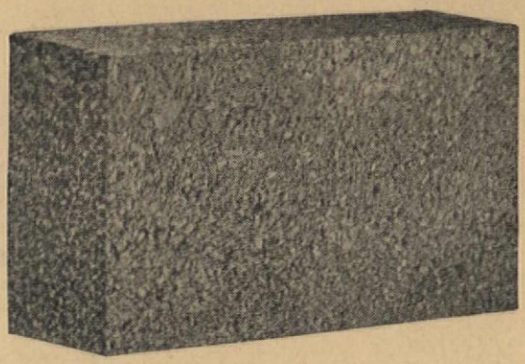
Why



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Kikutake hotel **10**

In an article appraising six recent buildings and projects by Kionori Kikutake, *Kenchiku Bunka* includes a tantalizing glimpse of the model of his hotel To-ko-en **9.** A major structure of reinforced concrete appears to raise the hotel rooms above a minor structure of 'pavilions' slotted in underneath—with an open floor between. The model of this shrine for the temporary guest demonstrates all the vigour and panache usually associated with this confident young architect.

Kenchiku Bunka, November 1964

USA

Three faces of Philip Johnson **11, 12, 14**

'In Xanadu did Philip Johnson a stately pleasure dome decree'—for Xanadu read University of Nebraska where Johnson completed his elegant shrine for the arts, the Sheldon Memorial Art Gallery **11.**

In Bielefeld, his 'Kunsthaus' **14** develops a square plan with an asymmetrical arrangement of rooms around a triple height central hall. The vast foyer of his Lincoln Center Theatre **12** ('d'une froideur glaciale' says *l'Architecture d'Aujourd'hui*) combines *de luxe* materials within an incredibly spartan framework—an affluent Alcatraz for 1984?

Kenchiku Bunka, November 1964
Bauwelt, June 1964
L'Architecture d'Aujourd'hui, 117/Nov. 64/Jan. 65

Canada

Confederation Center **13**

In the Confederation Center competition for Charlottetown, the competitors had to resolve a paradox inherent in the brief: on the one hand it was to be a permanent memorial to the Fathers of The Confederation, 'a national shrine to which Canadians will forever pay homage as the birthplace of their Nation'; on the other hand, it had to function as a live cultural centre for a town of only 20,000 people—like trying to produce a building as emotionally charged as St Paul's in Harlow!

The winners were Affleck, Desbarats, Dimakopoulo, Lebensold and Sise. Their design groups three buildings (theatre, art gallery/museum and library) around a glass-roofed memorial hall which is the emotional centre of the plan. Each building is similar in height and bulk to the old nineteenth century Classical Provincial Building on the same site. All the exterior walls are rectangular planes of stone rigorously articulated from each other by thin vertical windows in recessed corners. They enclose the central space in severe nobility, entirely appropriate to the atmosphere of a National Memorial, but one must question whether this solemn environment is equally appropriate to the cultural life of a small community.

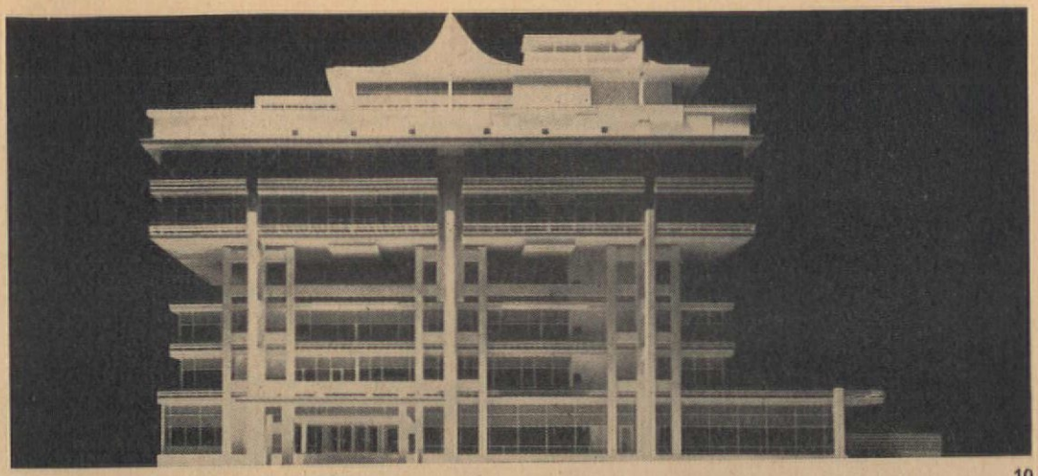
RAIC Journal, December 1964

Group Health Center, Sault Ste. Marie **15**

Consultation and examination rooms are wrapped round artificially lit internal reception and waiting areas in this two-and three-storey Group Health Center designed by Jerome Markson.

Photo: H. R. Jowett, Ontario

15



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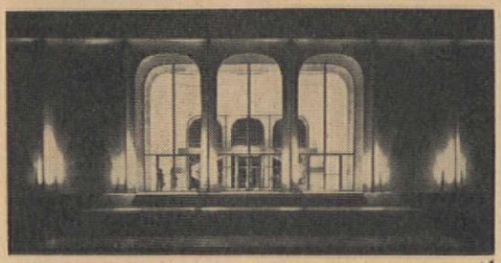

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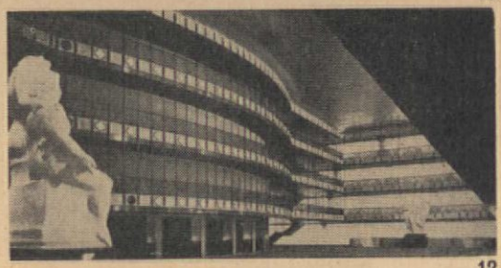

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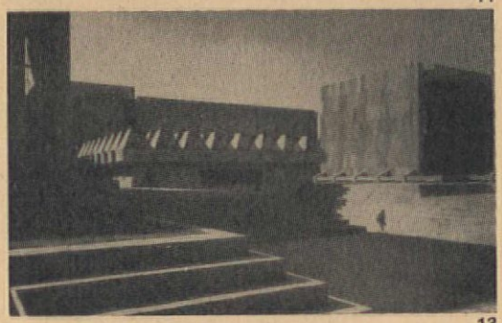

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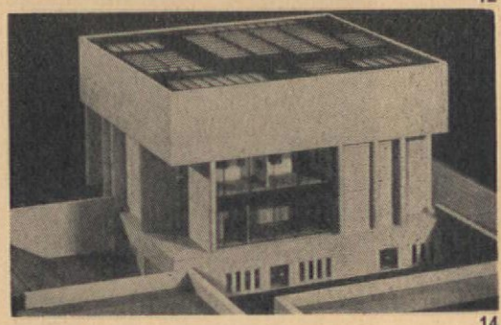


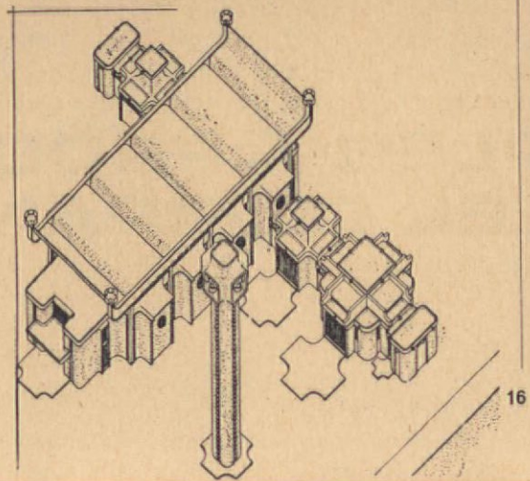
14

Africa

Sagrada Familia Machava **16**

For us, a manifesto published by the Students of Architecture Witwatersrand, includes contributions from Aldo van Eyck, Julian Beinart (on Western Native Township) and Pancho Guedes. Witty, mystic, obscure but very much alive. Here is a quote from Guedes on his little church of the Sagrada Familia at Machava **16.** 'It is a Japanese flavoured temple, a dolled up factory roof, some small public lavatories, a bookless library, a village square, a bell periscope, a singing shelf—and it wears eight glass rock suns on its side faces. The concavities of the outside are for hide-and-seek games, for lovers, for young gangs. Buildings shall also become habitable on the outside.

(Ed: We are pleased to be able to announce that Pancho Guedes was NOT among the 18 people recently detained in the Portuguese security police swoop in Laurenço Marques.)



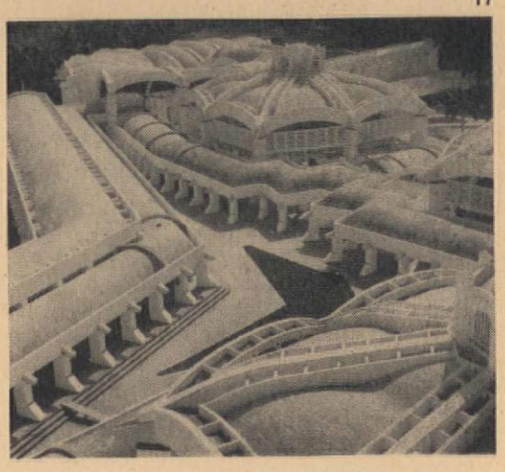
16

Cuba

National Art School **17**

The tradition is now firmly established for a totalitarian political revolution to engender a fundamentally new architectural style. This art school by the architects Ricardo Porro, Vittorio Garatti and Roberto Garratti is by no means an exception to this tradition. On the contrary, it is built in an eccentric folk style that calls to mind the work of Gaudi. It has been on the golf course of a former country club. Extensive use was made of the catalan vault system, owing to the shortage of cement and steel. The walls are of brick and concrete has only been used where it is absolutely necessary. Ricardo Porro states that in these buildings he has tried to give a symbolic expression of Cuba.

17



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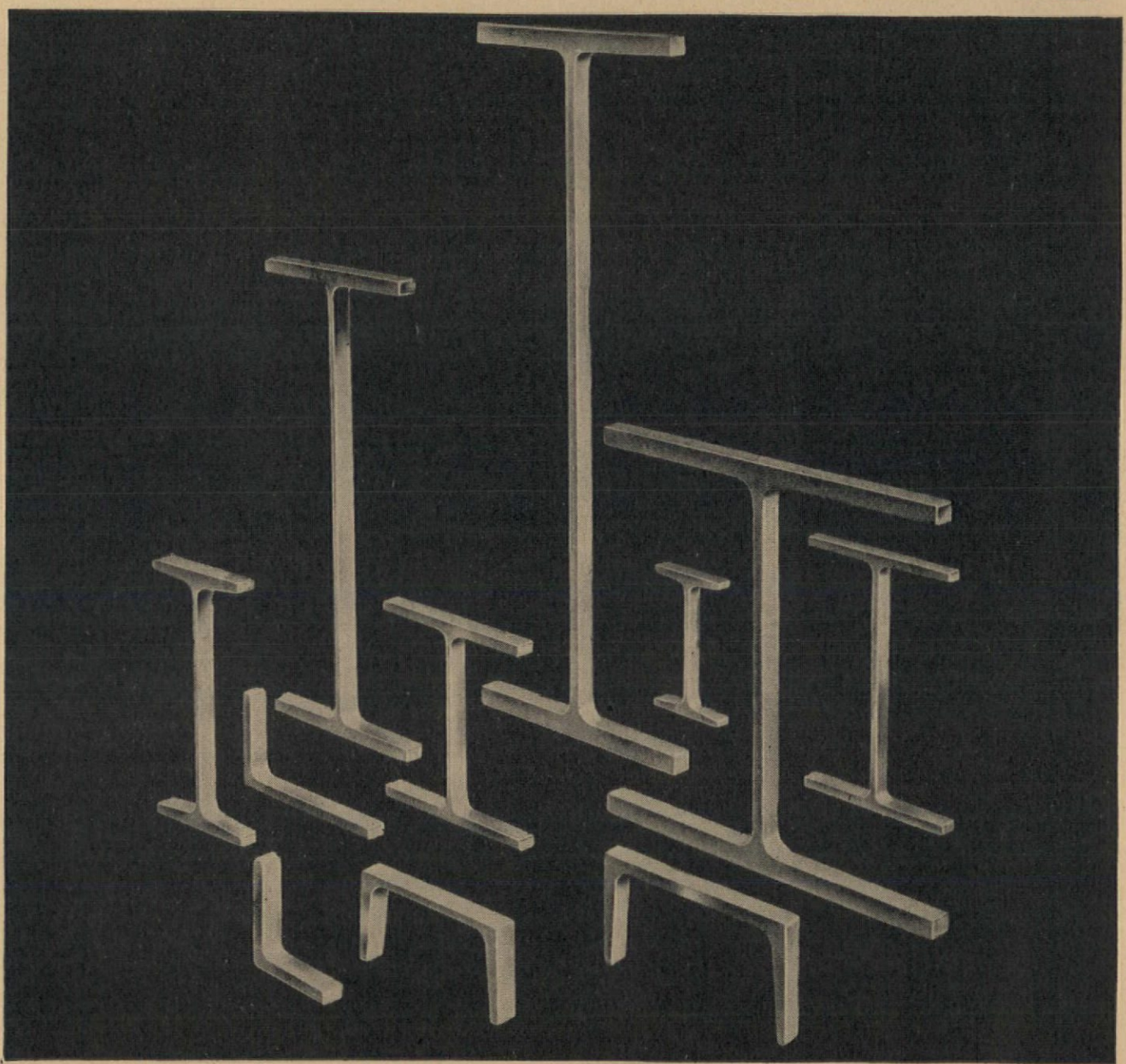

The structural steel sections shown here are just a few of the many rolled by Appleby-Frodingham Steel Company, who also roll a large proportion of the steel plates made in Britain. Appleby-Frodingham are experts in the production of steels for boilers, pressure vessels and highly-stressed structural components.

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Preserving the architectural heritage

The Council of Europe's 1963 publication 'the preservation and development of ancient buildings and historic or artistic sites' brings together the thoughts and experience in this field of several west and south European countries. The recommendations of its Assembly call for a European Conference, inter-governmental co-operation and a European institution for preservation. This document, in concentrating only on one part of Europe is limited in scope as it excludes the prodigous and successful efforts which have been made in this field since the war in Eastern Europe. It is regrettable that even in considering Europe's cultural heritage, we seem to be bedevilled by political considerations and ignore the touching love and care and the allocation of very considerable financial, technical and material resources which have been devoted in several Eastern European countries to the restoration and even the rebuilding of whole historic cores. The old centre of Warsaw, rebuilt from utter ruination after the war, now mellowed and looking as if it had been there for centuries, and many of Leningrad's magnificent palaces and nearby Peterhof, virtually rebuilt to their original form since the war, are some of the more spectacular examples. But perhaps the most consistent and sustained effort in this respect has been made in Czechoslovakia.

The historic development of urban settlements in Bohemia, Moravia and Slovakia has been relatively slow as compared with Western Europe, with the result that almost all old towns and villages have to date retained the essential character of their historic cores, dating back about 700 years. Thus the basic pattern of the urban fabric and architecture created by feudalism and home craft is still clearly identifiable. Few towns suffered any major war damage, so that after the war most historic towns were intact, though practically all the buildings were in a bad state of repair and neglect. The government at once declared 40 such towns as 'protected' and embarked upon a systematic programme of conservation, and partial rebuilding. For town after town, comprehensive rehabilitation schemes were prepared and realized, based on careful historic analysis of the whole historic townscape and of construction methods and decorative features of individual buildings. 19th and 20th century additions and crude adaptations were removed and buildings reinstated to their original form.

Prague with its 1000-year-old rich architectural heritage, was obviously amongst the first in this national rehabilitation programme. The whole of the castle and cathedral precinct towering over the city, scores of ornate baroque churches, palaces and gardens, individual houses and whole streets like the Alchemists' 'Golden Lane' have been restored and some, like John Hus' Gothic 'Bethlehem chapel' were revealed for the first time for centuries. Dozens of smaller towns and villages followed suit so that today, when this programme is perhaps only at its half-way mark, one can already see complete villages restored to their original form. Amongst these, one of the most successful is the small Moravian town of Telč, where arcaded renaissance houses of great individuality but common scale, link arms round the town square **1**. The fact that the country is only just at the beginning of the motor car age could help in establishing

1

pedestrian precincts and in routing the traffic around these historic streets and squares before it is too late. Unfortunately, Czech and Slovak architects appeared to me insufficiently aware of the erosive effect the motor car could have on all their good work, and inadequate thought appears to be given to this aspect as it relates to the restoration of historic cores. Also the problem of how to keep newly rendered and at times painted and elaborately decorated wall surfaces clean and intact, has not yet been entirely solved—some of the post war restoration, particularly in Prague, already begin to look grimy and defaced. On the other hand, there is no evidence of a sterile academic attitude of preserving historic buildings just as museum pieces—they are all in everyday use. The old houses are modernized inside and provide very reasonable living accommodation, the palaces and castles are homes of cultural, social and political organizations, and the churches are in use for worship and organ recitals.

This determined national effort to restore and rehabilitate the historic towns and villages in Czechoslovakia is remarkable as is the scholarly approach by the architects responsible for this work and the craftsmanship of the builders.

Walter Bor

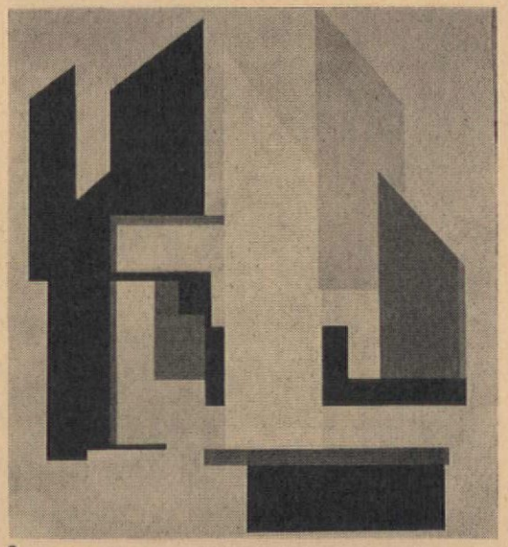
Art in Britain in the 1930s

The 1930s were among the most decisive years in the history of British art. Not only did London become for a short time an international art centre, but it was also the time when the provincialism that had dogged British art for so long, was replaced by movements, groups, art literature and above all painting and sculpture with an international outlook. From that period emerged the artists who form the backbone of British art today—Moore, Nicholson, and Hepworth. It was also the period when Herbert Read became the sole committed spokesman for the modern movement in art. It is as a tribute to him that the exhibition of Art in Britain 1930–40 (at both Marlborough galleries from mid-March) has been organized.

The modern movement in the 1930s was far from what might be described as a homogeneous art manifestation. It included the Euston Road School which represented a reaction against the sort of art done currently in Paris, as well as a strong surrealist movement, which made a big impact in England during the middle thirties—neither of which are the basis for this exhibition. Fundamentally this show deals with art tending towards abstraction, including Nicholson, Hepworth, Moore (who played an equally important role in the surrealist group), Piper, Jackson, Stephenson **2** and others. As a trend it was a sort of counterpart to the exponents of the Konkrete Kunst exhibitions in Switzerland. The ties between England and the Continent were established in a number of ways. Hepworth and Nicholson participated in the Abstraction-Création exhibitions in Paris, Myfanwy Evans was encouraged by Hélion to start what was to be one of the most vital contemporary art magazines in England, *Axis;* and close contacts were established with artists like Mondrian and Gabo, who actually came to live in England during the late thirties, as well as Calder, Hans Erni, Moholy Nagy and others. The thirties also produced the unique publication *Circle,* the international survey of constructive art, which was edited by Gabo, Nicholson and Leslie Martin. It dealt with art, architecture and allied fields, e.g. typography, and although it was originally intended as an annual, only one issue was published in 1937. Apart from *Axis* and *Circle* the exhibition is also based on the publication *Unit One,* a manifesto of the group under that name, which was edited by Herbert Read and published in 1934. *Unit One* was started a year earlier by Paul Nash, with five artists and two architects, whose communal aim was to present a united front against an indifferent public.

Today the art of the 1930s in Britain conveys many surprises. Nicholson's white reliefs and the works of Moore, Hepworth, Piper, the abstracts of de Maistre and Stephenson, as well as those of designers like Havinden and Morton do not look dated. A photograph taken at the Lefevre Gallery in 1936 during the Abstract and Concrete exhibition does not convey the feeling of a dusted relic of three decades **3.** What is consistently different, however, is the scale of works which seem small in comparison with the size of abstract paintings of young artists today. One of the things this exhibition is likely to achieve is to convince people about certain sources of influence and their application to present-day art.

Jasia Reichardt



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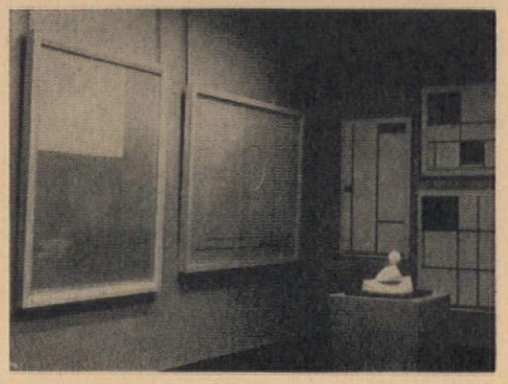

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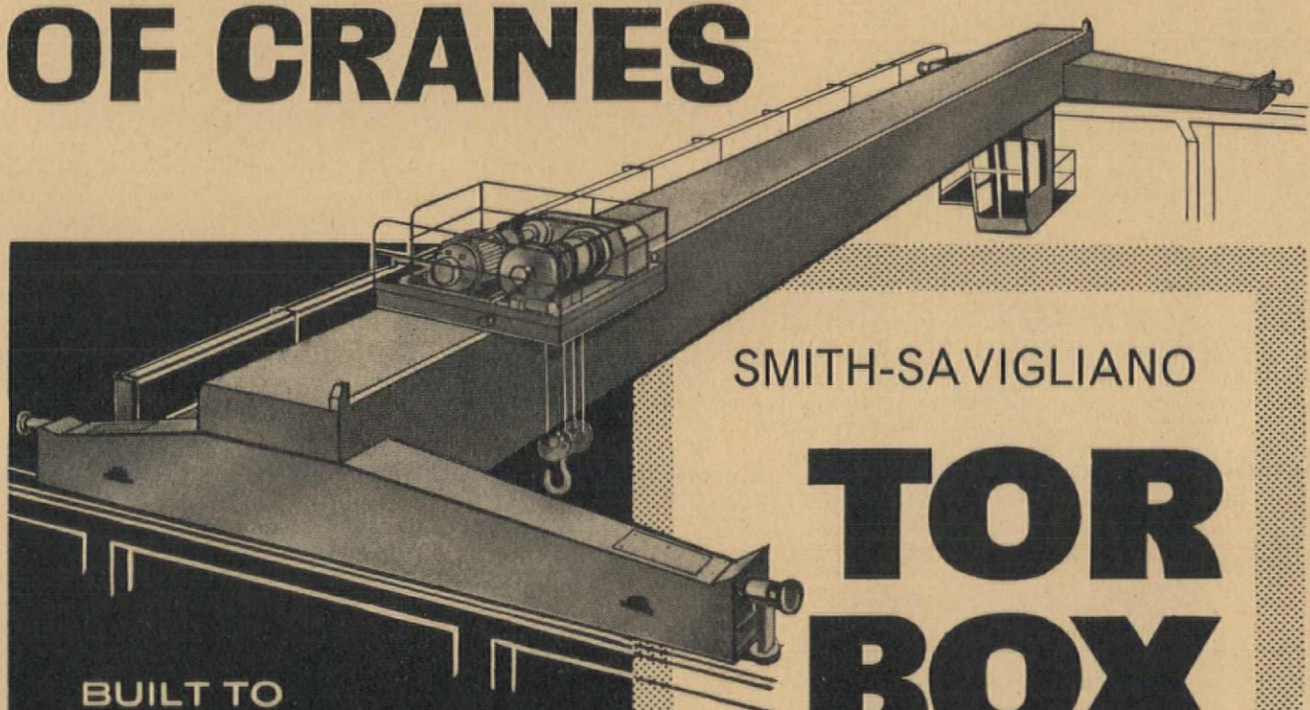

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Dans ce numéro

'La Philharmonie', Berlin-Ouest *Page 113*

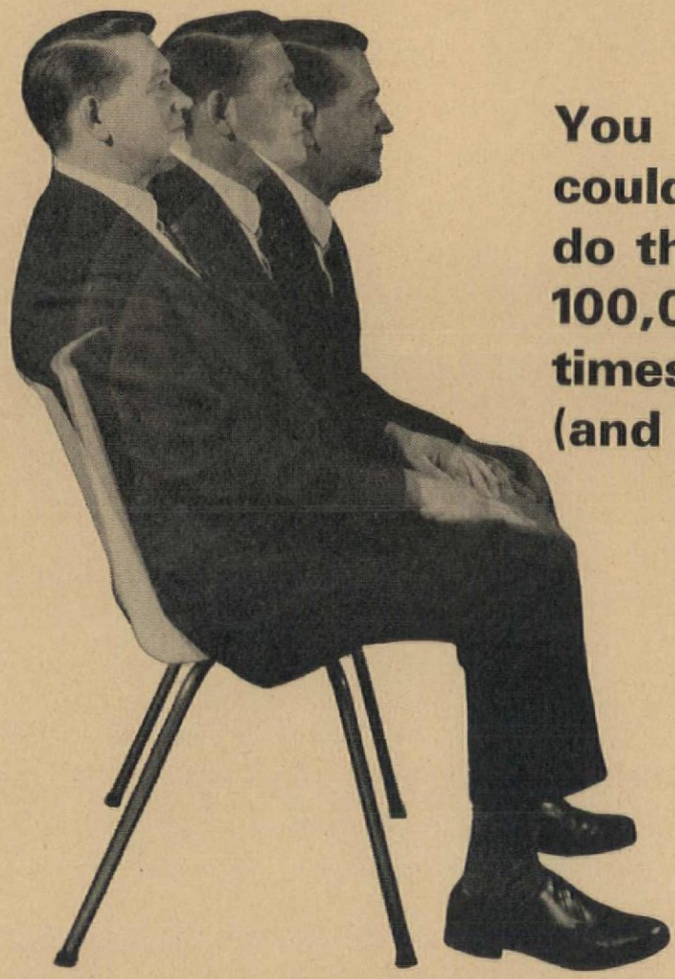
Projeté en 1956 lors d'un concours d'architecture, la Philharmonie est le premier terminé d'une série d'édifices qui vont former le nouveau centre culturel au sud du Tiergarten à Berlin-Ouest. Parmi les autres édifices projetés se trouvent la Galerie du Vingtième de Mies van der Rohe et la Bibliothèque d'Etat, autre mandat gagné par Scharoun lors d'un concours d'architecture. En raison des voies principales qui vont border et traverser cet ensemble, des problèmes d'acoustique considérables se posèrent lors de l'étude du projet de la Philharmonie. L'édifice de Scharoun cristallise sa conception d'une source de musique centrale autour de laquelle quelques 2218 places sont groupées librements s'élevant par palier comme les tarraces d'un vignoble. La couverture cintrée forme une tente ou 'voûte' qui domine l'ensemble. Pourtant le projet n'a rien de pseudo-romantique; la libre disposition des parois entre sièges ainsi que le cintrage concave du toit sont dictés par des considérations d'ordre structurel et acoustique. Le volume de la salle de concert, porté à 26.000 mètres cube, soit environ 10 mètres cube par personne, y compris l'orchestre, fait de la Philharmonie l'une des plus grandes salles d'Europe. Afin d'éviter les échos et d'assurer la meilleure diffusion du son possible dans cet immense volume, la disposition des parois et leurs finitions firent l'objet d'une attention particulière. Certaines de ces parois sont revêtues de grès, d'autres de bois de teck, d'autres encore de bois peint en blanc. Les sièges sont en bois contreplaqué moulé avec des sièges à bascule rembourrés. Le plafond est équippé de 126 résonateurs Helmholtz pyramidaux; on y a suspendu dix reflecteurs acoustiques. La moyenne du temps de réverbération est de 2,2 seconde.

Ove Arup *Page 129*

Ces deux ou trois dernières décennies nous ont donné trop peu d'ingénieurs de structure de renommée mondiale—Freyssinet, Torroja, Nervi, Guyon, et Candela sont ceux qui viennent à l'esprit. Ces derniers et quelques autres sont bien connus pour avoir associer leur nom à tel projet particulier ou telle forme de construction; nul se songe à mettre en doute leur importante contribution dans le domaine du génie civil, contribution qu'il vaut la peine de connaître. Ove Arup a rang parmi eux, mais cela peut-être n'est-il pas aussi apparent. Son influence est beaucoup plus profonde et subtile. Idées, attitudes, convictions et certaines vérités: les principes fondamentaux de la forme, de la fonction et de la structure, sont pour lui une préoccupation constante. Pendant le milieu du vingtième siècle, sa pensée a eu une influence considérable dans les domaines de la construction et de l'étude des structures. Il est parmi les rares hommes qui possèdent le don, la capacité d'influer sur la pensée de ceux qui l'entourent. Il use de ce don avec bonheur, avec élégance et simplicité. Ove Arup fête le mois prochain son soixante-dixième anniversaire. Pour lui rendre hommage, nous avons choisi deux œuvres illustrant la gamme étendue des mandats qui lui ont été confiés, une passerelle pour piétons à Durham qu'il a entièrement esquissée lui-même et l'Opéra de Sydney, l'œuvre déjà bien connue de Jørn Utzon, où il s'agissait de traduire en béton et en acier la vision de l'architecte tout en conservant sa qualité première. Les illustrations indiquent qu'en réalité des modifications considérables sont intervenues dans l'étude détaillée de la couverture de l'Opéra depuis les premières esquisses de Utzon pour le concours d'architecture en 1957. On découvrit rapidemment que les coques étaient irréalisables et l'on a développé une nouvelle couverture formée de tubes de béton armé triangulaires renforcés par des nervures partant en éventail des appuis de l'arrête longitudinale. Le tout sera recouvert d'une série de panneaux préfabriqués revêtus de tuiles de Høganas. Une autre modification importante est intervenue une fois la décision prise de résoudre le problème de la couverture en préfabriquant les panneaux de toiture. Chaque panneau ne pouvait évidemment pas être conçu comme élément particulier et indépendant de l'ensemble; Utzon et Arup s'ingénièrent à réaliser les 'coques' comme des segments d'une immense sphère de 62,5 mètres de diamètre. Malgré ces simplifications, une bonne partie du calcul et de l'élaboration du projet a été effectuée avec l'aide d'ordinateurs électroniques. Le coût de l'édifice s'est considérablement élevé, passant d'une estimation initiale de 2,5 millions de Livres australiennes à plus de 20 millions de Livres.

Le pavillon et la route *Page 143*

Dans cet article Alison et Peter Smithson analysent quatre projets qu'ils ont réalisés durant la dernière décennie. Ils suggèrent au lecteur d'isoler dans la mesure du possible les éléments de chaque édifice et de les considérer comme unités participant de l'organisation de l'ensemble et reliées à un système de circulation commun. Ils pensent que ce principe de composition devrait s'appliquer aussi bien à un édifice isolé qu'à un groupe d'immeubles dans un contexte urbain. La 'Mega-Cité' est un dinosaure, hostile à l'architecture et, somme toute, totalement inadaptée à la vie moderne. Selon eux, l'essence même de la ville moderne est la flexibilité de ses services et de ses techniques de construction; chaque élément de la ville devrait toujours pouvoir être modifié et se développer au rythme du changement des besoins des individus. La séparation et l'expression formelle de chaque unité fonctionnelle établi ainsi un critère d'évaluation de bonne architecture.
Poursuivant ainsi l'argument dans les détails de l'architecture, ils soutiennent que l'utilisation extérieure de béton, même si Le Corbusier utilise ce matériau pour la structure et la finition de ses èdifices dans les conditions peu développées de vie actuelles en Inde, n'est pas une solution valable plus particulièrement en Europe septentrionale où le béton ne se nettoie pas ni n'est mis en valeur par la saleté. La structure d'un édifice doit se distinguer de son revêtement protecteur. Cette conception de la séparation des fonctions devrait se lire partout en architecture, comme elle s'exprime dans les immeubles d'habitation de Ralph Erskine en Suède où les balcons sont suspendus pour éviter les ponts thermiques. Les Smithsons indiquent comment cette conviction a plus ou moins influencé le parti et l'étude de détail de leurs propres réalisations.



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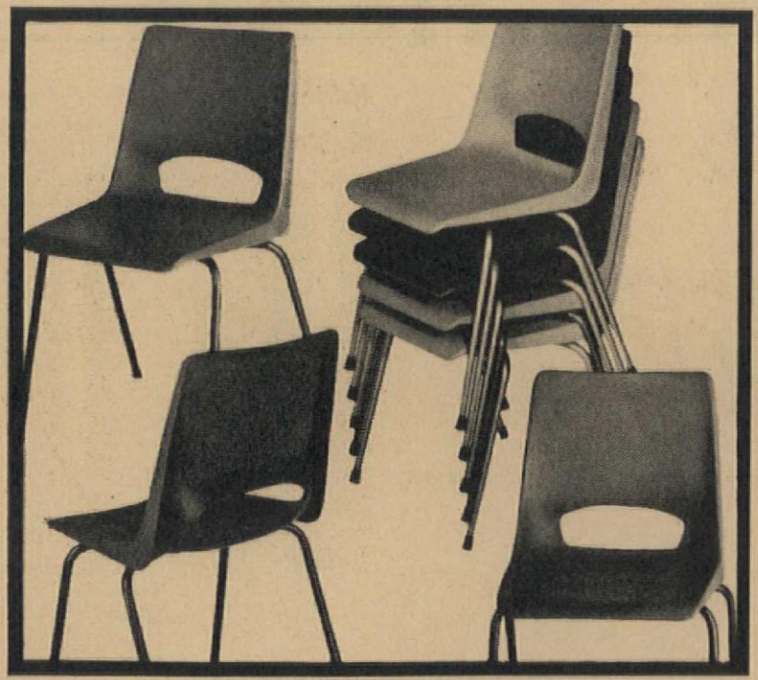

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Die Philharmonie, West-Berlin *S.113*

Die Philharmonie, 1956 zum ersten mal für einen Wettbewerb entworfen, ist das erste fertiggestellte Gebäude das werden soll innerhalb einer Gruppe, die nach ihrer Vollendung ein neues Kulturzentrum südlich des Westberliner Tiergartens bilden wird. Zu dieser Gruppe gehören unter anderen Mies van der Rohes 'Galerie des Zwanzigsten Jahrhunderts' und ein anderer Preisauftrag Scharouns, die Staatsbibliothek. Da der ganze Komplex von Hauptstraßen begrenzt und durchschnitten wird, entstanden beträchtliche Probleme in Bezug auf die Akustik beim Entwurf der Philharmonie. Scharouns Plan baut sich auf auf dem Begriff einer Zentralquelle für die Musik, mit Sitzen für 2218 Zuhörer zwanglos rund herum gruppiert und in Reihen ansteigend, etwa wie die Terrassen eines Weinbergs. Das gewölbte Dach ist als Zelt oder 'Himmelsdach' für diese Landschaft anzusehen. Dennoch ist der Entwurf alles andere als unbestimmt romantisch; die Anordnung und Winkelung der Wände zwischen den Sitzen wird bestimmt von baulichen und akustischen Überlegungen, und ebenso ist es mit denkonkaven Dachwölbungen. Das Fassungsvermögen des Saales mußte auf etwa 26.000 m³ erhöht werden (etwa 10 m³ pro Person), wodurch er zu einem der größten Säle in Europa wird, und um bei dieser Raumgröße Widerhall zu vermeiden und die beste Klangverteilung zu sichern, mußten die Flächen sorgfältig gewinkelt und bearbeitet werden. Sie bestehen teils aus Kalkstein, teils aus Teakholz, teils aus weißgestrichenem Holz. Die Sitze sind aus gebogenem Sperrholz mit gepolsterten Klappsitzen. Die Decke ist mit 136 pyramidenförmigen Helmholtz-Resonatoren und zehn aufgehängten Klangstrahlern versehen. Die durchschnittliche Nachhallzeit beträgt 2,2 Sekunden.

Ove Arup *S.129*

In den letzten zwanzig oder dreißig Jahren hat es nur zu wenig Bauingenieure von Weltbedeutung gegeben—Freyssinet, Torroja, Nervi, Guyon und Candela zum Beispiel. Sie und ein oder zwei andere sind wohlbekannt wegen ihrer Verbindung mit einigen sehr speziellen Projekten und Bauformen, und sie haben ohne Zweifel einen bedeutenden und leicht erkennbaren Beitrag zum Bauingenieurswesen geleistet. Das Gleiche gilt für Ove Arup—nur ist es vielleicht nicht so deutlich erkennbar. Sein Einfluß war tiefergehend und nicht so offenkundig. Es handelte sich mehr um Idee und Haltung, um Glauben und gewisse Grundwahrheiten—die Grundfragen von Form, Funktion und Struktur. Sein Denken hat in der Mitte des 20 Jahrhunderts einen tiefen Einfluß auf das gesamte Gebiet von Bau- und Strukturplanung ausgeübt. Diese Gabe, die Fähigkeit die Gedanken Anderer zu beeinflussen, ist wertvoll und leider nur Wenigen gegeben. Ove Arup hat diese Gabe und hat guten Gebrauch davon gemacht, mit Eleganz und Einfachheit. Da im nächsten Monat sein siebzigster Geburtstag ist, bringen wir als Ehrung für ihn hier zwei seiner Arbeiten, die zeigen, wie weit das Feld seines Wirkens war: eine Fußgängerbrücke in Durham, von ihm allein entworfen, und Utzons berühmtes Opernhaus in Sydney, wo die Vision des Architekten in Beton und Stahl verwandelt werden mußte, ohne die Grundidee zu beeinträchtigen. Wie die Abbildungen zeigen, haben tatsächlich erhebliche Änderungen im Plan des Daches gegenüber dem ersten Entwurf Utzons in einem Wettbewerb im Jahre 1957 stattgefunden. Die Schalendächer waren nicht ausführbar, und ein neues Dach ist gebaut, bestehend aus dreiseitigen Betonröhren, verstärkt durch Rippen, die von den Stützen zum Längsgrat ausstrahlen. Das Ganze wird mit einer Reihe Fertigplatten bedeckt, die mit Høganas-Ziegeln verkleidet werden. Eine weitere bedeutende Änderung im Dachplan hat ihren Grund in der Vorfertigung dieser Dachplatten. Es war natürlich nicht möglich, jede Platte als unabhängige und verschiedene Einheit zu entwerfen. Utzon und Arup kamen auf den Gedanken, alle diese Schalen zu Teilstücken einer großen Kugelfläche von 75 m Durchmesser zu machen. Trotz dieser Vereinfachung mußte vieles im Planungs- und Kalkulationswerk mit Hilfe von Computern gemacht werden. Die ursprünglich geschätzten Kosten für den Bau sind erheblich angestiegen, von 2,5 auf 20 Millionen australiche Pfunde.

Der Pavillon und die Straße *S.143*

Eine Analyse von Alison und Peter Smithson, betreffend vier Bauten, die von ihnen während der letzten zehn Jahre errichtet worden sind. Sie schlagen vor, daß soweit möglich die Elemente jedes Gebäudes isoliert stehen sollen, sodaß sie als unabhängige Einheiten gelten können, die ihren Platz im Gesamten dadurch einnahmen, daß sie an eine gemeinsame Verkehrsader angeschlossen sind. Dieses Kompositionsprinzip sollte sich nach ihrer Ansicht auch auf einzelne Gebäude und Gebäudegruppen im städtischen Verband erstrecken. Die 'Mega-City' ist ein Ungetüm, feind der Architektur und jedenfalls unpraktisch, was das moderne Leben betrifft. Denn das Wesentliche einer modernen Stadt ist die Anpassungsfähigkeit ihrer Versorgung und ihrer Bautechnik; und das bedeutet, daß jedes Element in einer Stadt die Möglichkeit haben muß, sich zu ändern und mit den wechselnden menschlichen Bedürfnissen zu entwickeln. Die Trennung und formale Kennzeichnung jeder Funktionseinheit ist also ein Kriterium für gutes Bauen.

In der Ausdehnung dieses Themas bis sogar in die Einzelheiten der Architektur behaupten sie Folgendes: wenn auch Le Corbusier in den Heutigen Verhältnissen in Indien das gleiche Material für Tragwerk und Verkleidung seiner Bauten benützen kann, ist dies doch im allgemeinen keine gültige Lösung, und besonders nicht in Nordeuropa, wo der Beton weder sich selbst reinigt noch durch Schmutz verschönt wird. Das Tragwerk eines Gebäudes muß von der schützenden Haut verschieden sein. Und diese Trennungstechnik sollte überall in der Architektur durchgeführt werden, wie zum Beispiel in Ralph Erskines Wohnungen in Schweden, wo die Balkone außen angehängt werden, um Kältebrücken zu vermeiden. Die beiden Smithsons zeigen, wie dieser Gedankengang die allgemeinen Auffassungen und Einzelheiten ihrer eigenen Arbeiten in verschiedenem Maße beeinflußt hat.

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Genesis of the Philharmonie

Kenneth Frampton

One of a continuing series of sketches by Scharoun, done in 1923, showing affinities with Erich Mendelsohn's designs for the Einsten tower, Potsdam, of 1920. (Courtesy *Zodiac 10*)

The Philharmonie is a phoenix born in the Tiergarten out of the soil and the culture of Berlin. The genuine article as opposed to the imported and now faded flowers of seven years ago, the buildings of the Hansa Viertel. It owes its vitality and authenticity to its septuagenarian designer Hans Scharoun, who has been a Berliner without a break for the last forty years of his life.

The Philharmonie is not only a phoenix, it is the fulfilment of a vision first dreamt of in the Berlin of 1919. It is at one and the same time, the end of a long road, the realization of a dream and a challenge to the future.

The challenge that it offers to the future is complex. Indeed it is a challenge on more than one level, for its successful realization tentatively proffers again the possibility of an organic topological architecture that would be both utilisable and capable of a wide application. In this respect the Philharmonie may well not be the end of a road but rather a beginning. Both in its structure and spatial organization it tentatively relates different generations and modes of thought that would otherwise remain, as at present, extreme poles apart. Model for model there is not too much separating the Philharmonie from the largely unrealized suspension projects of Frei Otto and Conrad Roland Lehman. The development of new materials and techniques will surely see more of these light suspension projects realized, and should this happen, the Philharmonie will then appear in retrospect to be a proto-type solution, an all-embracing tent structure, within the web fabric of which, warped or flat surfaces could be irregularly suspended for human use.

Whether or not the Philharmonie holds any promise for the future, as opposed to being a singular monument realized out of a past utopian dream, turns largely upon this issue of utilizability. Hardly any case can now be made against it as a general model, on the grounds of it being ultimately an irrational conception from the point of view of modern production techniques. The promise and present performance of both sprayed and moulded plastic argues to the contrary—as does the fact that Frei Otto's suspension structures are always built up out of the assembly of a few simple repeated elements. On the grounds of utility however it is certainly arguable that, taken as a whole, the Philharmonie has a future as a model only for building on a public level. Scharoun himself would surely make no broader claim for his concert hall than this.

To understand more fully this one-off public work, to determine its monumentality or conversely its lack of it, one needs to examine in more detail the development of Scharoun's own thought. There is no doubt that this is his master work, the tardy realization of an inner concept with which he has been struggling all his life. It is surely as much the essence of Scharoun's thought, as his almost equally masterly model housing for the Breslau Werkbundsiedlung of 1929, yet it would be a gross over-simplification to see it simply as an extension of German expressionism, now flowering into the present. Scharoun's position is at once more complex. It comprises a compound of apparently irreconcilable attitudes, almost as though he had inherited from 'Der Ring' group of 1924 (of which he was the youngest founder member) the joint irreconcilability of the different views then held by its various members. For 'Der Ring' comprising initially Häring, Mendlesohn, Mies van der Rohe, Gropius, the brothers Taut, Bartning and Hilbersheimer, as well as the young Scharoun, failed understandably to generate a common approach. It was in the last analysis simply the banding of an 'us' of young 'moderns', against a reactionary 'them'. which was then almost totally omnipotent. Although it met frequently and discussed at length, it failed to develop a unified aim as a group. The rebuff that Hugo Häring received as secretary of 'Der Ring' at the first CIAM congress held at La Sarraz in 1928 appears to have only had the effect of promoting the cause of the 'Neue Sachleikeit', presumably causing further differences between the various factions of 'Der Ring'. These differences were similar no doubt to those which divided the schools of Rotterdam (Brinkman and van der Vlugt) and Amsterdam (De Klerk and Wendigen school) at the same time. The differences that then divided 'Der Ring' still divide architects today. It is doubtful whether these differences will ever be resolved collectively as they may well prove to be rooted in those poles of human thought which are fundamentally apart—the age old schism which on occasion we see in terms of the classic versus the romantic.

In all this Scharoun has held and still holds a special position; a position at its most responsible close to the teachings of his friend and mentor Häring, and at its most exotic to be found in his own correspondence to Bruno Taut's *Die Glässerne Kette*. The position which Scharoun has gradually established through his work over the years has been sharply analysed by Margit Staber in her essay on Scharoun in *Zodiac* No. 10. She writes, 'One of the most important aspects of Scharoun's work is that he has enlarged the necessary ascetism of the "functional building" of the thirties, deriving from an objective thinking, into an architectonic art, not by the use of decoration or ornament, but by morphogenetic means, and by this means achieving greater richness and liberty in the disposition of his buildings.'

Essentially Scharoun's thinking is mystical and pragmatic at the same time. He has inherited from Häring, and developed in close collaboration with him, the notion of an 'organic' architecture, in which space acts as a positive force upon the life it contains, and vice versa. Their joint conception of an 'organic' architecture seems to turn upon the manner in which the human will is used collectively to create the form of the environment. It is a conception that immediately promotes a confrontation of the traditional eastern and western conceptions with regard to man's relation to nature. Häring places himself firmly in the eastern camp. Two typical quotations from Häring's writings leave us in no doubt as to his views and sympathy. In favour of the tilted roof he wrote: 'It covers, roofs, protects and accompanies a man striding forward, his elevation to the sun. Rising from the horizontal of the earth, starting therefrom, it at the same time lifts towards the sun; this shape of roof is in complete harmony with nature.' And of standardization he wrote (more extremely) in 1948: 'Standardization promotes

the might of machinery, meaning the might of the owner of machinery. Machinery creates a compulsion leading to imperialism. Standardization runs on the tracks of power. Supremacy is achieved by non coordination. The people are difficult to lead because their superiors overdo it. The more laws and orders there are, the more thieves and robbers there are (Laotse). Suggest, do not command.'

The intense mysticism and the social commitment of both Häring and Scharoun, developed jointly in periods of great political and social unrest, have brought them to make statements with regard to art, form and life which are essentially religious in the faith that they both place in universal forces. Thus in 1919, Scharoun wrote to the members of *Die Glässerne Kette*, in a letter addressed to 'You who fight with me', as follows: 'We are throwing around coloured rags which a genius above and within us all, someday—who knows when—will bring into a convincing unity and shape.' In 1947 Häring wrote: 'Organic building has naturally nothing to do with the imitation of the created world. The determinant requirement which emanates from the opinion of organism, is that the form of objects is no longer to be governed from the outside, but must be sought within the essence of the object . . . An order will come to exist, as it exists in nature itself.'

The genesis of the 'Philharmonie' can be traced back through Scharoun's two unbuilt projects for the state theatres of Mannheim and Kassel (1952–53), to water colour sketches that he made in the isolation of his Berlin 'retreat' during the period 1939–45. In these sketches, Scharoun visualizes vast mountainous aspirational public structures, reminiscent of icebergs, flooded with light and crowded with people. Once a real problem of a public structure presented itself however, he returned in collaboration with Hugo Häring and Margot Aschenbrenner to a consideration of the 'essence of the object'—the inner form or space. Out of these two projects (Kassel being premiated but remaining unbuilt owing to local opposition), Scharoun constructed his essay on the architectural structure of the theatre in which he contrasts the 'nordic' German theatre, the theatre of the Greeks and the Medieval mystery plays, the theatre of the irrational and the modern theatre of the absurd, with the proscenium arch theatre of the Renaissance as exemplified in the French classical school. For Scharoun, the irrational theatre raises man from the level of perspective to 'aperspective', to become one of 'a community of affected and touched persons'.

The projects for the theatres of Mannheim and Kassel and the Philharmonie were designed practically as a continuous series, the latter taking almost eight years to become realized after initial designs were made. In the Philharmonie—the Greek theatre is once again a model. Scharoun's own words more than adequately convey the manner in which he has attempted to achieve 'a community of affected and touched persons'. In a talk entitled 'Musik im der mittlepunkt' given before work was started on site, he said, 'One questions whether it is any coincidence that in any place where music is improvized that people gather themselves into a circle. . . . The orchestra is not exactly at the centre of the space, but on a podium placed in such a way that it is encircled by a rising row of seats in a kind of "vineyard-mountain-system". The actual concert hall of the Philharmonie is a raised-up, built-in valley created through the gentle depression of the ground above the foyer and the elevation of the vineyard mountains on either side of the orchestra. . . . At the same time, the grouping of the orchestra and the performance of the conductor can be observed from various points in "essence" and in "action", and the uniting aspect of an all embracing relationship replaces a former stage-like "picture aspect" only.' Of the conception of the foyers in the same talk he remarked, 'They thus serve as preparatory spaces for the latter musical event enjoyed in community. In this way the transitory, ephemeral aspect stands in a tensional relationship to the permanent abiding aspect, i.e. to the essential festive spirit, the climax of the whole building—the Konzertsaal.' (See *AD June* 1963.)

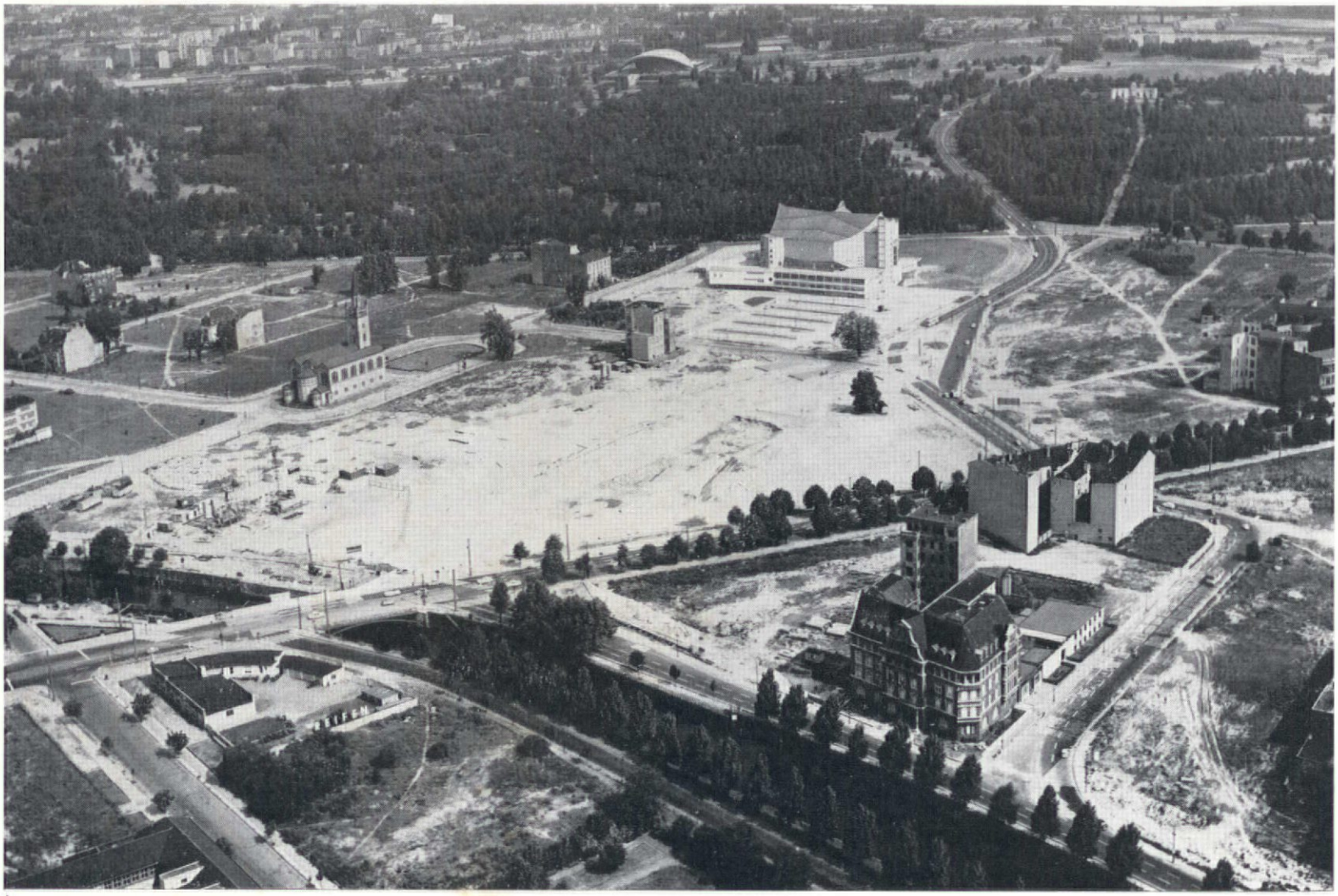
The spaces of the Philharmonie, the foyer and the auditorium itself conform exactly to these design aims and confirm the mastery of its architect. Staircases spring lightly out of the foyer floor and flow and straddle across and around the irregular flanks of the auditorium in a continuous sweep of space. The total colour tone here is cold, the concrete walls and columns being painted pale grey or white, the lowest foyer level being finished in cut grey limestone and slate mosaic, the foyers and stairs are carpeted in grey fabric above; the whole being flooded with muted light, either reflected or direct. On occasion brightly coloured glass blocks are introduced in large panels to create zones of bright, 'colour-as-light', in the grey foyer space. The whole effect is of a cool, indeterminate, and almost immaterial space, encircling under and around the auditorium. The auditorium itself is equally indeterminate volumetrically, an inner space composed of shifting 'dynamic' slabs or banks of seating, the apparent relative positions of one slab to another continually changing as the observer moves around the inside of the auditorium. The tent form of the roof bellows out and down over the orchestra podium carrying suspended from its 'belly' an 'immaterial' layer composed of curved sound reflectors and lights. The tone of the auditorium interior is warm; generally the wall and ceiling surfaces are either faced extensively in plywood or painted white in small areas. The seats themselves are built of a matching plywood and covered with a yellow ochre coloured fabric. The flat bulkheads to the tops of the fronts to the seating banks are faced in pale grey limestone. very little strong colour is used and the whole effect is of a contained, intimate, dynamic space, whose colour tone is established by the warmth of the light wood and the ochre fabric offset by white metal organ pipes and enriched by ochre and white paint.

Of the outside of the Philharmonie, succinct comments are always made and rarely are they complimentary. Equally succinct and significant is Scharoun's own interrogative reply when pestered by a student for a justification of its somewhat awkward exterior. The oracular retort was, 'It has an outside?' and the conversation ended. Undoubtedly it does have an outside and its swelling bulky irregular form has not been rendered more explicit and unified through the naïve decision to paint the main bulk, the auditorium, yellow ochre—and the outside walls of the ground floor foyer white. An already critical composition is dissipated further by this change of colour. This, the colour of Berlin, the colour of the east as they say, is yellow ochre—or the 'Brandenbergisoher' colour which was used on the walls of the eighteenth-century Charlottenberg Palace. Here plinth, pilasters, window surrounds and pediments are all picked out in white, while the walls remain in yellow ochre. In following a Berlin tradition so crudely and slavishly, Scharoun's 'phoenix' in the Tiergarten has not been well served.

Scharoun has always set great store by the choice of site. It forms a consistent part of his theory, and on occasion, as in the 'Romeo or Juliet' flats at Stuttgart or in the girls' gymnasium in the small town of Lünen, he has achieved his aim with economy and clarity. Here in Berlin however the choice is not so clear or so felicitous, and until the western tangential motorway is built there will be very little for the building to 'work with' plastically. The Tiergarten is virtually a zero space, today flat and lifeless. The other buildings scheduled to join the 'Philharmonie' and form a 'cultural centre' to be wilfully implanted on the site, do not promise to serve it well from a plastic-urban point of view, in spite of the fact that one of these buildings, the state library, has been designed by Scharoun himself.

A final and fundamental townscape conflict will be set up once the Gallery of the 20th Century designed by Mies van der Rohe is erected to face, across an irregular space, the opposing Philharmonie. It will be an uneasy polemical confrontation between two distinct and age-old poles of thought, between the classic and the organic; a 'building out' of a conflict of little mutual benefit to either buildings or to people. Scharoun's precepts about the sociological importance of the choice of a theatre site hardly seem to apply here and one remains profoundly doubtful that the 'Philharmonie' does in fact stand at that mystic point where 'it naturally possesses its necessary spiritual relevance to the town'—(to quote Scharoun's own words.

The erection of the Philmarhonie raises all the old problems once more and the conflict between the two poles of thought within 'Der Ring' is by no means settled. Since the building was first opened just over a year ago, appropriately with Beethoven's Ninth symphony, it has been nothing but an unqualified and even popular success. Few buildings built outside Finland have achieved such unity to the extent that all applied art, light fittings, etc., appear as from a single hand yet are in fact from many. In the Philharmonie a number of artists worked jointly under Scharoun's direction. In addition it has scored on almost every other level, socially, economically (cost £1·5 million) technically, acousitcally (reverberation time 2–2·4 secs), and finally musically. This success only serves to strengthen the challenge jointly made by Scharoun and Häring (the one built, the other largely theoretical) to standardization and to classicism. The 'Philharmonie' is not an historicist *tour de force* in style, a phenomena with which we are today so much inflicted. It cannot be written off as a monument because it is not in the least monumental. It is a piece of living design and although it is the idiosyncratic creation of a powerful individual, its importance lies in fact that it does offer an alternative choice that appears to be valid. In its foyers, one quickly becomes aware of the potential that this non-Euclidean architecture possesses for being erected out of lightweight prefabricated plastic parts held in suspension. Although it is unlikely that such an architecture will ever have a general application, the total success of the Philharmonie, the point of balance which it holds between an organic and an objective architecture, compels us to re-assess a forgotten school of architecture, to look again at Taut's Utopian dreams and to read, perhaps for the first time, the theoretical writings of Hugo Häring.



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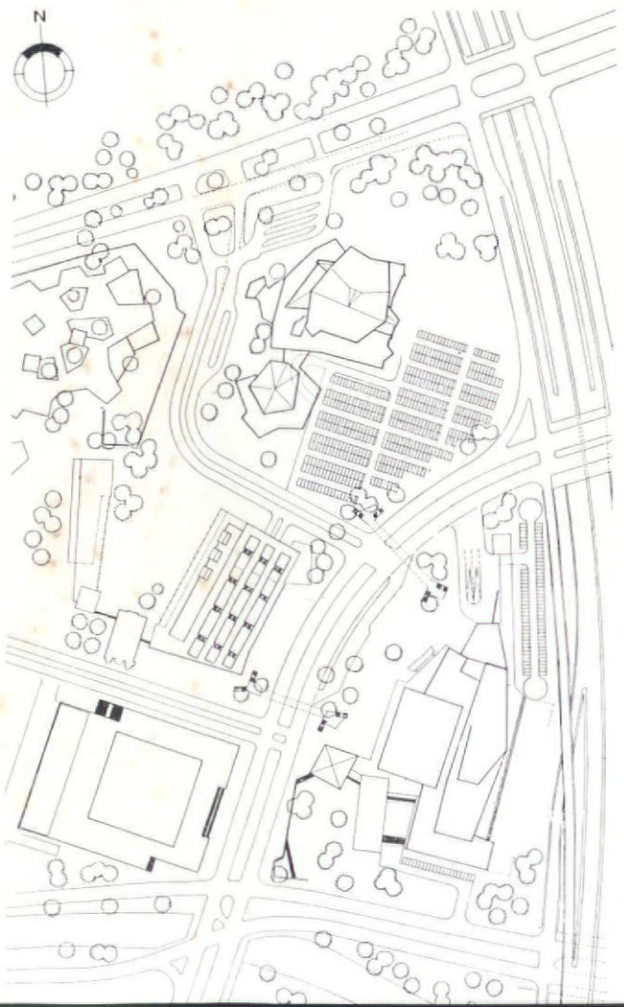


2

The Philharmonie, West Berlin

Hans Scharoun
in collaboration with Werner Weber

In 1956 when Scharoun won the competition for the design of the Berlin Philharmonie the site proposed was on the Bundesallee, behind the Joachimsthalschen High School. The form and layout of the building in this densely built-up business and residential area was a particularly difficult feature of the competition. But in 1959 when the present site, on the southern boundary of the Tiergarten, was chosen, the layout and spatial arrangement of the building were little altered. */Continued on page 120*

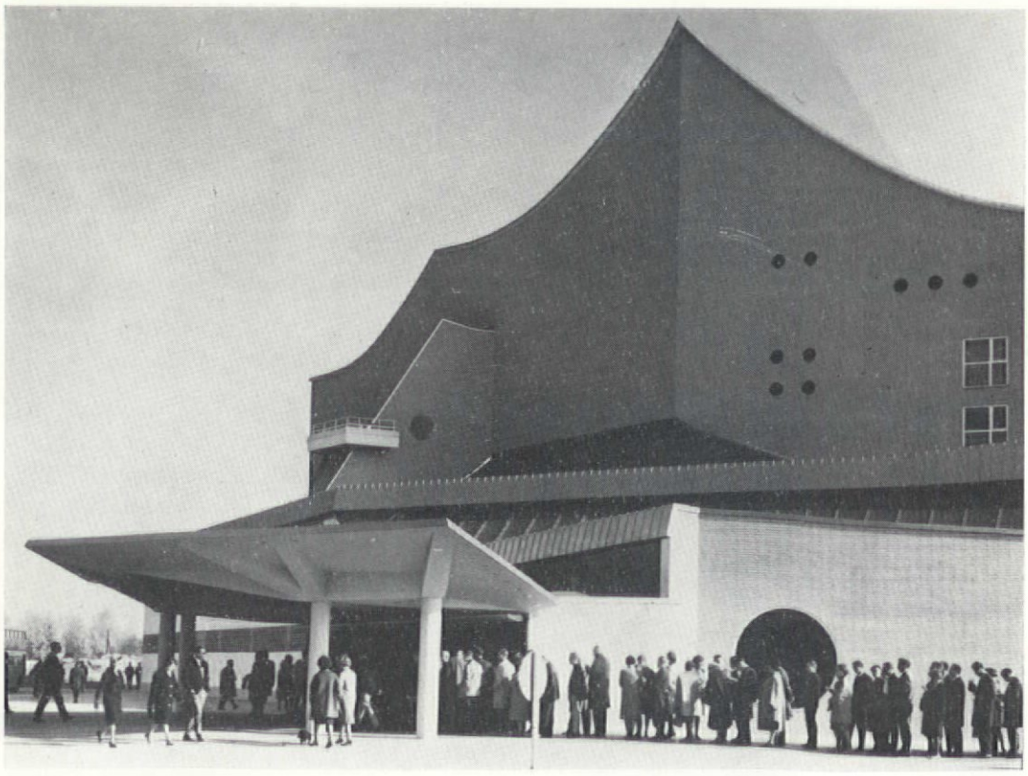
1
Aerial view of Berlin showing the area between the Reichstag and the Potsdamer Platz/Leipziger Platz. In the distance, on the north side of the Tiergarten is Hugh Stubbins' concert hall. To the right (east) are the Potsdamer Platz and the Leipziger Platz. To the west is St Matthew's Church. The Philharmonie is in the middle distance

2
Site plan showing Gallery of the Twentieth-century by Mies van der Rohe (bottom left) near St Matthew's Church, with the new library by Hans Scharoun to the east, and the Philharmonie to the north

Photo: Reinhard Friedrich

1

2



1
View from the west with the glass-roofed foyer in the foreground. The main part of the building is of raw cement painted ochre, the colour of the Schloss Brandenburg, the lower wings are white

2
Main entrance

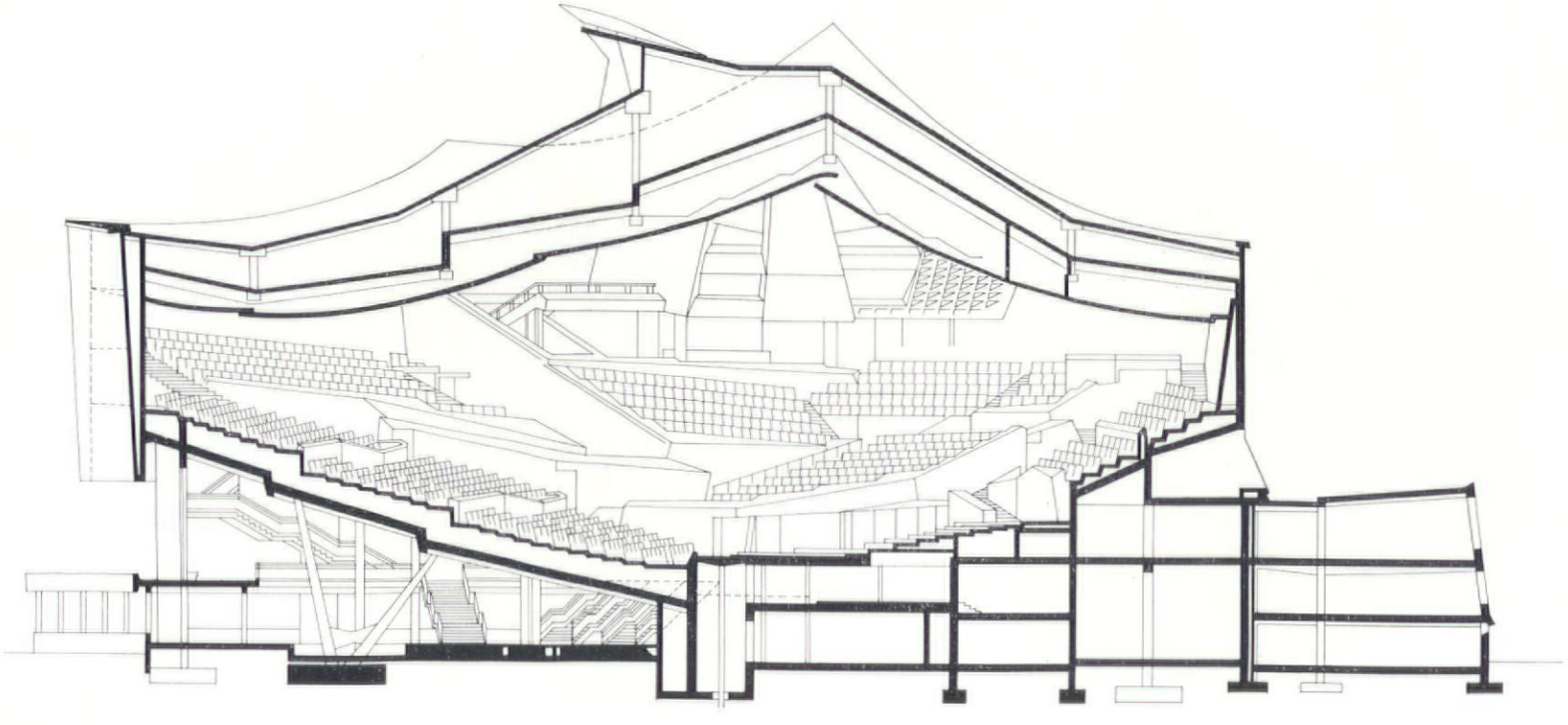
3
View from the south with recital room and recording studios in the foreground

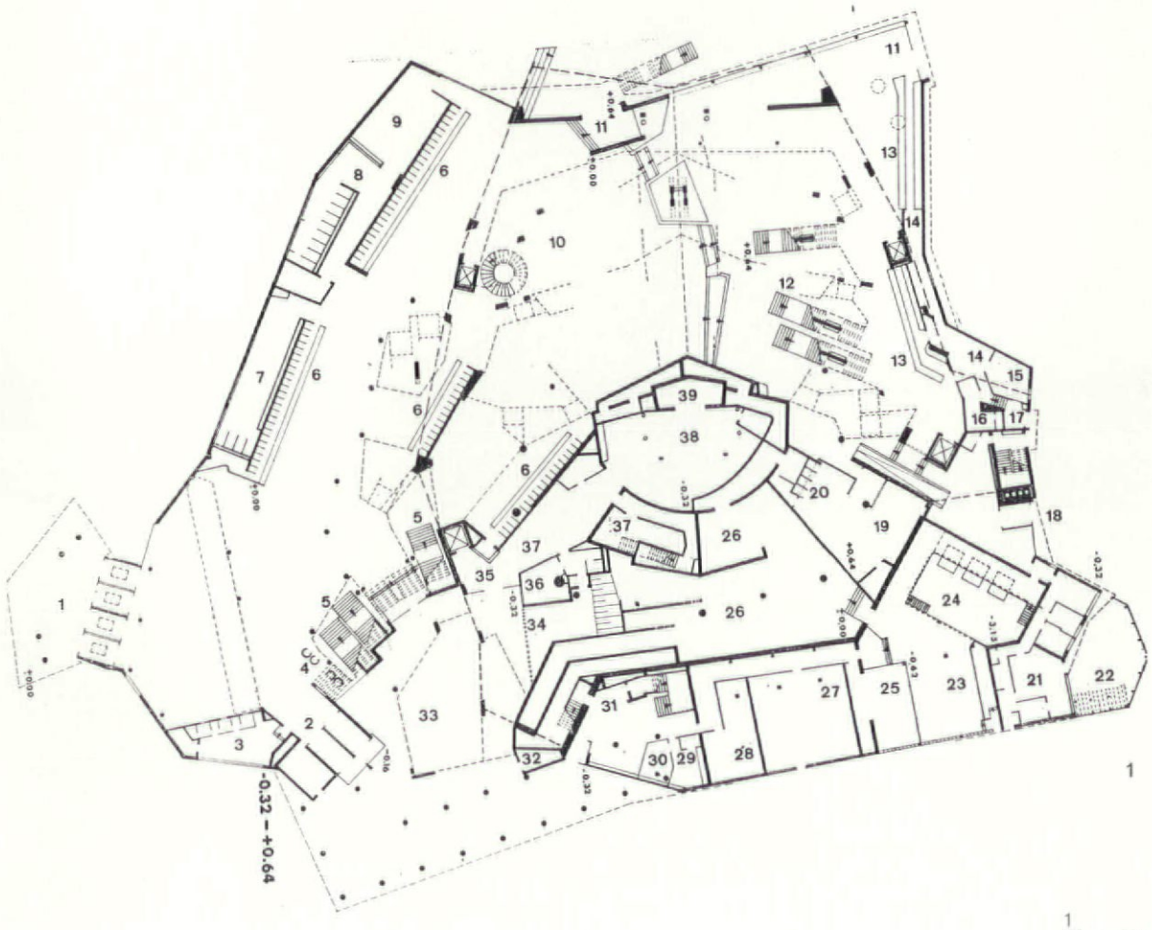
4
Section

Photos: 1 and 3 Reinhard Friedrich; 2 Orgel-Köhne

3

4

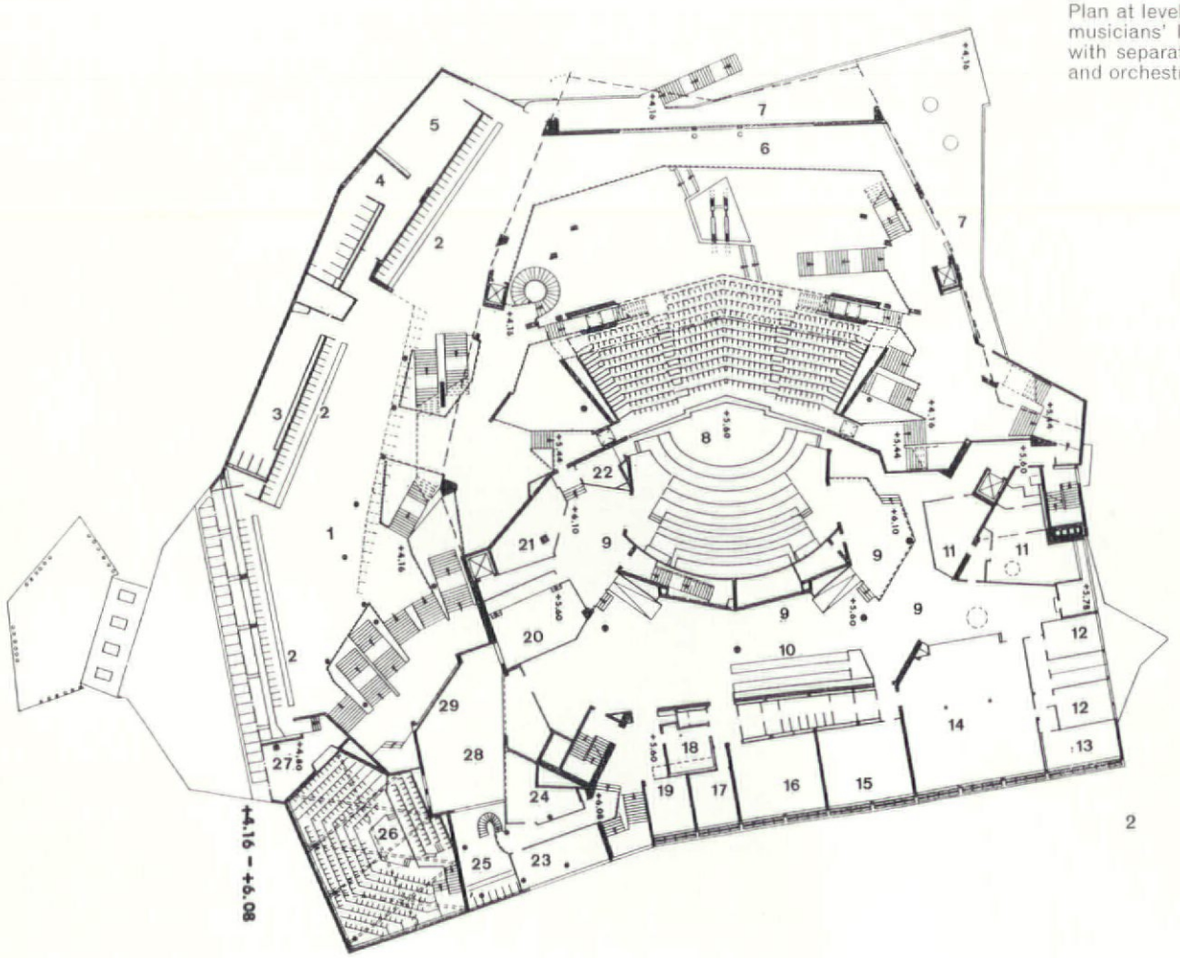




1

1
Plan at levels — 0·32m to + 0·64m. Main entrance with ticket office, foyer and cloakrooms, instrument stores and orchestra pit, plant and service rooms and the caretaker's flat

2
Plan at level + 4·16m to + 6·08m. Main platform and musicians' lobby, recital room and recording office, with separate rooms for the concert master, soloists and orchestra members



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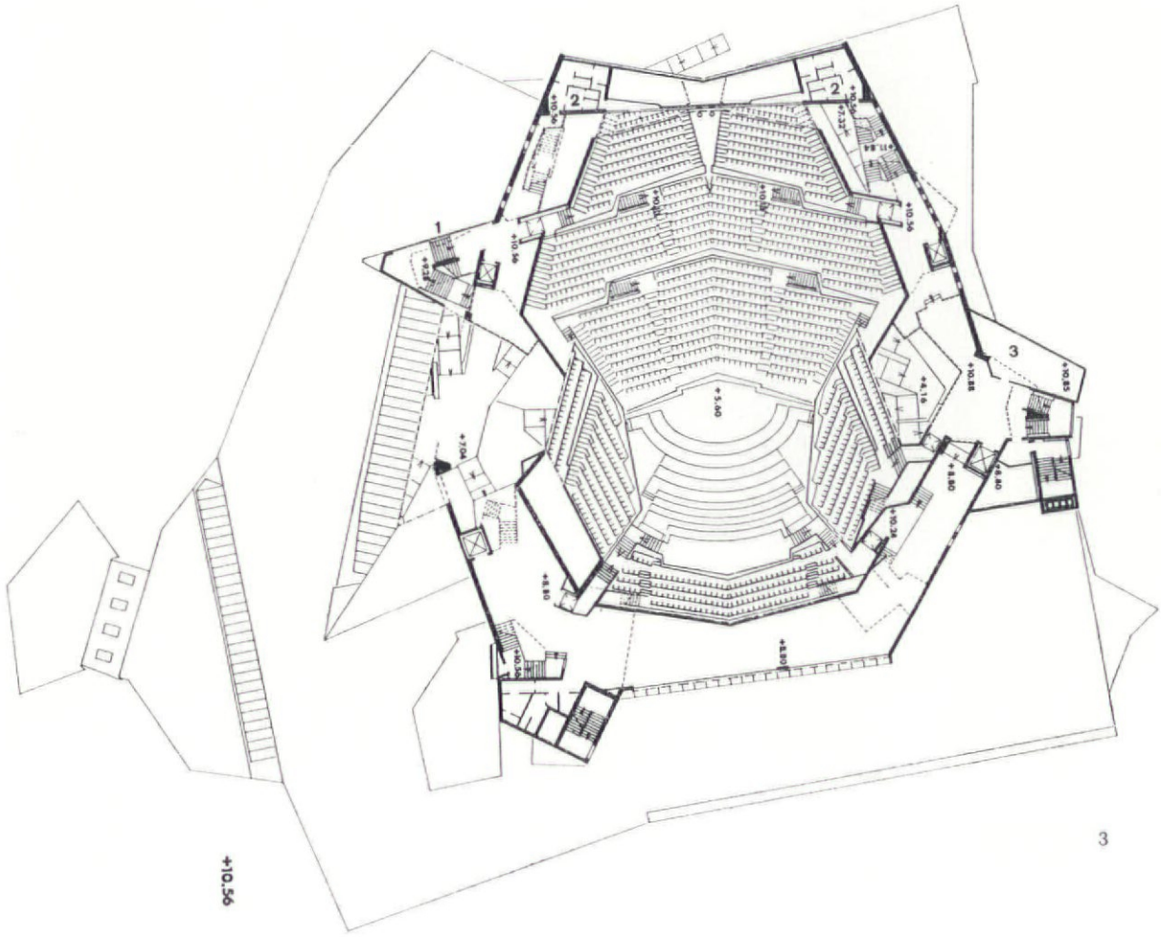
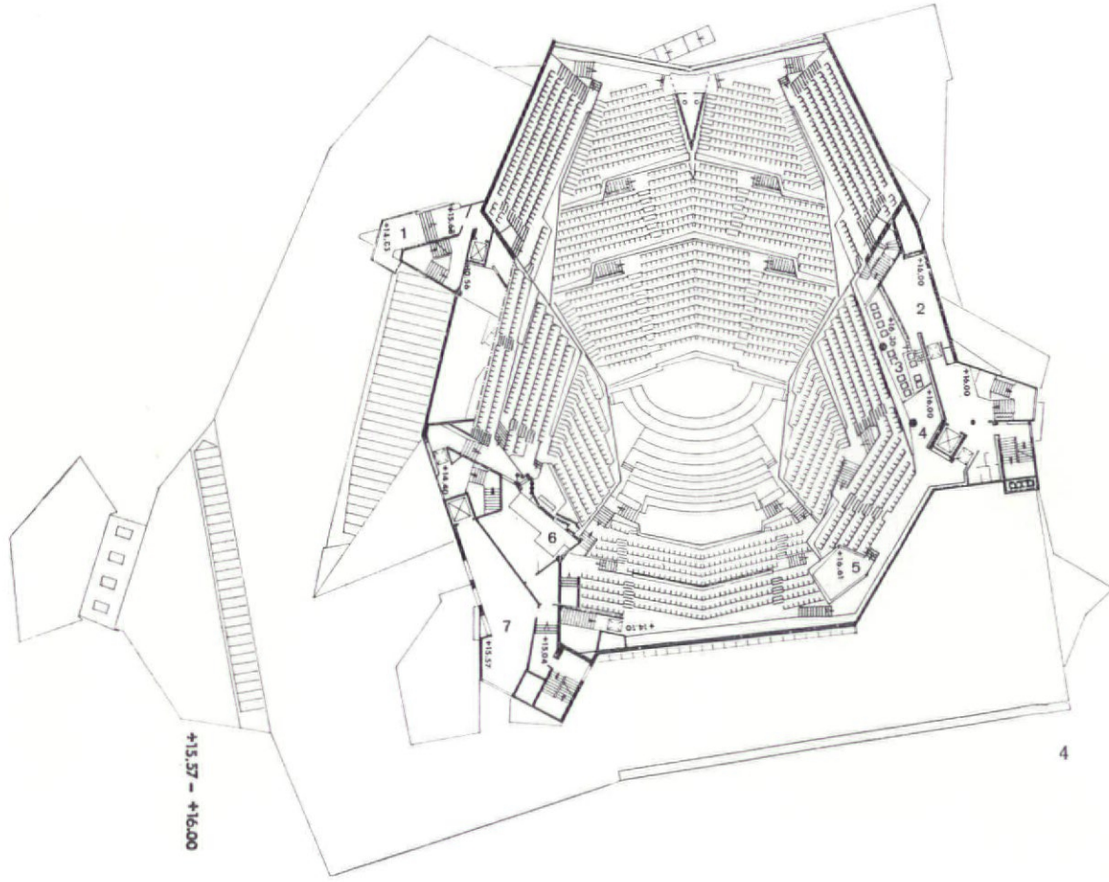


3
Plan at level + 10·56m. Main auditorium

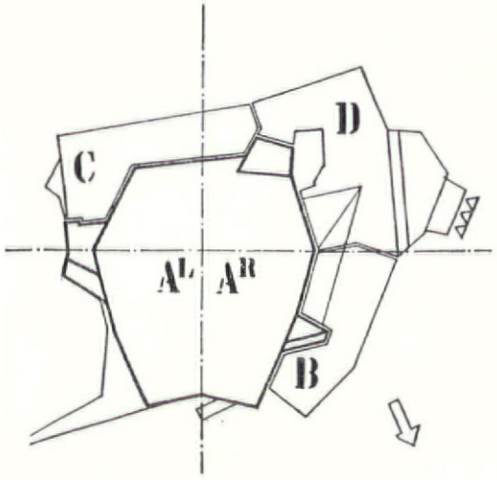
4
Plan at level +15·57m to +16·00m. Galleries, ceremonial box, organ and studio for electronic music



1

Plan showing breakdown of structural units

Part A contains the auditorium, the larger part of the foyer, the studios, etc., as well as a part of the artists' and plant rooms.
Part B shows the entrance and cloakroom block adjacent to part A on the west side.
Part C connects with part A to the south and contains the majority of the rooms for the orchestra, administration and boiler-room.



Part D comprises essentially the entrance and ticket halls as well as the choir practice room.
All the sections of the building are separated from one another by expansion joints which have not only a structural but also an acoustic, significance.

Part A
The adjoining roads made special sound absorption measures necessary, especially as the auditorium is also intended to be used for making recordings. All entrances to the auditorium have lobbies, acting as sound barriers. The external walls are in two skins, the roof in three, including the suspended ceiling.
Especial care was devoted to the elimination of noise from the plant in the building (air-conditioning grilles, lifts, toilets, etc.). The dividing walls to these spaces were treated with acoustic finishes.

Part B
Includes cloakrooms and toilets on two levels.

Part C
On the ground floor is the administration and musician's entrance, the doorkeeper's office, as well as a series of rooms for the electric and heating plants.
A caretaker's flat is situated at the south-east corner. The boiler-room is at a lower level (—3·24) and, on account of the unfavourable water table, had to be tanked.
All administration offices are on the mezzanine floor at 2·56. At 5·60, linked to the musicians' foyer, are waiting rooms, rehearsal and tuning rooms and some solists' studios.

Part D
On the west, towards Matthäikirchestrasse, is the main entrance and ticket hall which leads direct into the cloakroom space and foyer. The staircases to the upper range of cloakrooms is in Part B together with the choir practice room, its small foyer, changing rooms and toilets.

2

3

4

1
Main foyer looking towards the north-east. The limestone floor with inset mosaic and slate panels to act as a guide to the various staircases was designed by Erich Reuter

2
Main foyer seen from the helical stair, showing the twin V-supports to the main seating tiers of the auditorium. The domino lights on the left are of various tones of stained glass set in concrete panels, designed by Alexander Camaro

3
Eastern end of the main foyer with stairs leading to the upper galleries of the auditorium. The raw concrete work throughout the foyers is painted white

4
Main foyer seen from the first floor level, directly opposite view 2

Photos: Reinhard Friedrich

1

2

1
Upper level of main foyer, with cloakrooms in the background and access galleries in the distance. The carpeting at this level is a warm grey

2
The same view as that above, but seen during the day to show the effect of light flooding through the glass roof and the coloured glass panels

3
First-floor foyer with the glass roof over

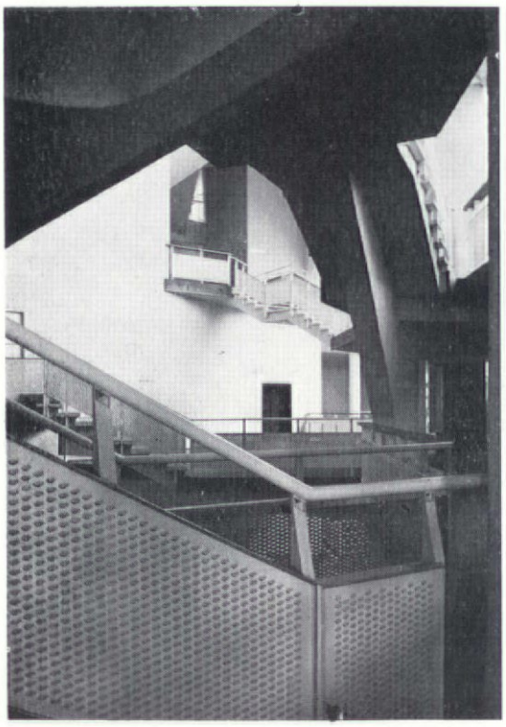
4
Stairs flung through space at the upper level of the main foyer. The balustrade in the foreground is of stamped sheet metal, lacquered white, with steel uprights and handrails

Photos: 1, 3 & 4 Reinhard Friedrich; 2 Lehmann

Continued/ The auditorium and main foyers remained as they were; only the entrances and ancillary buildings were replanned. Scharoun's original concept of an architecture controlled by and emanating, as it were, from the music at its centre, seemed to require no change. 'It is no coincidence,' he wrote in his competition report, 'that people always gather in circles when listening to music informally. Their natural arrangement should be adopted for a concert hall. This was my first decision. Music was to be the focus, both visually and spatially. . . . I imagined the auditorium as a valley; at the bottom the orchestra encircled by tiers of seats, rising like the terraces of a vineyard, above, the ceiling, a tent-like shape, a skyscape swooping down to meet the landscape below.' Equally Scharoun has claimed that the form and silhouette of the building are a reflection of icebergs he saw floating beyond the harbour buildings of his native Bremen. But such visions, though they have been given vital form, have been firmly subordinated to the requirements of the building. In particular they have taken shape at a remarkably low cost, little more than £1,500,000. Construction too has been efficient and rapid—the foundation-stone was laid in the autumn of 1960, three years later the building was opened.

3

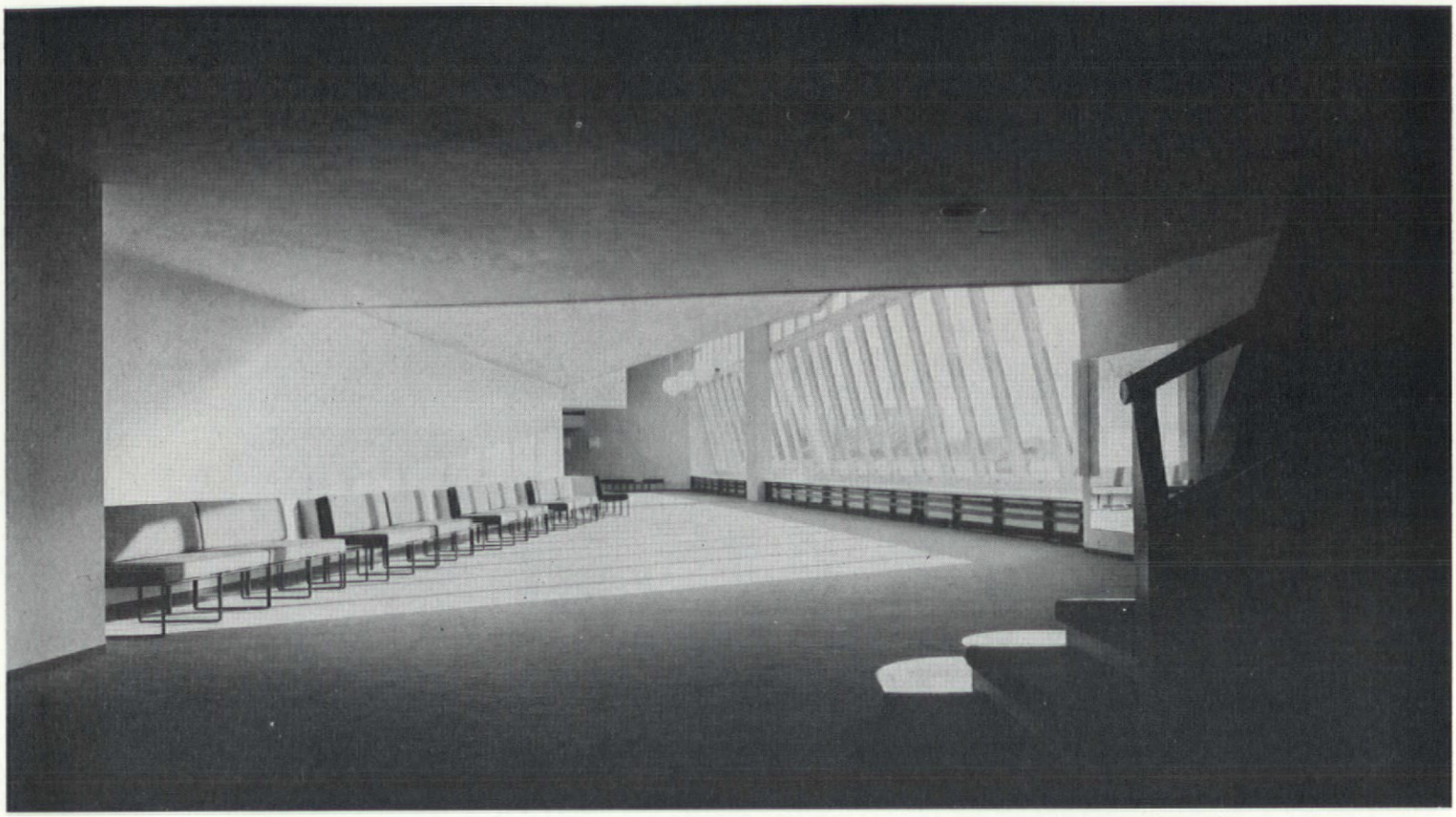
4



Recently Scharoun has won a second competition for an immense State Library which together with the Philharmonie, Stühler's surviving Mathäikirche, a group of shops and restaurants, a new museum and Mies van der Rohe's precise, formal Gallery of the Twentieth Century, is to make a new cultural centre for Berlin. The new design is far less Expressionistic than that of the Philharmonie, probably in deference to Mies van der Rohe's adjoining gallery. This oddly conceived cluster is to be flanked by a sunken by-pass and intersected by a network of roads which will, perhaps, make the sculptural qualities of Scharoun's buildings more evident when viewed from a fast-moving car, but will certainly not add to the attraction nor the coherence of this 'kulturband'.

The foyers

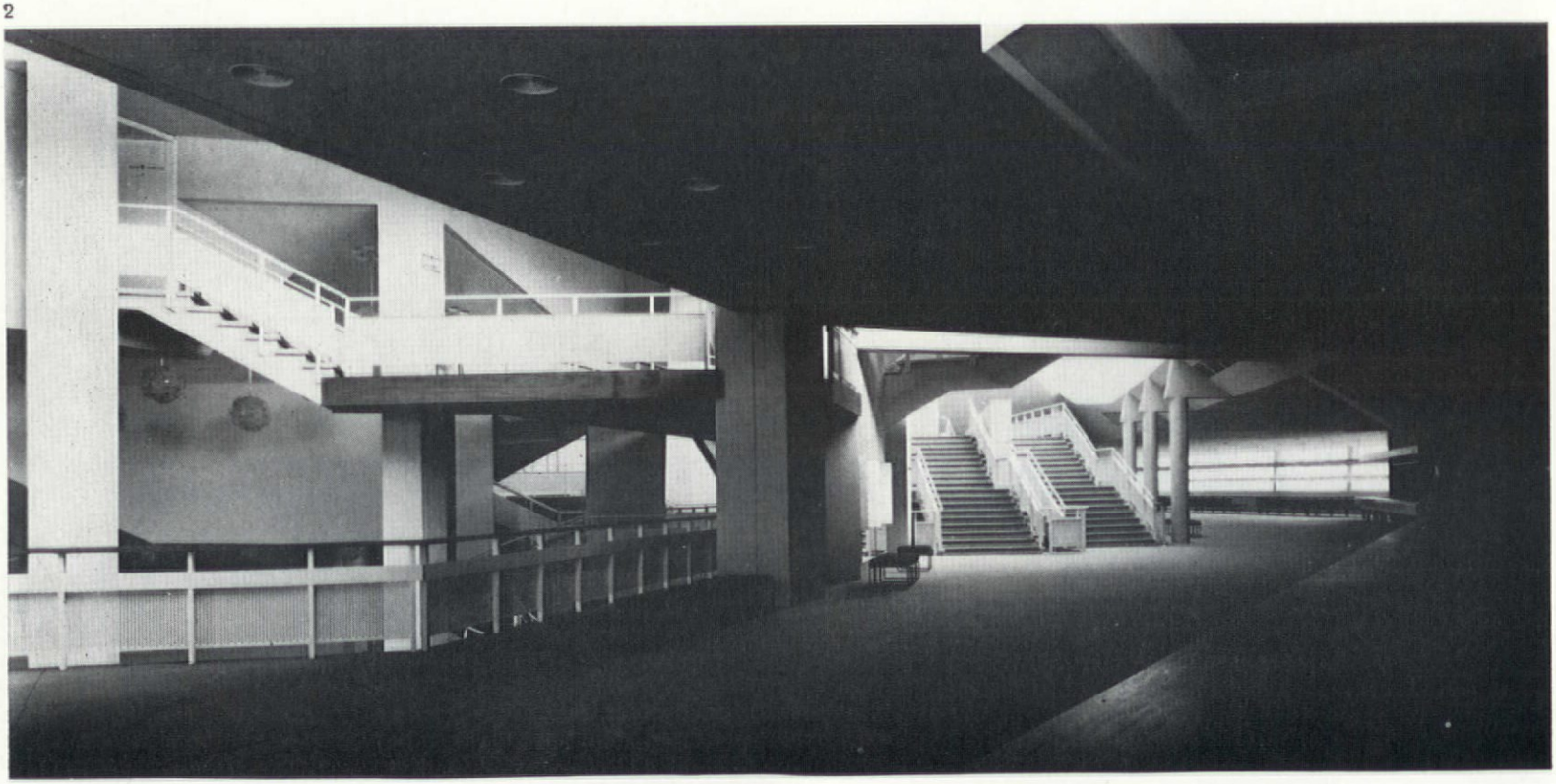
The administrative rooms and foyers that are massed around the bulk of the auditorium are of an altogether different shape and scale, but they were designed with equal precision and thought. There is nothing wayward about their arrangement. Even the staircases that seem to thrust out from every corner of the main foyer, leading only to suspended bridges beyond and more distant catwalks, are carefully contrived to lead each member of the audience as directly as possible to his appointed seat. There was confusion on the first night, mainly due to the fact that directional signs have been avoided, but most of the audience being subscribers, they have now learned to take to their staircase and to follow their route with perfect ease—and absolutely no crush—from the entrance door to their seat. Any sense of overt segregation that this arrangement might imply is at once destroyed by the interplay of spaces in the main foyer and a certainty of being a living part of one varied but identifiable and visible congregation. There is very little applied decoration in the foyers. The audience moving through these spaces supplies all occasional interest. The white painted concrete structure and walls have been left with their shutter marks, the ground level has been nobly paved with slate and inset mosaics to suggest a directional flow to the stairs, while the upper levels have been finished off with a simple warm grey carpet. This sound-absorbing surface and the acoustic plaster on the underside of the auditorium are the only surface coverings. Everywhere the reinforced concrete structure has been left apparent. Colour is provided by four coloured glass window panels in the foyer, */Continued on page 124*



1

1
Foyer at level + 8·80m at the southern end of the auditorium
2
Upper level of foyer seen from the cloakroom
3
Uppermost level of the main foyer as seen from one of the access stairways
Photos: Reinhard Friedrich

2



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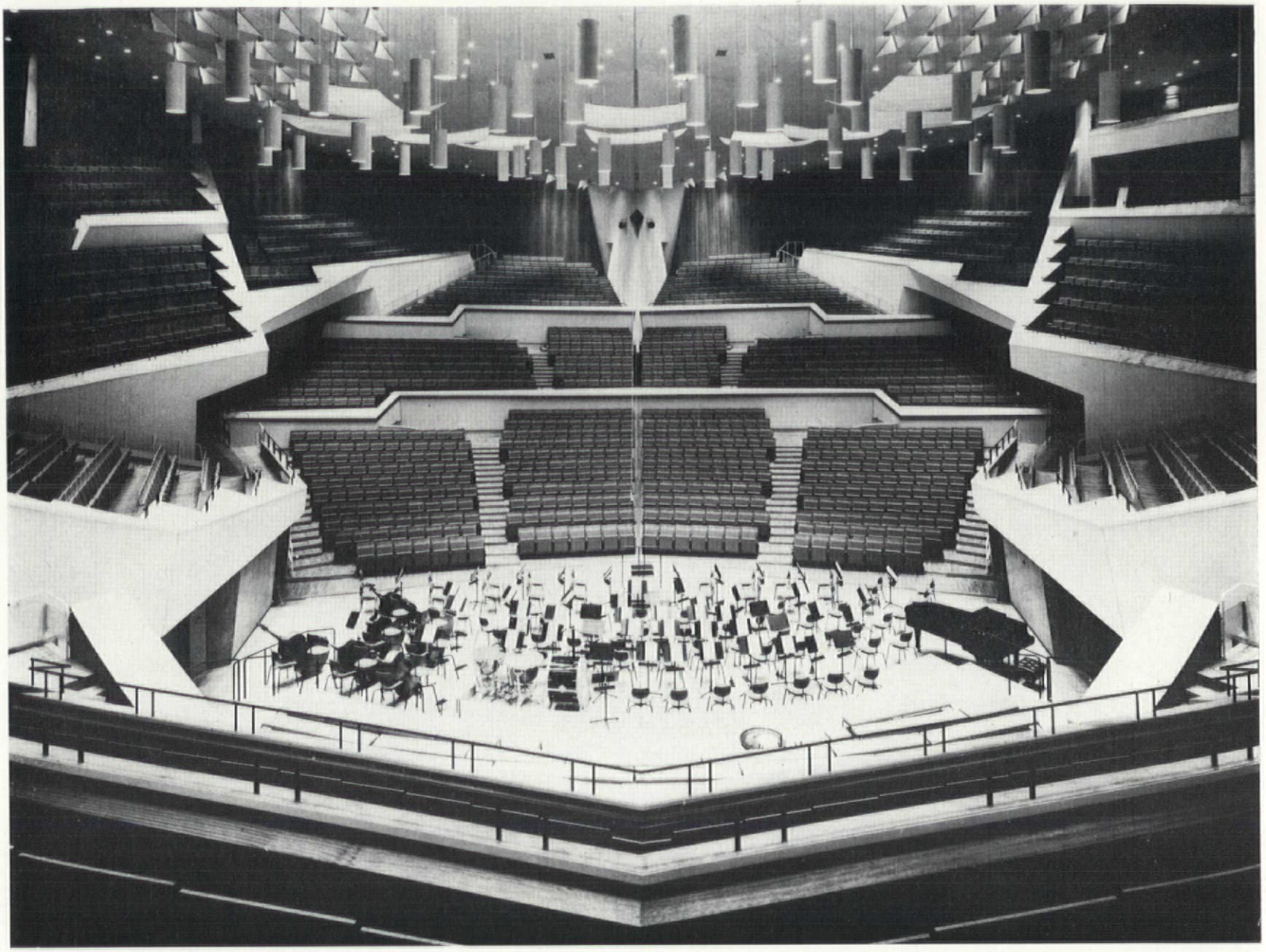


1

Continued/ but the truly magical quality of the lighting comes rather from the glazed rooflights high above the highest stair and gangway. Decorative features that have been introduced are fussy and irksome—dandelion lamps with dimples and a large sculpture in the main foyer by Bernhard Heiliger. The one attempt to give a contrived sculptural form to the structure itself—the double V column that sinks into a flower box in the foyer—has just that uncertain quality characteristic of contemporary fine arts.

The auditorium

The form of the auditorium arises directly from its plan. At the centre is the main orchestra platform, which can be raised and lowered in different sections to create a pit or a stepped dais to accommodate massed choirs. Three additional platforms for musicians and singers are located around the perimeter of the hall. Altogether 2218 people are grouped around the orchestra; in front are the four main tiers of seats for 1330 people, 300 are seated in the three tiers on either side and 270 in the two tiers behind. Despite these numbers no one is more than 100ft from the orchestra. Communication between performers and listeners is close. And this sense of intimacy is much enhanced by the grouping of the seats. The tiers are separated and given their own identity and the seats in each, are placed at a different angle from those in the next.

The parapets between are angled and sloped in accord with acoustic requirements, providing a wonderful variety of reflective surfaces. Some are faced with limestone, others with teak, while some of pine or fair-faced concrete are painted off-white. The overall colour-tone of the auditorium is thus light. The floor of the orchestra platform is a pale Oregon pine, the apron and the high balustrades surrounding it on three sides are of limestone, serving as a giant reflector to the main tiers of seats. Acoustic requirements have dictated the finishes throughout. The parapets and the auditorium walls are vibrators or resonators, to absorb the lower frequencies. The seats are of plywood, with tip-up cushioned seats, to absorb the high frequencies. Fully upholstered seats were not used as they absorbed the higher pitches to too great a degree. Reverberation times measured in the middle tone ranges (c′ to c′′′′) are as follows:

a. in an empty auditorium 2·4 seconds.
b. with musicians and choir, but without an audience, 2·2 seconds.
c. with musicians and audience, 2·0 seconds.

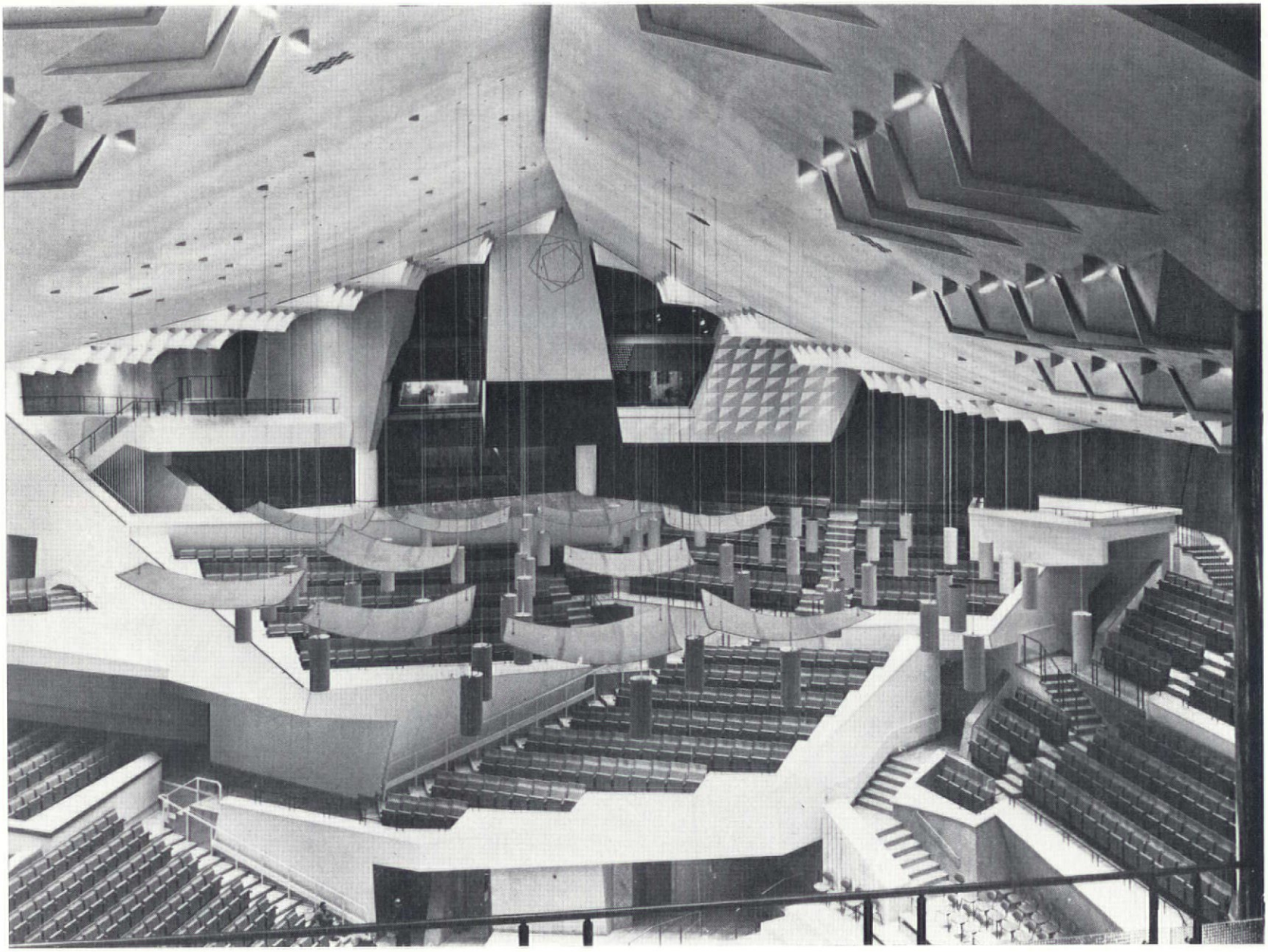
In order to achieve the desired reverberation

1
The auditorium looking across the orchestra platform which is of Oregon pine towards the central spur and the north wall which is covered with Kambala wood

2
View across the auditorium showing the ceremonial box on the right with the television and special effects control rooms beyond the suspended sound reflectors. The ceiling is fitted with 136 pyramidal Helmholtz resonators

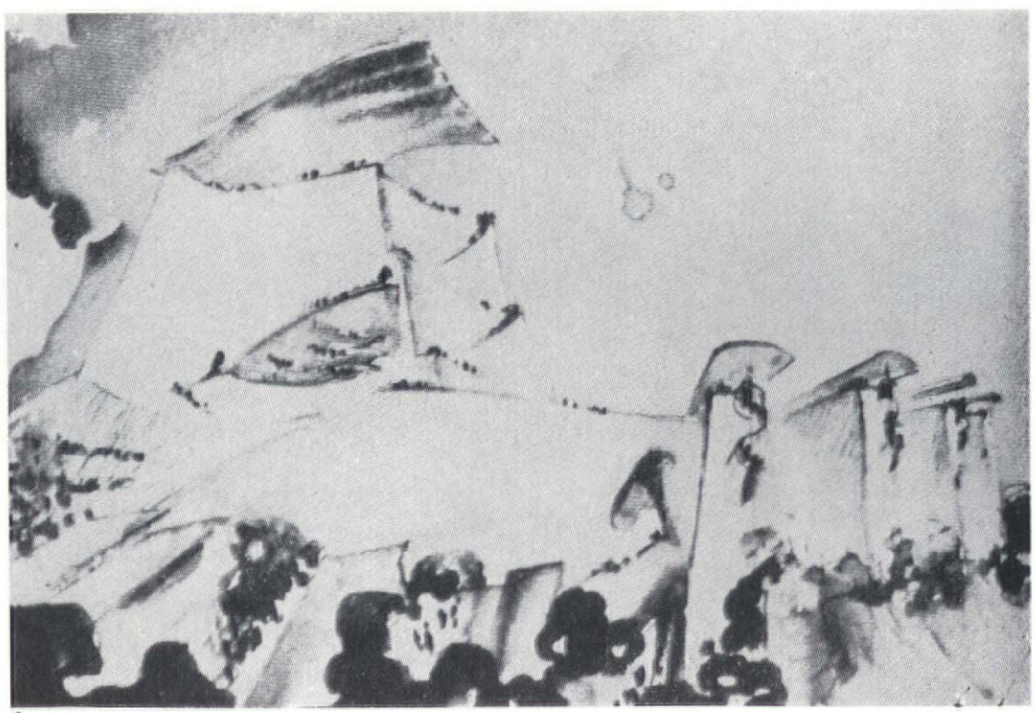
3
One of a series of visionary drawings done by Scharoun during the war years which indicates just how fully the volumes, spatial effects and forms that he has toyed with have been realized in the Philharmonie

Photos: Reinhard Friedrich



2

time of 2·2 seconds the volume of the auditorium was increased to 34,000 cu yds, about 13 cu yds per person, making it one of the largest in Europe. To prevent echoes and ensure the maximum diffusion of sounds in this great space the ceiling was designed as a series of convex curves, giving to the auditorium its tent-like shape. This section is repeated in each of three insulating roofs and appears triumphant in the external silhouette. The basic shape of the auditorium is thus determined by the arrangement of the seats and the acoustic requirements, but even the subsidiary elements are an equally forceful expression of other functional criteria—the dazzling organ to one side of the auditorium is an important feature of the composition, as are the ceremonial box (and adjoining invalids' box) and the whole range of recording and television studios above them. Only the triple pentagon set on a panel between the glazed walls of these studios, symbolizing a new relationship between space, man and music, strikes a false and unconvincing expressionist note. Even the spur at the opposite end of the auditorium, which appears an equally contrived decorative feature, is in fact an acoustic feature, a pipe duct and a vantage point for television cameramen. These functions known, its appearance is readily accounted for.



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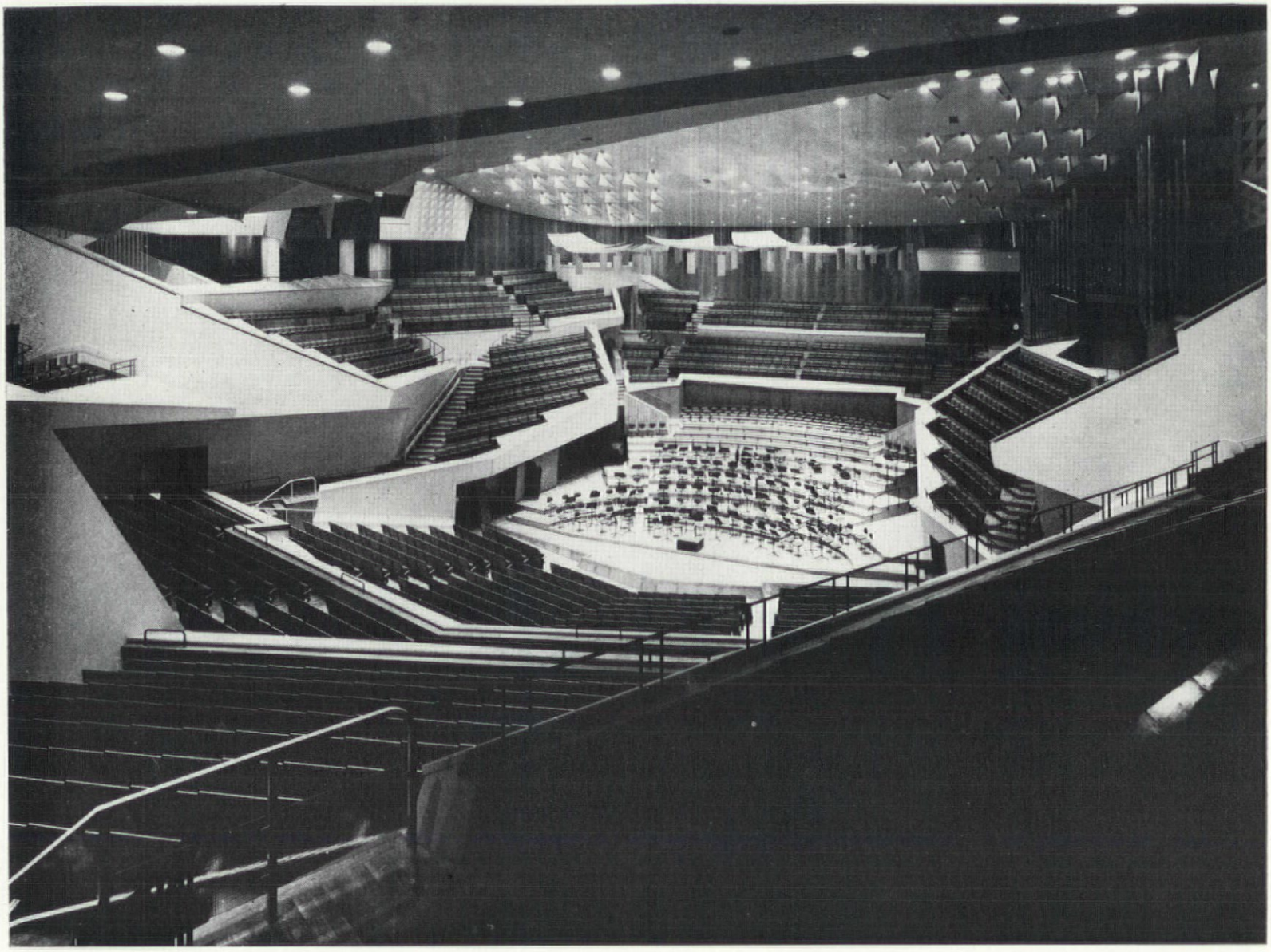


1

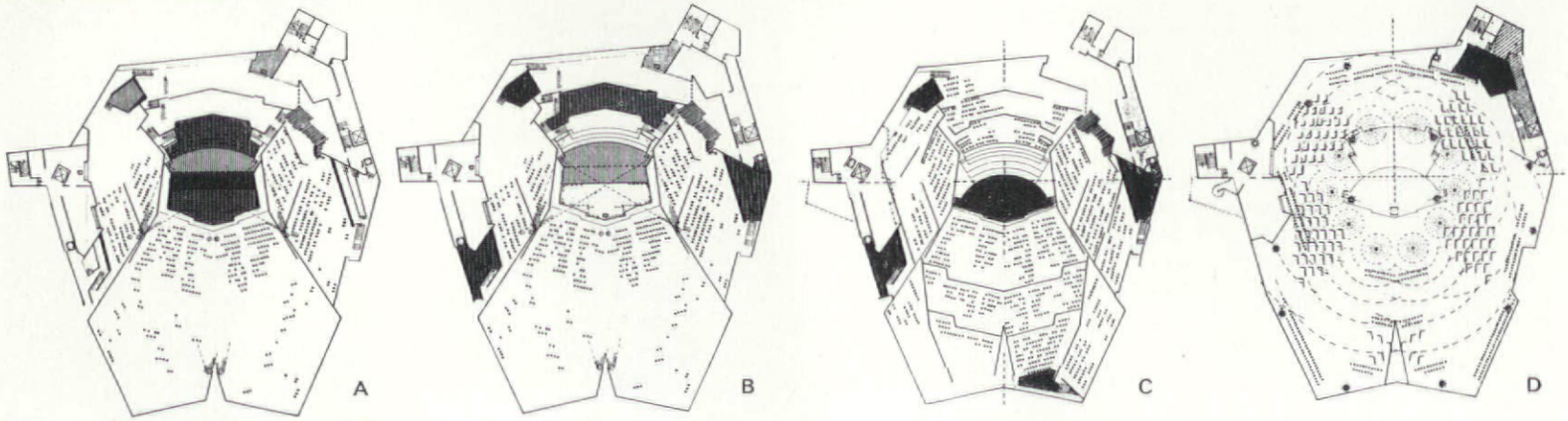
Diagrams showing various arrangements of the auditorium

A
Music from the main dais, from the three stereo-music platforms and a further group of musicians next to the spur

B
Electronic music, controlled from the studio, prepared in the rooms shown hatched. Ten built-in loudspeakers in the ceiling and fifteen movable ones on the auditorium walls serve to beam the music

C
The orchestra pit is sunken: for semi-scenic performances, the orchestra extends into the acting area. The scenery can extend back as far as the middle high-level dais (shown hatched). Lighting control is from the room next to the studio for electronic music (similarly hatched). The choir is behind the orchestra

D
Scenery is arranged on three levels. Behind is the choir, and the musicians are on the three stereo-music platforms. The organ is indicated in diagrams 1, 3 and 4, the spotlights are also shown in 3 and 4, and in 1 the artists' entrance



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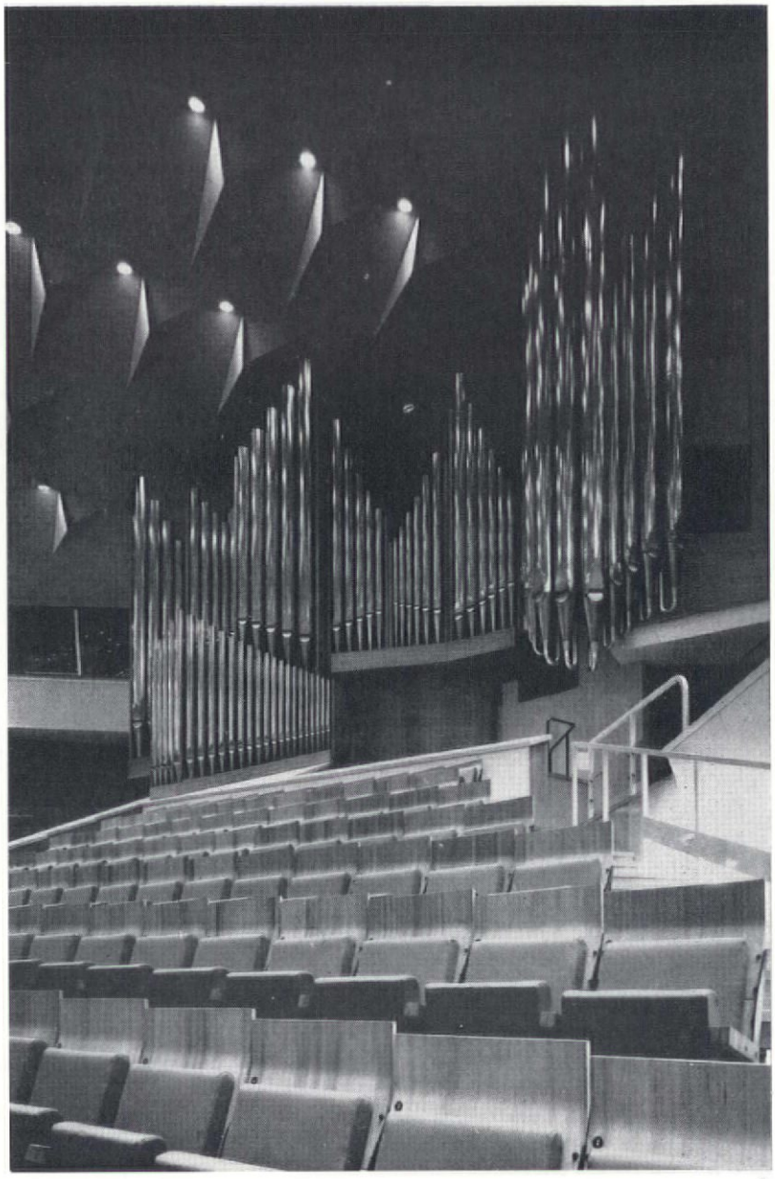


3

1
General view of the main auditorium

2
View along the west side of the auditorium with one of the balconies for a small orchestral unit to be used in works for dispersed orchestra, with the organ and control box in the distance

3
The 72 register organ built by Schuke, under Professor Michael Schneider, situated at the southern end of the auditorium, with the special sound effects control room on the right

Photos: Reinhard Friedrich

Construction

Every part of the building was built independently of the others and is stable in itself. Owing to the high water table the idea of a basement was abandoned.

Roof construction

The roof over the concert hall is a clear span. Loadbearing material is reinforced concrete, consisting of five precast curved beams of different lengths. These in turn carry purlins for a concrete roof 7cm thick above, and 14cm thick below the beams. The space between the concrete roofs is fully accessible, and the acoustic ceiling visible from the auditorium is suspended from it. All the plant and equipment built into the auditorium ceiling (lights, spotlights, microphones, etc.) can be reached from here. The annexes (B, C and D in the diagram on page 118) have a normal roof construction.

External walls

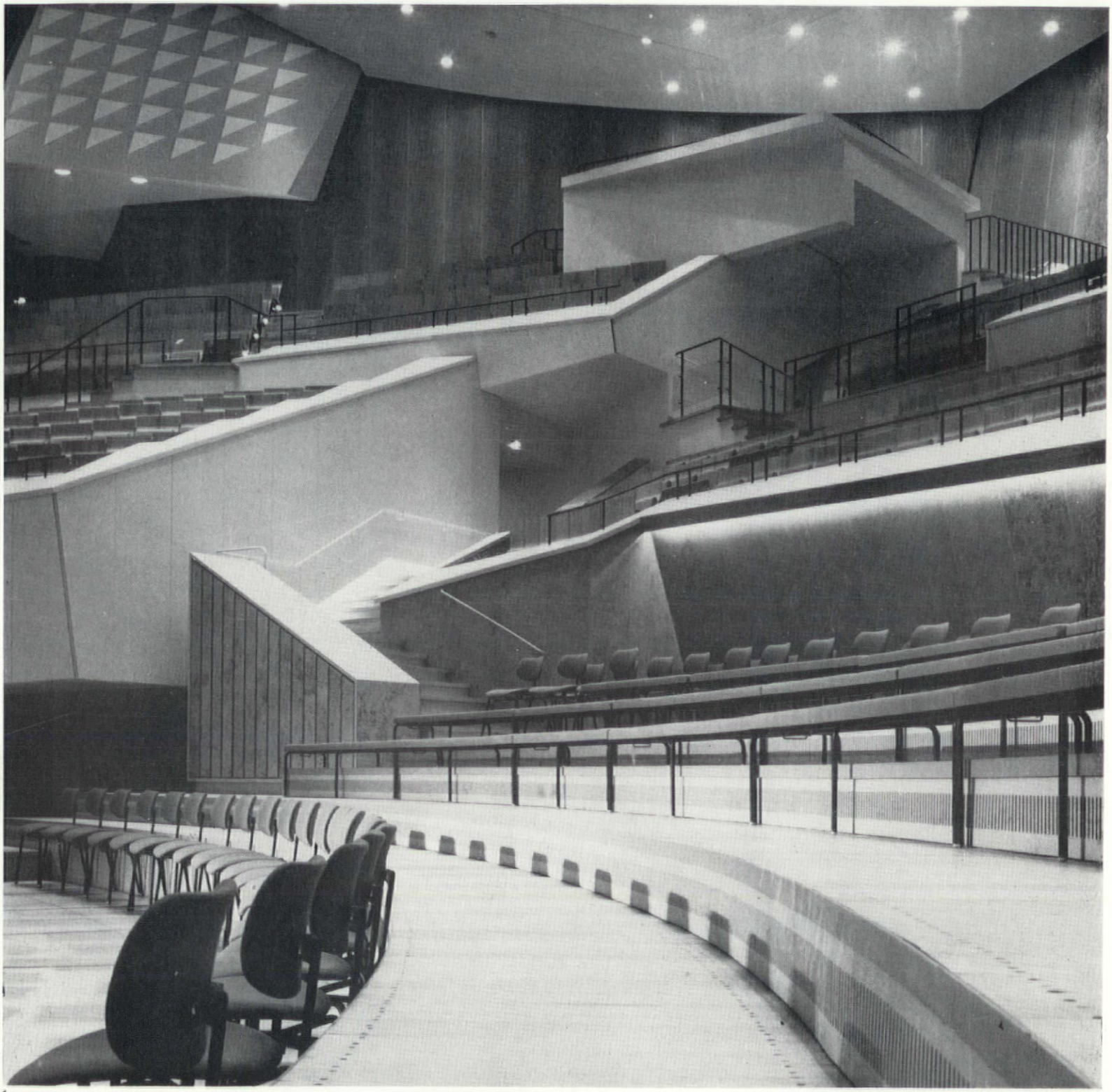
The whole of A (page 118) is built without any expansion joints. Thermal movement is taken up by means of additional reinforcement and the frequent breaks in the perimeter of the wall. As the external faces were intended to be fairface concrete with vertical rough-boarded finish, the thermal insulation, consisting of 5cm thick lightweight woodwool slabs, was used as permanent shuttering in the inside face.

Internal walls

The internal walls in A (page 118) are almost exclusively loadbearing, and consist of 20–40cm thick reinforced concrete. In the upper storeys, where mass walls could not be used on account of the weight involved, and where sound insulation through partition walls was of great importance, multi-skin partitions were used having a flexible core between rigid skins.

Ceiling construction

The floor beneath the auditorium is also built in two skins; a structural slab which carries the steel framing which in turn supports the prefabricated finished concrete floor panels and below the reinforced concrete ceiling to the main foyer. The cavity is used as a plenum for the air-conditioning with outlets situated beneath each seat.



1

1
View from the orchestra platform looking towards the ceremonial box, with the television control room on the left

Photo: Reinhard Friedrich

Plant and heating

The heating and air-conditioning system is fed by three oil-fired boilers, providing a maximum of $9{\cdot}925 \times 10^6$ BthU's/hr. The concert hall itself is heated in conjunction with the air-conditioning, all other rooms and foyers are heated with radiators. Several areas of the ground floor foyer have supplementary under-floor heating and additional background heating in the foyer, rehearsal room and other large volumes, which is supplied by powerful forced air plants, that in the main foyer has an hourly capacity of 66,000 cu yds.

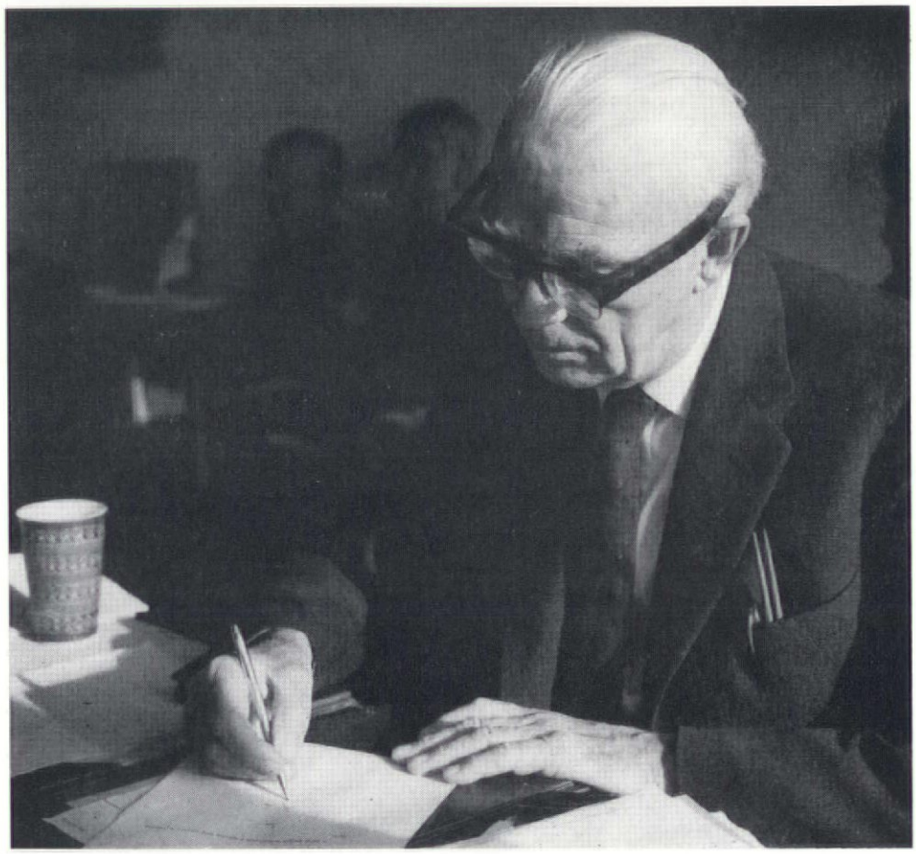
Supervision: Kurt Enderlein
Structural engineer: Hans Schroeder
Acoustic consultant: Lothar Cremer
Music consultant: Fritz Winckel
Heating and ventilation: Wilhelm Raisz
Electrical engineer: Hans Gerstenberg

In the last two or three decades there have been too few structural engineers of world eminence—Freyssinet, Torroja, Nervi, Guyon and Candela come readily to mind. They and one or two others are well known for their association with some rather special projects and forms of construction and there is no doubt that they have made a significant contribution to building engineering which is plain for the world to see.

So has Ove Arup—but perhaps not so obviously. His influence has been much deeper and more subtle. It has been concerned more with ideas and with attitudes, with beliefs and with certain essential truths—the fundamental matters of form, function and structure. His thinking has had a profound effect on the whole field of building and structural design during the middle of the twentieth century.

This gift, the ability to influence the thoughts of others, is very precious and is given to so very few. Ove Arup has it and has used it well, with elegance and with simplicity. May he long continue to do so.

Next month he will celebrate his 70th birthday. To do honour to the occasion, we are publishing two works which can be said to represent opposite extremes of his activity: the first, a simple footbridge designed by himself, revealing of his clarity of thought: the second, the vast and complex Sydney Opera House in which he has helped Utzon to make possible the architectural intention of letting the structure speak for itself.



Ove Arup

Biography

1895 Born in Newcastle-on-Tyne, England, of Danish parents (British subject by birth).

1902–1907 Preparatory school in Hamburg, Germany.

1907–1913 Public school in Sorø, Denmark.

1913–1916 University of Copenhagen, studying philosophy and mathematics. Took degree of 'Filosofikum' in 1914.

1916 Having decided that the study of philosophy, although interesting, would not solve the mysteries of the Universe, Ove Arup wavered between architecture and engineering, choosing the latter because he hoped he might be able to take up architecture later on a solid technical basis.

1922 He graduated early in 1922 from the Royal Technical College in Copenhagen as a Civil Engineer, specializing in the Theory of Structures, and accepted a job with Christiani and Nielsen in Hamburg and

1923 later in London, where he soon became Chief Engineer in charge of designs and estimates.

Christiani and Nielsen is a Danish civil engineering firm with branches in most parts of the world, at that time mainly specializing in harbour and marine works, especially quay walls and jetties, to the design of which they made outstanding contributions. Ove Arup benefited greatly from this world-wide experience and learnt the importance of integrating the design with the means and methods of execution. He was responsible for the design of various jetties and quaywalls, but also of bridges and industrial structures such as silos, coal bunkers, etc. He wrote a series of six articles in "Concrete and Constructional Engineering" on the design of jetties and piers.

1933 In 1933 he became acquainted with the Tecton Group of architects led by B. Lubetkin and became interested in the modern movement in architecture. He tried to interest his firm in the development of reinforced concrete construction as applied to buildings, but they were not quite ready for it at the time. He then

1934 joined the firm of J. L. Kier and Company as a director and chief designer on the understanding that they would interest themselves in this subject, and collaborated with Tecton in the design of all their architectural work, including the block of flats known as "Highpoint", the Finsbury Health Centre, the Penguin Pool and other Zoo structures in London and Dudley. The collaboration with Tecton ceased during the war, but was taken up after the war until the dissolution of this firm.

He brought to this work the experience gained from the design of engineering structures—the need to consider constructional methods, the importance of simplicity and, partly as a consequence, the preference for the reinforced concrete slab as a structural element. He gained from it a better understanding of the meaning of architectural discipline.

He joined the MARS Group—affiliated to CIAM—and wrote a number of articles on the subject of planning in reinforced concrete and related subjects.

1938 In 1938 he started his own firm of engineers and contractors together with a cousin, a dealer in various structural and building materials (Arup and Arup Ltd.), in the hope of being better able to back his own ideas on the integration of design and construction. The approaching war made it necessary, however, to turn attention to preparations for the conflict. He made a study of rational shelter design and Concrete Publications published a book by him with the rather long-winded title: *Design, Cost, Construction and Relative Safety of Trench, Surface, Bombproof and Other Air Raid Shelters.* He also published *Safe Housing in Wartime, London's Shelter Problem,* and later, in 1944, *Memorandum on Box-Frame Construction.*

In these publications he was concerned only with the purely technical aspect of obtaining the maximum protection for a given sum of money, or obtaining a given standard of protection as economically as possible. It was necessary therefore to attempt to measure the degree of safety of various shelters against attacks by bombs of various sizes, and this investigation led him to recommend the use of what he called multicellular wall shelters which did not attempt to offer protection against a direct hit. He did not have much success in persuading the Government to pay attention to his findings until towards the end of the war, partly because the shelter problem became a battleground for political propaganda, and his ideas were used—in a distorted form—by the self-appointed communist-inspired ARP (Air Raid Protection) Coordinating Committee, under the Chairmanship of Professor Haldane, as a stick with which to beat the Government.

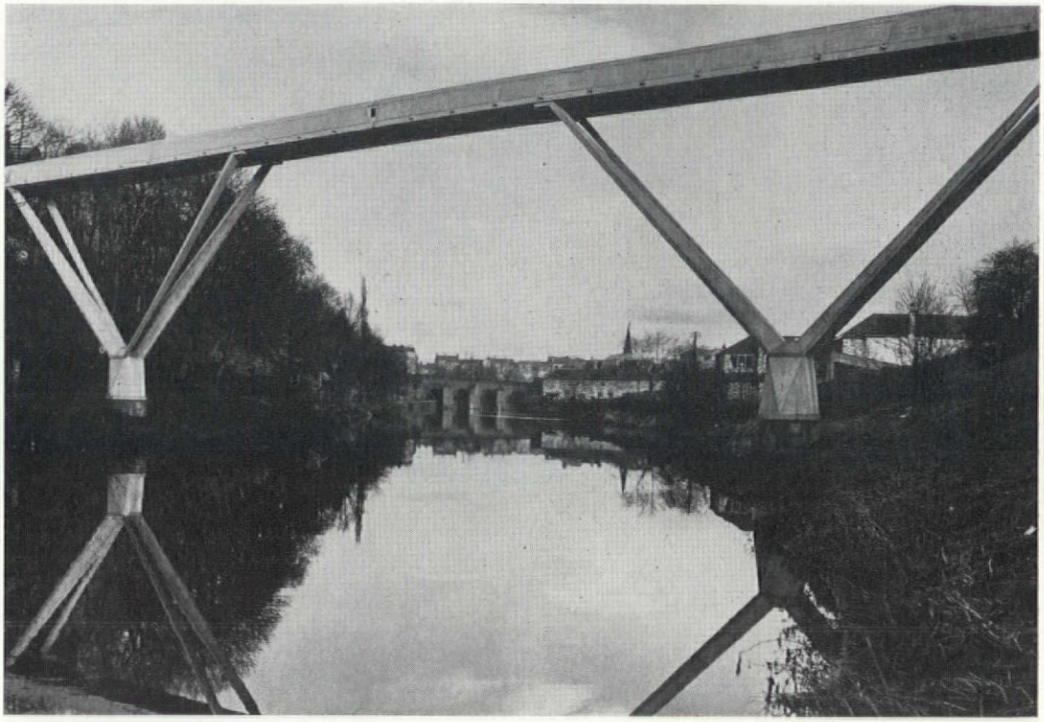
He was however appointed as technical adviser to the Finsbury Borough Council to organize their shelter construction, which he did on a consultative basis, without involving his own firm.

Until he left this firm in 1945 he designed various underground spirit tanks, shelters of different kinds, a large jetty for oil tankers at Heysham—using for the first time the principle of weight-lifting fenders, which were also successfully applied to the pierheads built for the invasion of France. These latter fenders were designed and constructed by Arup and Arup Ltd. according to the ideas put forward by A. L. L. Baker, later Professor of Concrete Technology at the Imperial College of Science and Technology.

1945 Towards the end of the war and until he left the firm of Arup and Arup Ltd. in 1945, he acted as consulting engineer for schools, blocks of flats and industrial projects, and in 1945 went over entirely to consulting work, as the whole tendency in the building industry was unfavourable to the idea of combining design and contracting. The Bus Station in Dublin (Architect: Michael Scott), the Rubber Factory at Brynmawr (The Architects' Cooperative Partnership) and extensive flat schemes for the LCC (using load-bearing concrete walls) were some of the schemes for which he acted as consulting engineer.

1956 In 1956 he took into partnership three of his collaborators, R. S. Jenkins, Geoffrey Wood and Peter Dunican. R. W. Hobbs joined the partnership in 1961.

The firm has grown considerably, with offices in Dublin, Nigeria, Ghana, South Africa, Zambia, Rhodesia and Kenya—and also Manchester, Sheffield and Edinburgh, and the number of designs undertaken range over a wide field. Amongst the work in progress at present or recently completed is the Sydney Opera House by Jørn Utzon, bridges in Ghana, Nigeria and Newfoundland, many universities in England, the Barbican scheme in the City of London, the Crystal Palace Sports Centre, Coventry Cathedral by Sir Basil Spence, office blocks, flats, and hospitals.



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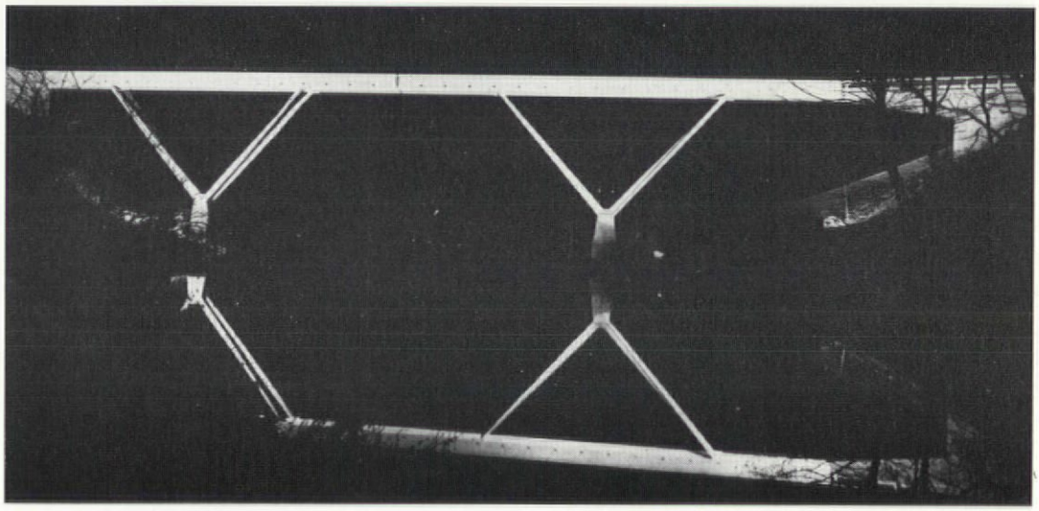

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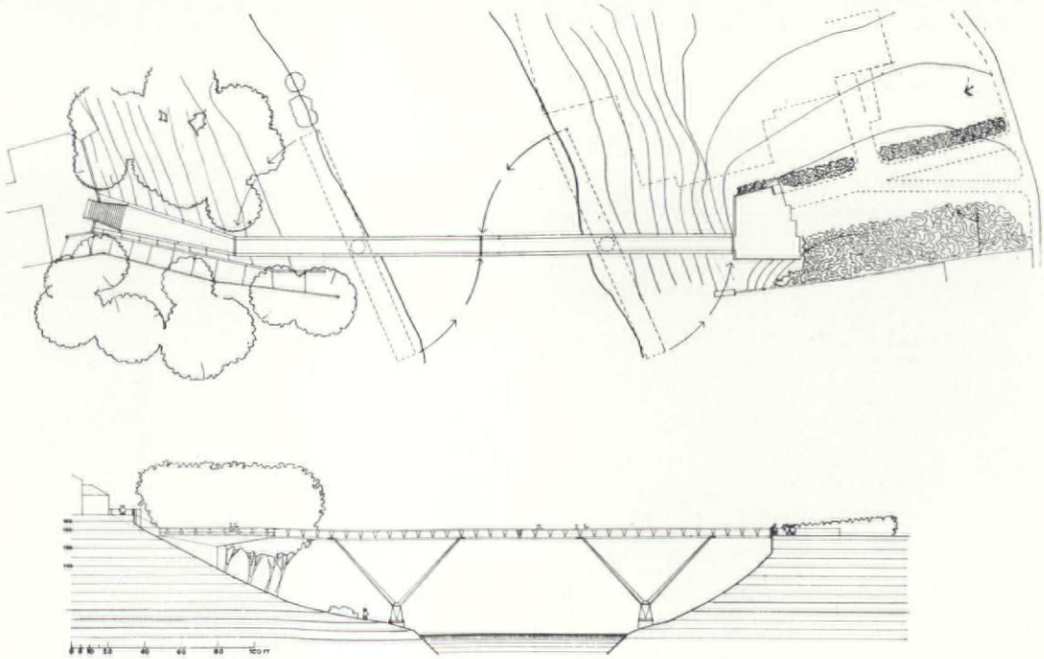

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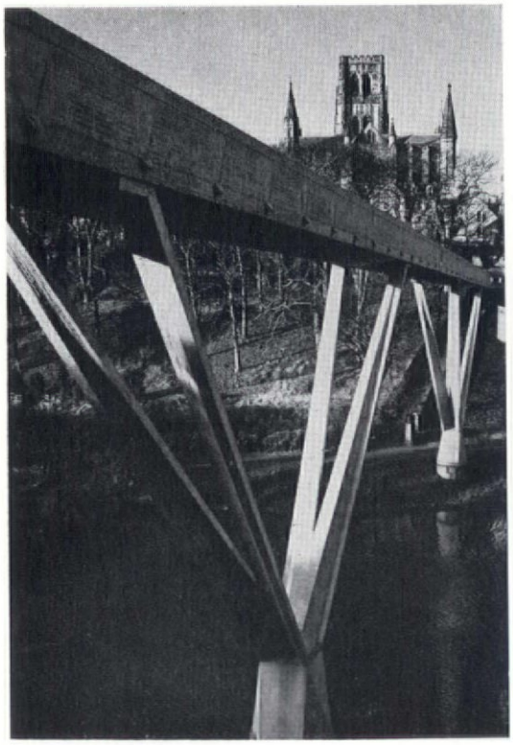

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Kingsgate footbridge, Durham

Ove Arup

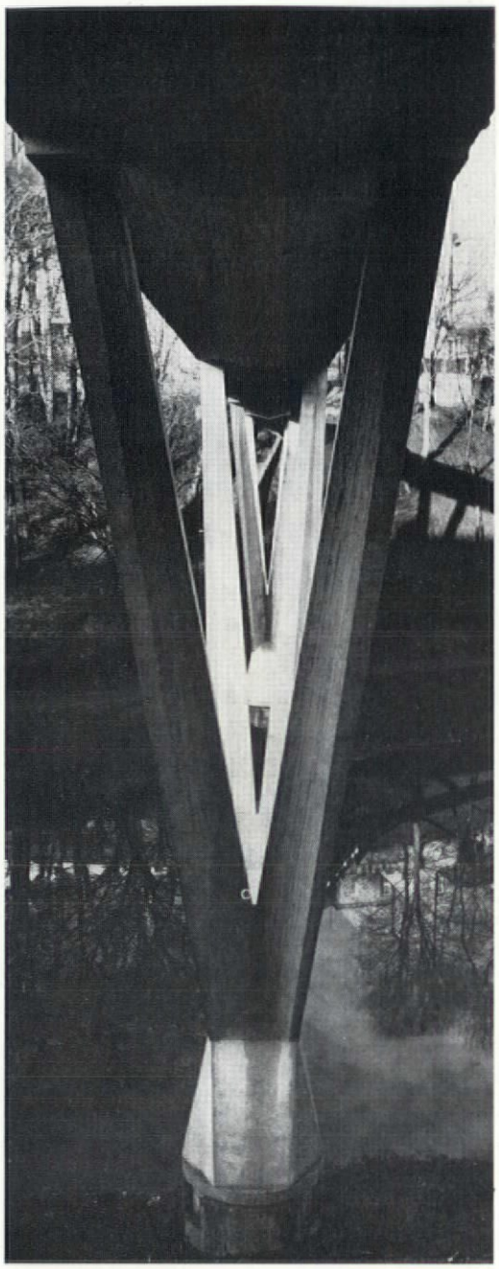
The client for this footbridge is the Council of the University of Durham, and the bridge is needed to link the two groups of college buildings on opposite sides of the River Wear. At this point the river is some 120ft wide, and it runs through a deep wooded valley close below Durham Cathedral. One edge of the valley is 56ft above the river and the other, on the cathedral side, is 10ft higher still. The distance across the valley is about 350ft. It was obviously important that the bridge should not prove unworthy of the cathedral which towers above it, of the ancient bridges which are its neighbours, or of the site itself, which has great natural beauty. Therefore, although it was a relatively small project, a great deal of care was needed in the design, which was entrusted to the consulting engineers, Ove Arup & Partners.

The client was able to spend about £35,000 on this bridge, and it had been thought that this would only cover the cost of a short bridge low in the valley, with steps and ramps up the sides to the top. However, it was possible to show that, by using extra height to advantage structurally, the money available would cover the cost of a high bridge across the top of the valley, level with the lower edge, with a few steps on the higher side to make up the difference in level. Thus the bridge measures approximately 350ft overall, and it consists of two identical sections of the main span, each 136ft long, and a long cantilevered abutment reaching out through the trees on the cathedral side.

The bridge was conceived as a thin, taut, white band stretching horizontally across the valley, resting on a pair of slender tapered fingers, in a vee shape, rising from each side of the river. The main spans are of white concrete, sandblasted to expose the Pink Shap granite aggregate. The abutments, which have a more robust character, are of plain grey concrete with a strong board-marked surface texture.

Consideration of the method of construction played an important part in the design of the

1, 2, 4 & 5
The new footbridge
3
Plan and elevation of the bridge showing, dotted, the position of the spans during construction before being swung over the river Wear
Photos: 1, 4 & 5 Architectural Review. *2 Fillinghams*



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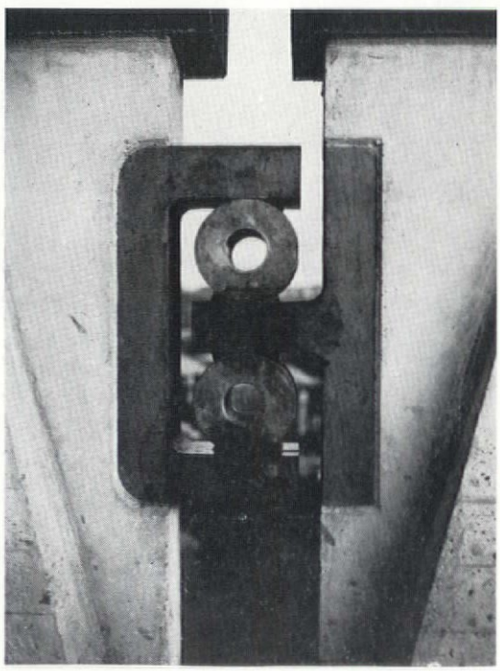

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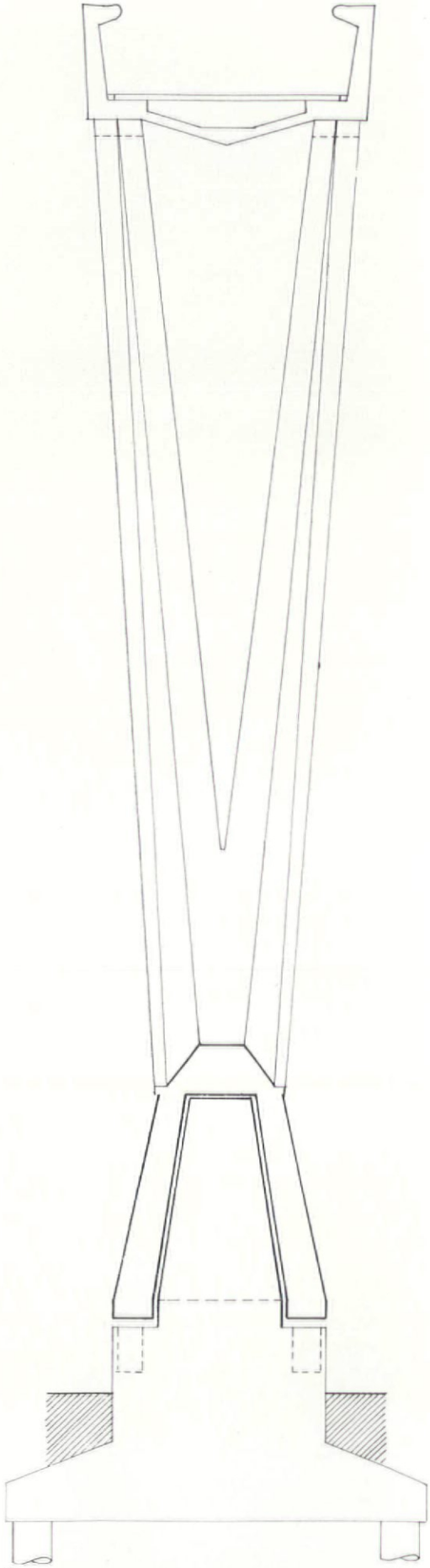
bridge. It was felt that a worth-while saving would result if temporary works over the river, such as gantries and scaffolding, could be avoided. In any case, it was not permissible to obstruct river traffic at all. Each half of the main span was therefore designed to be built approximately at right angles to its final position, parallel with the banks and thus over dry land. A temporary bearing was built into each supporting pier so that the half-spans could be turned into position after construction. This method of construction was not, of course, mandatory, but the successful tenderer for the construction of the bridge, Holst & Co. Ltd., elected to build it this way. Provision was made in the bases of the piers for three jacks to be inserted after turning so that each half-span could be accurately relevelled, rather as one would use the three screws to level a surveying instrument.

The shape of the cross-section of the main spans is determined entirely by its function as a footway and the thickness of its parts by structural considerations, for the side walls are also the beams which carry the bridge over the raking supports. There are solid side walls with rounded flanges projecting inwards along the top to lean against whilst admiring the view, and a 9ft wide walkway of precast planks covering a trough which will be needed to carry pipes and cables. The spans are designed to an 8ft module, and this is defined by the pattern of the shuttering. This is in 8ft sections between which are inserted small precast concrete waterspouts to drain the bridge deck.

The raking supports change in cross-section continuously and linearly from top to bottom, the underside being a hollow curve, the upper surface being formed of straight facets. The cross-sections at the top and bottom are derived partly from the shapes of the bridge soffit and the pier respectively, and partly from requirements of strength. Straight lines between top and bottom define intermediate sections, which simplified the construction of the formwork.

The abutment which cantilevers from the cathedral side is, in effect, a hollow concrete box with the walkway along the top. Like the raking supports, its cross-section changes steadily from the tip of the cantilever, where it takes the shape of the floor of the main span which it abuts, to the root of the cantilever where it becomes a simple rectangle as best befits its purpose at that point. The transition is accomplished in such a way that the abutment is made up of plain surfaces, and warped shapes are avoided. This is not only a matter of economy, but also because it was thought that warped surfaces would not suit the character of the cathedral. The strength is here in the deck and substructure rather than in the walls as with the main spans, so it is possible to vary the cross-section to provide just the required amount of material at each point without detriment to its function as a bridge. The handrailing is open, of precast concrete, and in a way it is a negative of the pattern made by the main span walls.

After the main span sections are turned, the bearings are grouted up to prevent further movement, and the ends locked to the abutments. The two half-spans are then joined by bronze expansion joints which permit horizontal movement due to temperature change, but transmit vertical forces from one half of the bridge to the other. Incidentally, this locking device takes the shape of a U and a T lying down, which fits in neatly with the fact that the bridge connects the university with the town.



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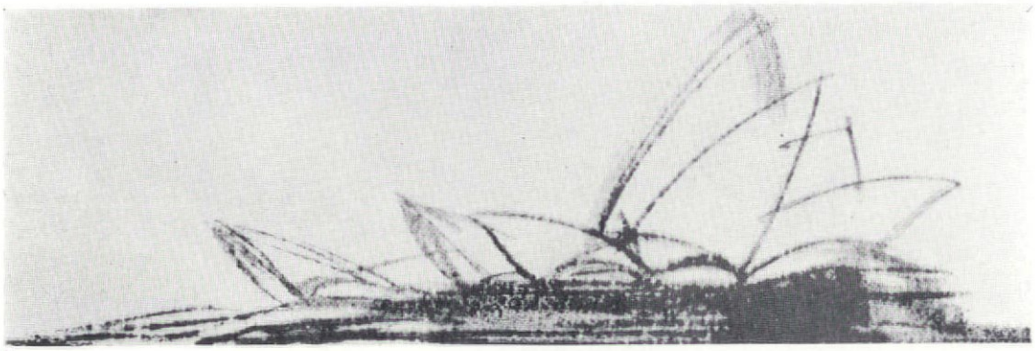
6
Underside of the bridge
7
Detail of the bronze expansion joint between the spans
8
Section through the deck and supporting pier
Photos: Architectural Review

Sydney Opera House



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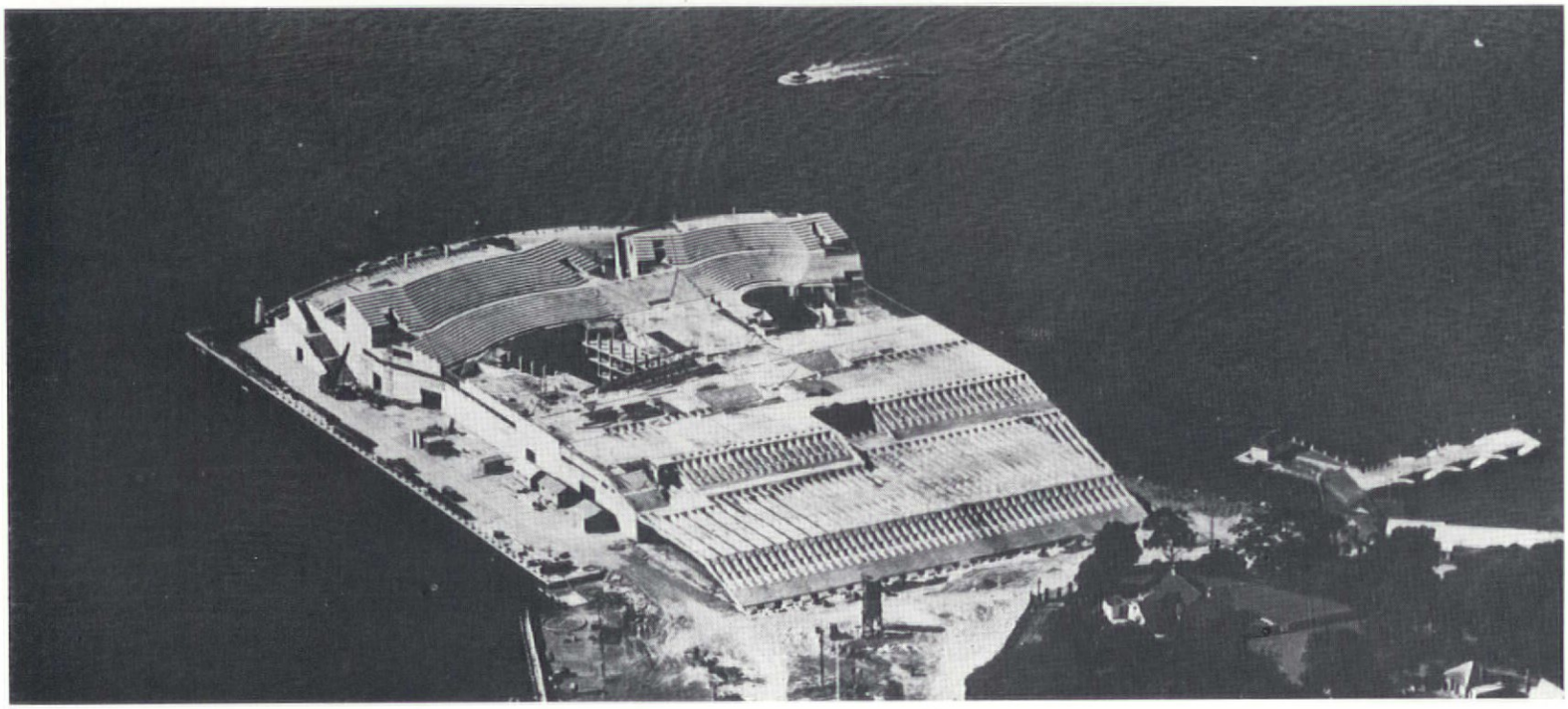

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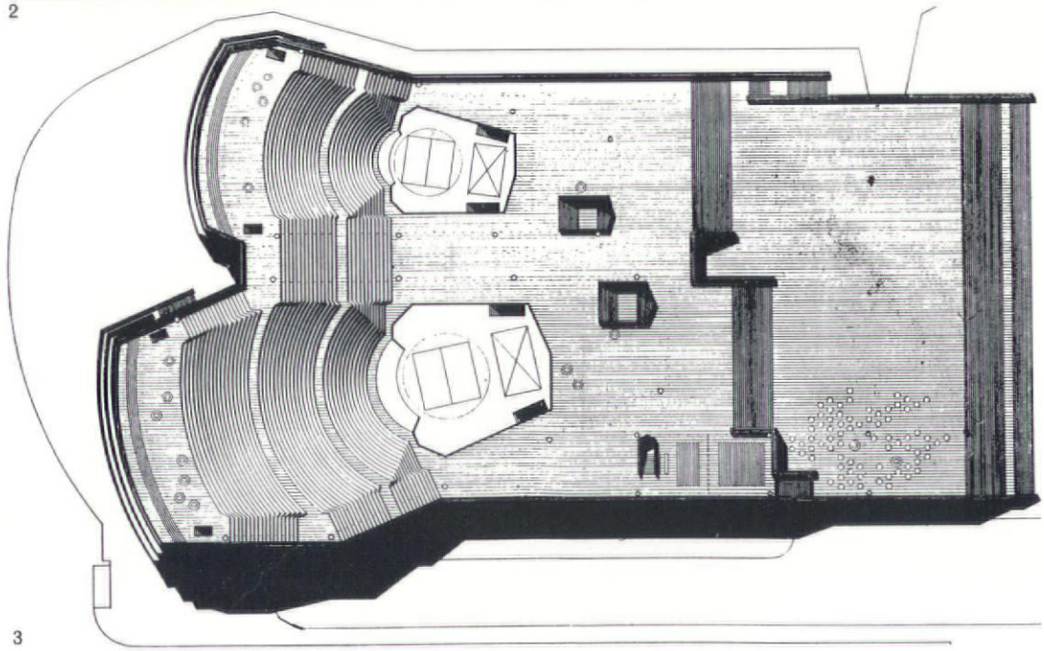

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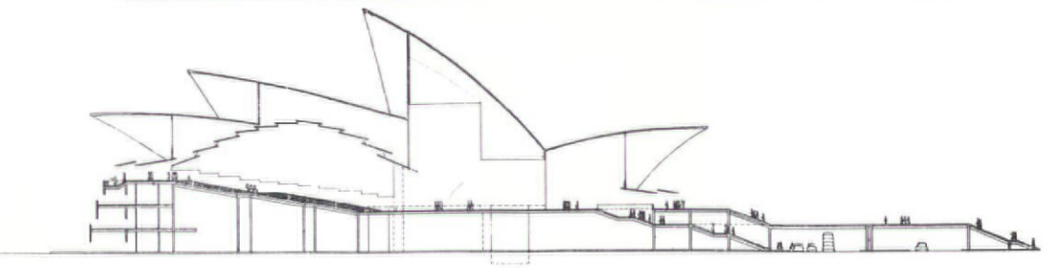

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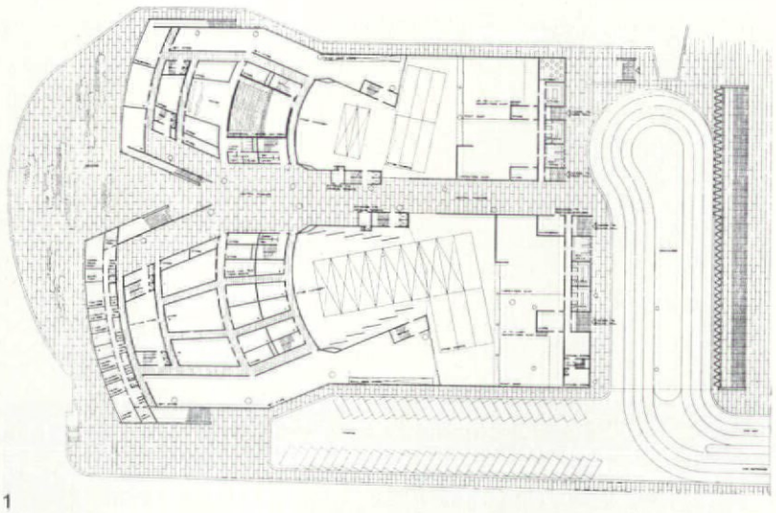
Architect/Jørn Utzon
Consulting Engineers/Ove Arup & Partners
Quantity Surveyors/Rider Hunt & Partners

Consultants:
(Mechanical)/Steensen & Varming
(Electrical)/Zeuthen & Sørensen
(Acoustics)/Dr Vilhelm Lassen Jordan
Prof Lothar Cremer & Prof Werner Gabler
(Stage Machinery)/Prof Walther Unruh
Waagner-Biro A.G.

1
Utzon's early seductive sketch of the future opera house seen from the east

2
View of Bennelong Point jutting out into Sydney harbour, with the first stage of the contract complete: the stepped and pitted platform that is to serve as the base for Utzon's furling roofs

3 & 4
Plan and section of the opera house as submitted for the competition in 1957



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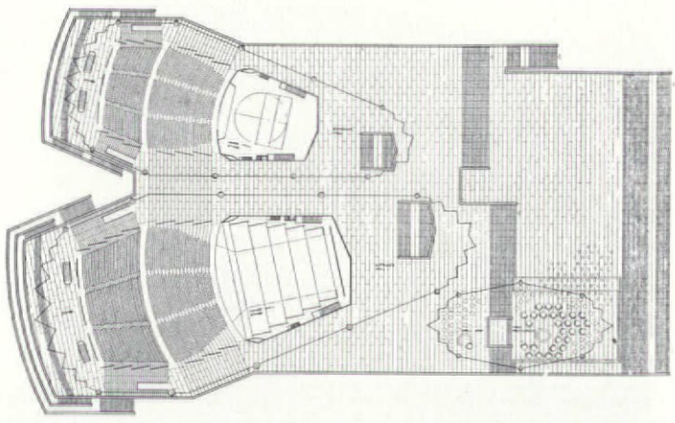

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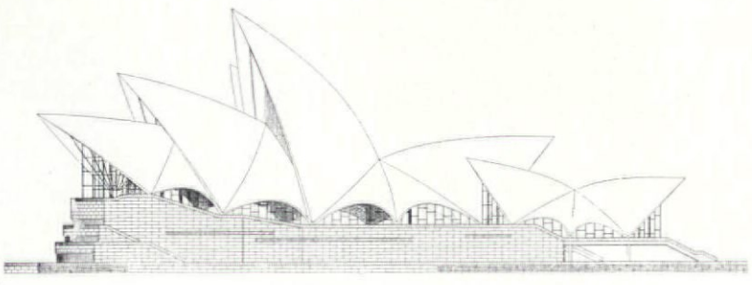

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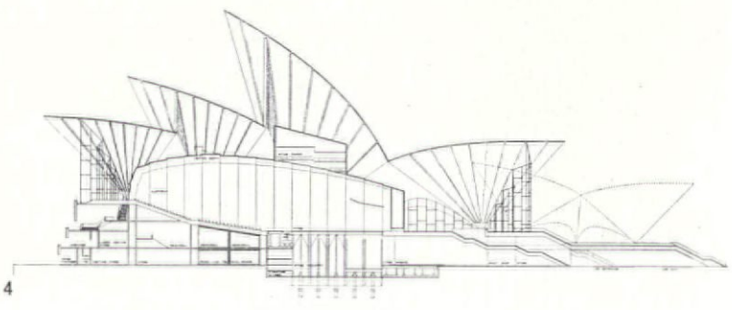

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Extracts from a paper read by Ove Arup to the Prestressed Concrete Development Group, in London, January 1965.

1, 2, 3 & 4
Sketch scheme presented in March 1958, with alterations and refinements on the competition design, but with little major change in the conception. The plan of the lower level shows the vehicle concourse and stage workshops and storerooms, that of the upper level shows the adjacent auditoria and foyers, with the restaurant and grill room at the south-west corner. The west elevation and, in particular, the section through the major hall and concourse, shows the silhouette of the shells intended at this stage, the shape of the hall and the treatment of the window wall overlooking the harbour

5
Model of the 1958 submission scheme showing the main entrance from the south

Photo: R. Rigby

Sydney Opera House is not so much a job as a battle, a battle which is still in progress, and the outcome of which is somewhat uncertain.

Since the then young architect Jørn Utzon won the competition in 1957, the Sydney Opera House has been news.

There is clearly a need for more information about what has been happening in Sydney, and what the situation is now, so that one can begin to understand why this job is so difficult and controversial, and how an alleged 'estimate' of cost can grow from A£3,500,000 to nearly A£20,000,000 for what is supposed to be the same job. I will therefore attempt to throw some light on the subject.

My first contact with the scheme was when Utzon came to see me at our office some time in 1957, after he had won the competition and had been to Sydney to receive the prize, and, incidentally, had charmed clients and public alike by his enthusiasm and personality and had been enrolled as public speaker and television star in the fight against the vicious and noisy opposition to the winning scheme.

The competition documents called for two main halls, one for symphony concerts, large scale opera, ballet, pageants and mass meetings seating about 3000–3500 persons (this was later reduced to 2800), and a small theatre and concert hall for 1200 persons. Utzon placed these two halls side by side, with the seating, so to speak, scooped out of a massive rising concrete base as in a Greek theatre.

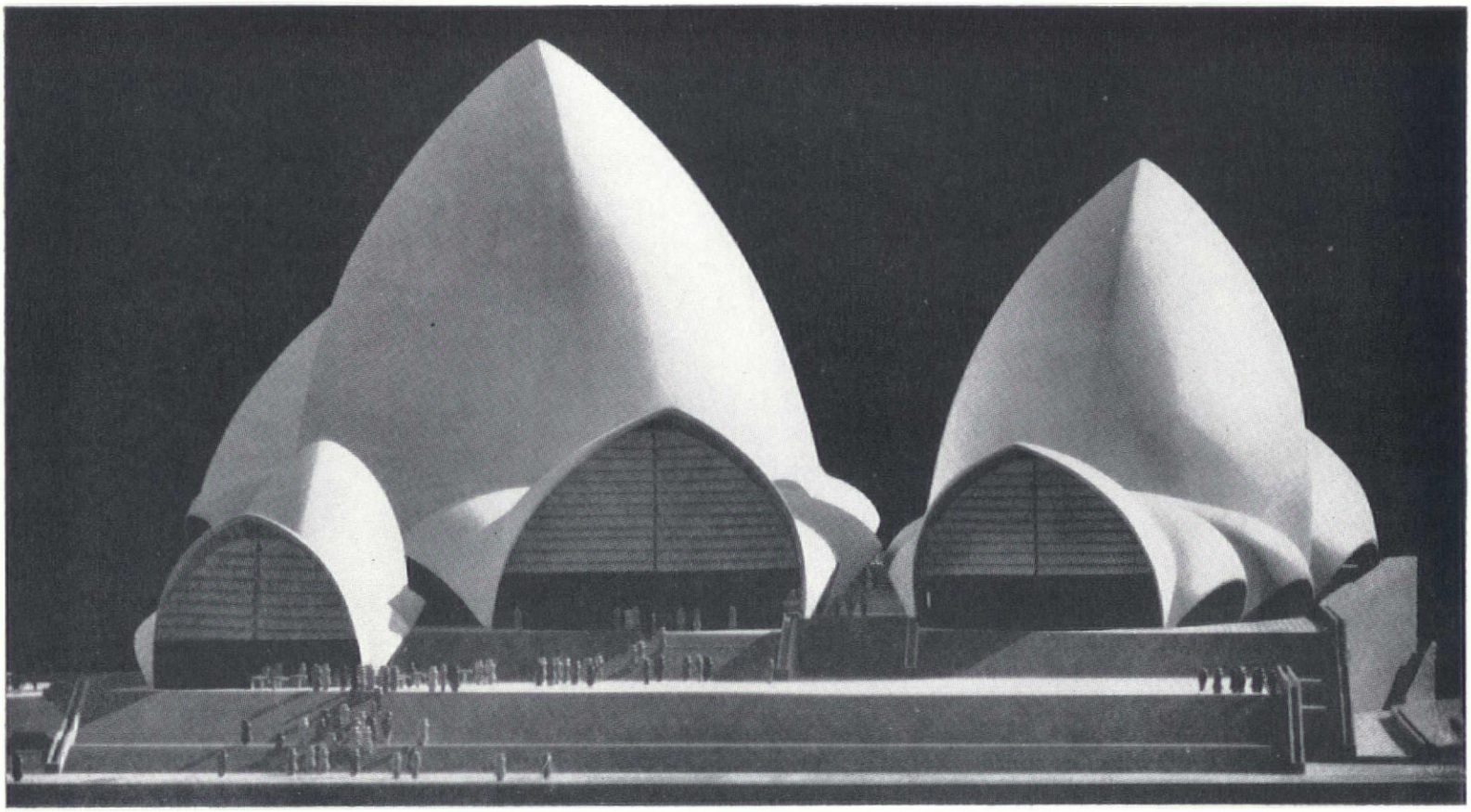
The auditoria did not face the main entrance from the neck of the peninsula as one would expect, but the other way round, so that people have to pass the stage before entering directly into the seats from the rising base.

This fundamental design decision was a stroke of genius. It made it possible for Utzon to solve what he considered to be the main problem posed by the site, that of creating a satisfactory and in fact very exciting silhouette from every direction. How he did it you can see from his drawings—the solid base rising from the water like a rock, and containing the workshops, the rehearsal rooms, the dressing rooms—and, as a later addition, an experimental theatre for 400 people, and then above this a large number of sail-like gleaming shapes which cover the entrance hall, stage towers, stage, auditoria and bar area. From this bar there is a marvellous view of the harbour. This arrangement eliminates the greater part of the access and escape stairs usually required in a multi-storeyed building and gives a solution of great simplicity and beauty.

That none of the other competitors had the courage to adopt this solution is explained by the fact that it is both very unorthodox and that it does entail an infringement of one of the conditions. In order to get room for the two halls side by side, Utzon had to overstep the limits of the site by extending the base into the harbour on one side. And even so the narrowness of the peninsula has a restraining effect on the shape of the auditoria, and above all it prevents the provision of side stages. Utzon solved this latter dilemma by building the stage on lifts or moving platforms which enable complete sets to be transferred to the stage from the large spaces created in the base below the level of the stage. This solution has, I understand, worked successfully elsewhere—but it has been the subject of a good deal of controversy. I am not able to say whether this solution involves a sacrifice, but I am fairly certain that if it does, it has been worth while making this sacrifice for the reasons mentioned.

The assessors for this competition were Eero Saarinen, Sir Leslie Martin, Professor Ingham Ashworth and Dr Cobden Parkes.

Utzon's drawings for the competition were



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really only sketches blown up photographically to the required size. He told me he had thought a good deal about the competition, visualizing the site and the scale, etc., and arriving at his basic solution, but only in the last minute had he got down to making some drawings and he really thought it would be quite useless to send them in, and he nearly didn't. I quote from the Assessors' Report: 'The drawings submitted for this scheme are simple to the point of being diagrammatic. Nevertheless, as we have returned again and again to the study of these drawings, we are convinced that they present a concept of an Opera House which is capable of becoming one of the great buildings of the world. We consider this scheme to be the most original and creative submission. Because of its very originality, it is clearly a controversial design. We are, however, absolutely convinced about its merits.' It certainly required great courage to back a scheme like this which contained hardly any details or any evidence of its structural feasibility. Had the panel of assessors included an engineer it might have meant the loss of one of the great buildings of the world—but I expect it was reassured by the then prevailing faith amongst architects in the omnipotence of shells. The Report ends on an ominous note; I quote: 'It is perhaps not unimportant to mention that we have had approximate estimates made for all the schemes which have been given places and several others in addition. The scheme which we now recommend for the first premium is, in fact, the most economical on the bases of our estimates.'

This estimate of three and a half million, prepared, I believe, by some unfortunate Q.S.s under duress in a few hours, was of course hopelessly out. The temptation to use it as an argument for Utzon's scheme in the storm of controversy which broke out immediately after the publication of the result was unfortunately not resisted. It has provided welcome ammunition for opponents of the scheme or of the Government ever since.

When it came to the publication of the winning scheme it was found that there was no drawing of it which would convey anything to a layman. Utzon had not submitted a perspective as called for by the conditions of the competition, so an artist had to be commissioned to make a painting of his interpretation of Utzon's intentions.

I suppose every architect is unusual in a sense, but some more than others, and Utzon more than most. I will not presume to give you the 'low down' on Utzon's character, but he is certainly unusually gifted, and he is very, very much an architect, one who masters his architectural media and who is very sensitive to space, form, colour and texture, and to aesthetic logic or consistency—if one can talk of such a thing. He has also a very good structural sense, and is quick to learn. And he combines a steadfastness of purpose—call it stubbornness if you like—with complete flexibility of mind, by which I mean that he is willing to consider any proposal or alternative provided in his opinion it improves the quality of the scheme, but he will not accept an aesthetically inferior solution if he can help it—he will then rather start all over again and reopen old decisions to try to find a satisfactory answer.

He is very good at explaining what he is after and uses every opportunity to demonstrate his views on architecture or aesthetics. This is of course a requisite for fruitful collaboration. It is an education in itself and it enables one to offer rather more helpful advice.

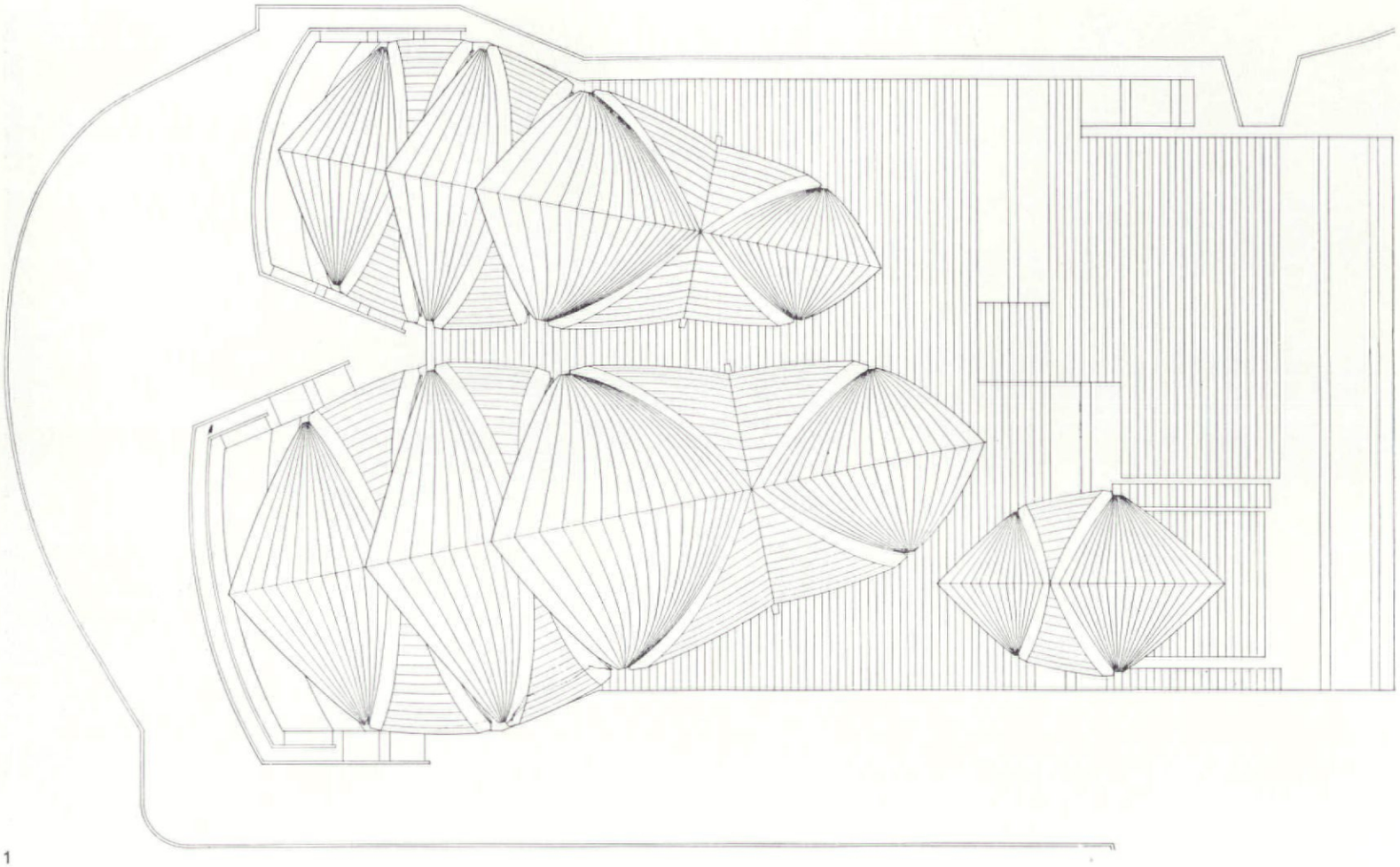
For thirty years or more architects and engineers have talked and talked about collaboration between our two professions. But as I have frequently pointed out it rarely ever happens. In a superficial sense, yes—but not in a creative, mutually inspiring sense. Well, it has happened in this case. It has happened because Utzon is a creator, ideas pour forth from him, he is not cramped by any ideological strait-jacket or bound by any style.

And of course this is a case where it should happen, where it *must* happen if the scheme is to be a success, because the structure here *is* the architecture—or vice versa. Utzon's whole intention was and is to let the structure speak for itself. This has been a significant factor in the whole development of the design.

As an architect I think Utzon is a genius—I almost think he is the best I ever worked with—if such a comparison were possible; but uncompromising and very demanding when the quality of the job as he sees it is at stake. However, I should perhaps add here that most of the alterations which have occurred on this job are due to the cropping up of new design considerations owing to clients' wishes, unforeseen difficulties and especially the work of other specialists on heating, theatre technique or acoustics, etc., impinging on the structure or vice versa.

The client is the Government of New South Wales. To act for the Government there was created an Executive Committee (under the Chairmanship of Mr S. Haviland), a Technical Advisory Panel (under the Chairmanship of Professor Ashworth), a Music and Drama Panel and some other advisory bodies, all consisting of people representing Music and Drama and the professions.

What is remarkable is that throughout the vicissitudes and tribulations which have befallen this job, these people have given the architect their full support. They have been greatly worried at times—but they have never wanted to take any measures which would in any way spoil the job—they also wanted it to be the best possible. That applies of course especially to Professor Ashworth and the other professional people on the Technical Panel and Executive Committee, because they are in close touch with



1

the architect and can better understand what is happening. The Government have to cope with the political pressures from the public, the local press and the Opposition, and the fantastic rise in the official estimates and the sensation-mongering have frequently put them in a very difficult position.

Another unusual thing is the way the job is financed. There is a special Opera House lottery run by the New South Wales State Lottery which collects A£100,000 every ten to fourteen days.

We were very lucky to find in Sydney a firm of civil engineering contractors of such competence and integrity, second to none we have ever come across—Messrs Hornibrook.

Utzon and I went to Sydney in March–April 1958, with a preliminary sketch design for discussions with the Executive Committee and Technical Panel. Considerable additions and alterations were demanded, and readily agreed on, but one thing worried me greatly—the insistence that the contractor had to be selected and work on the site started before February 1959, when the foundation stone had to be laid by the Premier. It was explained that if a *fait accompli* were not established whilst Mr Cahill was still Premier the job would probably not go forward at all. And nobody could know for certain whether Mr Cahill and his party would be re-elected in March 1959. As it happened he was, but died shortly afterwards, which was a great loss to the friends of the Opera House.

To make this early start possible, it was agreed that the contract should be split up into two or more parts, and only the first part, for the foundations and the concrete platform or box up to and including the seating of the two halls, should be awarded in January 1959, on the basis of an approximate Bill of Quantities, which would at least establish the rates to be applied to the subsequent work even if the quantities had to be altered. And we only agreed to this on the understanding that Utzon's outline drawings for the base would be available to us in June or July 1959. It took not months but years to produce this information, for various excellent reasons. As a result we had to start the job without a single correct drawing.

All sorts of complications arose, there was a large outfall sewer to be diverted, the base had to be extended into the sea, a new theatre to be added inside the base, and all the time the ideas about the stage machinery underwent numerous changes from a scheme costing A£400,000 to the final one costing two and a quarter million including stage lighting, with quite different space requirements.

This, and other alterations in the accommodation and the brief affected of course the other services, air-conditioning, electricity, etc., and they again affected the structure, and so on in a vicious circle.

The base had of course to accommodate the foundations for the superstructure. Each hall with stage towers, etc., was to be supported on ten piers going right through the base to the sandstone. The restaurant required six piers—much later reduced to four. The location and the size of these piers depended of course on the design of the superstructure or 'shells', and that took about five or six years to complete—so we had to fix the location according to an early version of the design and guess the loads, on the safe side—which much later was proved not to be so safe.

The result was that instead of costing A£1·4 million and taking two years to build, it cost nearly twice as much and took nearly twice as long. The contract was purely structural and civil engineering, including seven hundred 3ft diameter cased bored piers. Some of this work was exceedingly difficult due to tidal effect, and the unreliability of the sandstone.

The base itself is a kind of multi-storeyed building entirely of concrete, containing a multitude of different sized rooms and passages, ducts and shafts and pits and what not, and generally the necessary enclosures do the structural job—very few columns are in evidence, the emphasis being on simplicity.

The concourse consists of the 300ft wide steps and platform leading to the Opera House, covering the area where people arrive by car. It is an enormous slab, about 75,000 sq ft in area, with spans varying from 136 to 164ft.

The development of the design of this slab is in a way typical of what has happened throughout this job. To begin with there was Utzon's wish to avoid the use of intermediate supports which would have reduced the spans and the cost—not so much because they would be in the way but because, without them, it would be much more impressive and would create the right atmosphere of generous simplicity right from the start. But he also wanted the roof underneath the concourse to be of sculptural interest and to express the structure, so that one could

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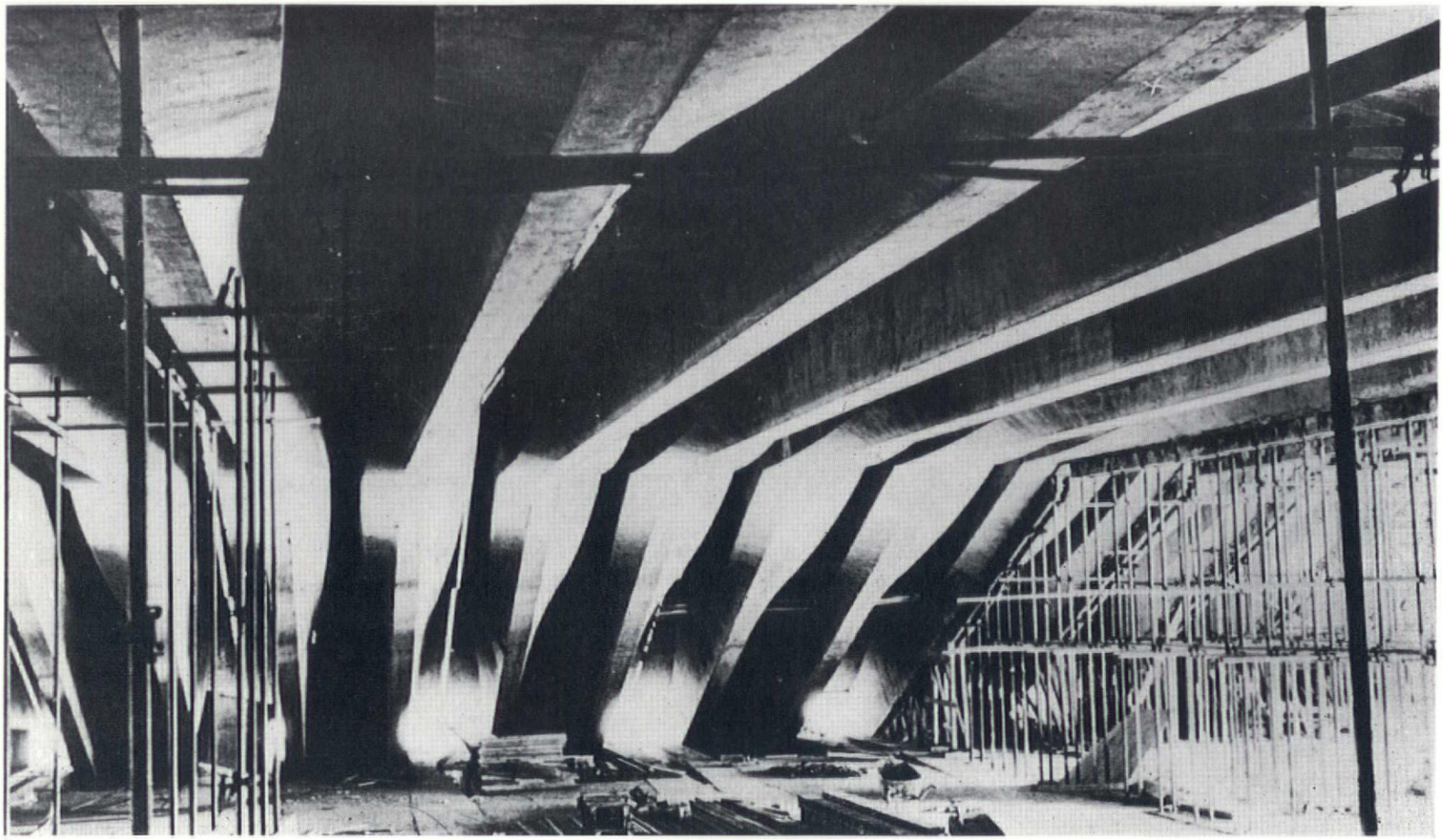

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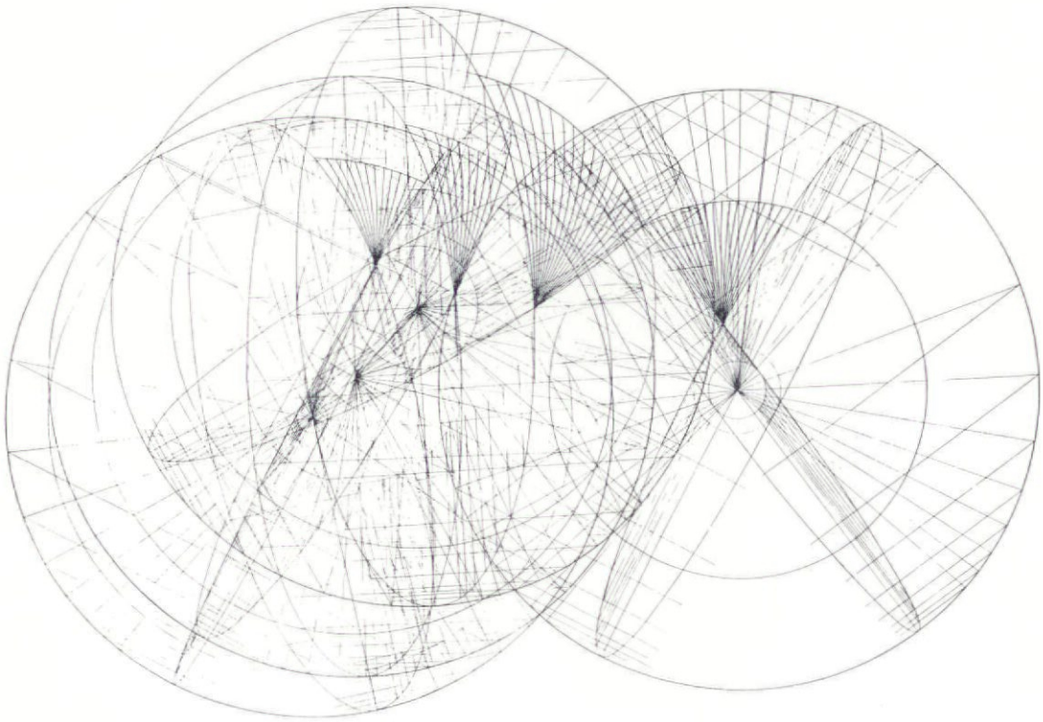
1
Roof plan of the opera house as revised in January 1962

2
A view of the vehicle concourse, during construction, showing the folded and twisted slabs, serving both as beams (spanning up to 164ft) and gutters for the paved area above, that were contrived to create the atmosphere of generous simplicity demanded by Utzon. He later adapted this arrangement for the roof of his competition designs for the Zurich Opera House

3
Geometrical drawing indicating how all the 'shells' of the major auditorium are to be cut from spheres of equal diameter, 246ft, greatly simplifying the construction of the main ribs and the roofing panels

4
Diagrams showing various stages in the development of the design of the roof shells. Reading from top to bottom, the second and fourth diagrams are each plans of the elevations above them



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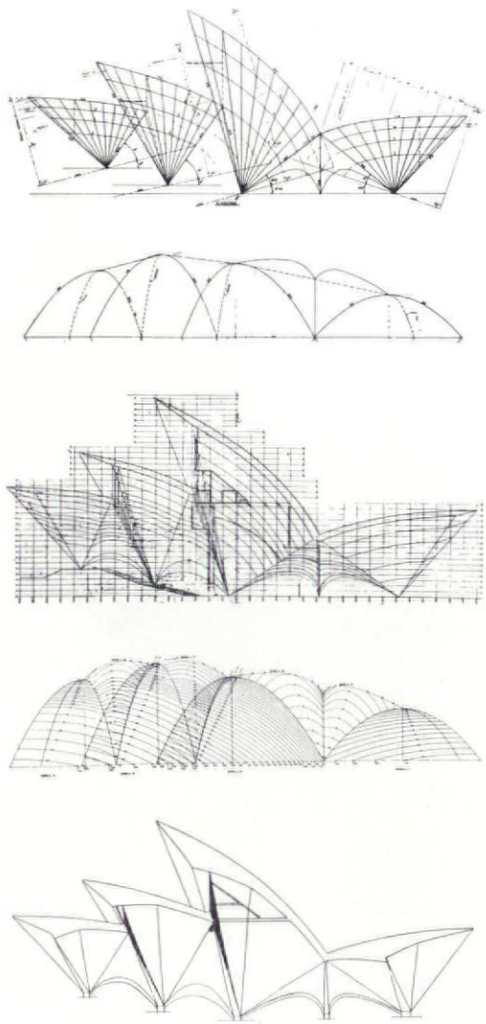

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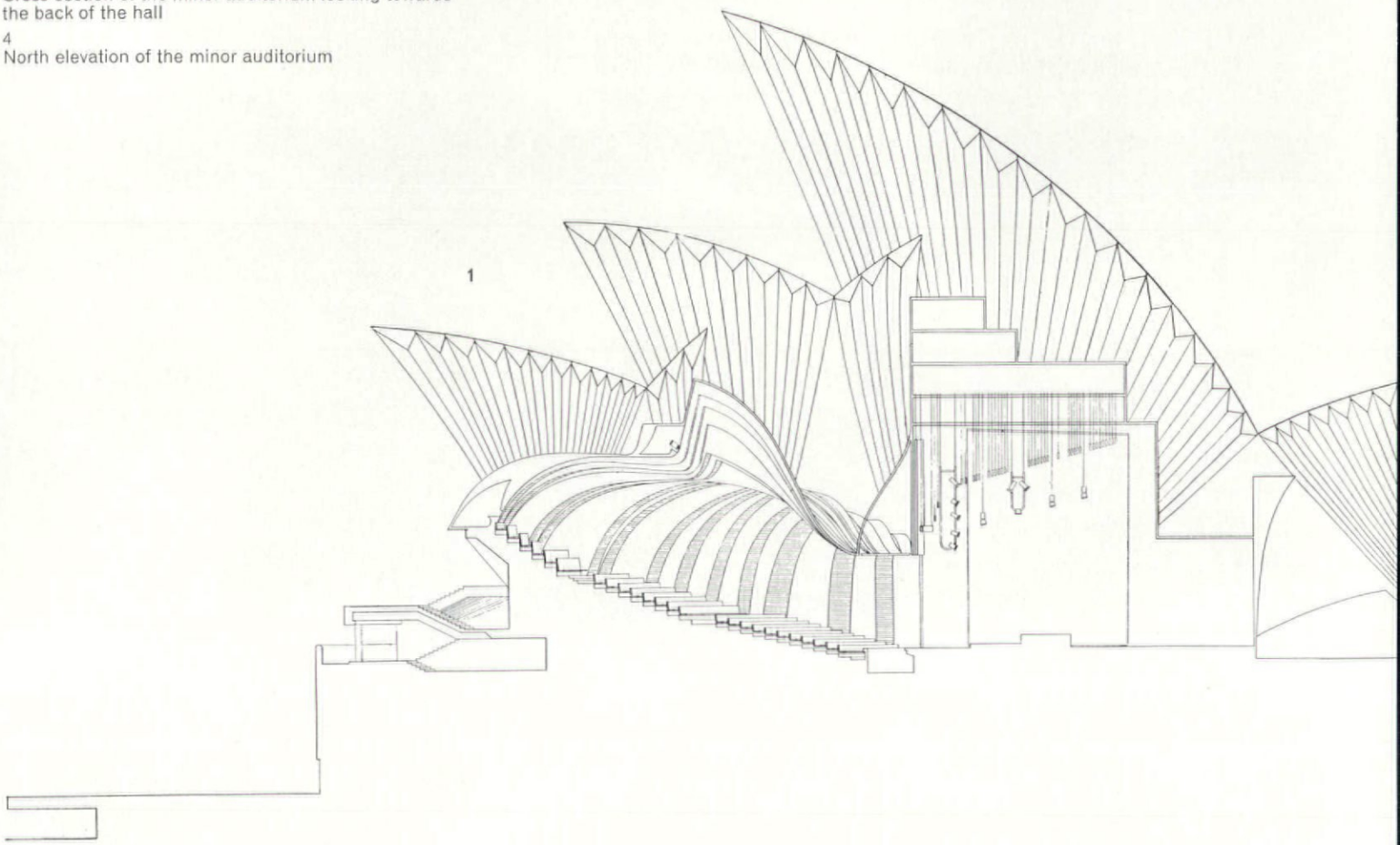
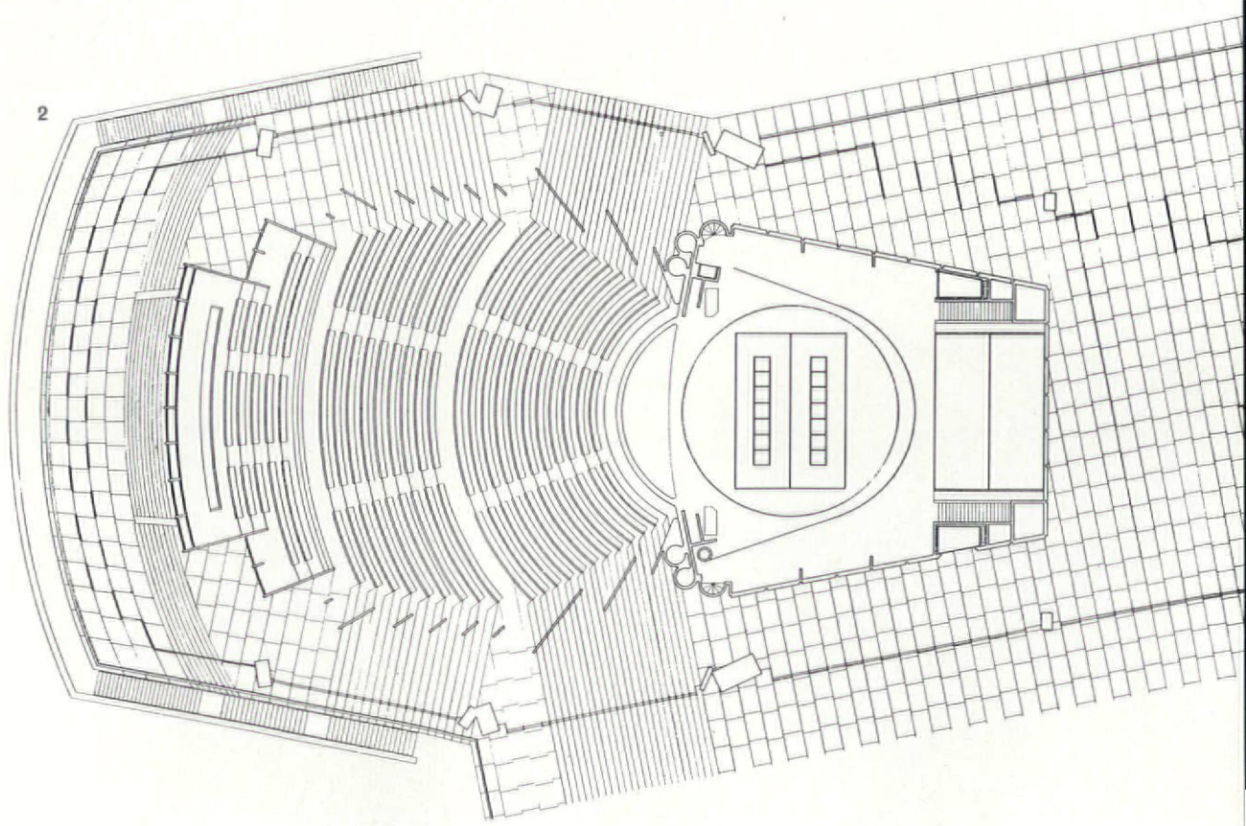
1
Longitudinal section through the minor auditorium, dated January 1962, showing, primarily, the way in which the steps that make up the podium discipline the architecture of the base, but equally how the fantasy of the roof silhouette has finally spurred Utzon on to the juke-box Bauhaus of the auditorium interiors

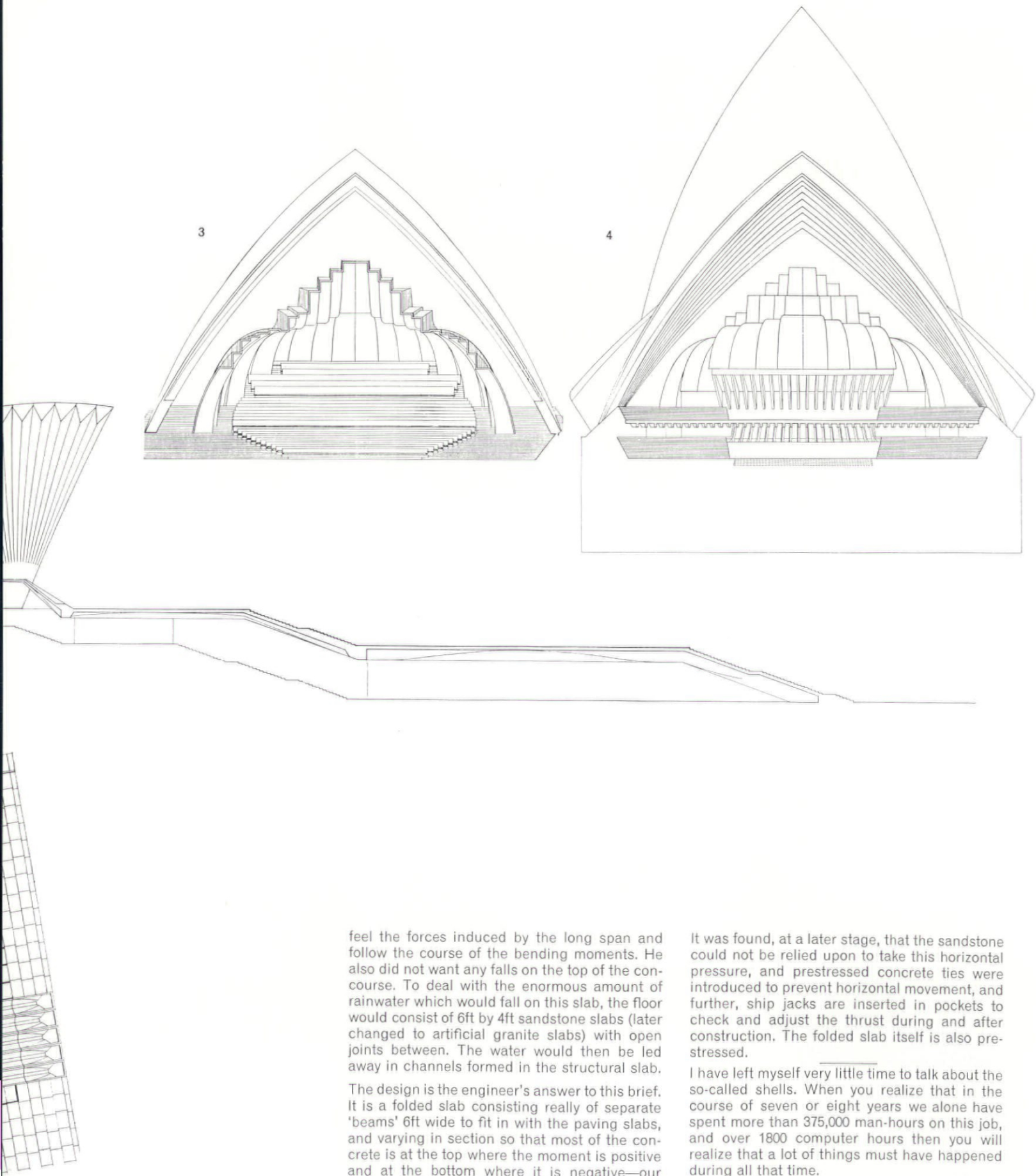
2
Plan of the minor auditorium

3
Cross-section of the minor auditorium looking towards the back of the hall

4
North elevation of the minor auditorium







feel the forces induced by the long span and follow the course of the bending moments. He also did not want any falls on the top of the concourse. To deal with the enormous amount of rainwater which would fall on this slab, the floor would consist of 6ft by 4ft sandstone slabs (later changed to artificial granite slabs) with open joints between. The water would then be led away in channels formed in the structural slab.

The design is the engineer's answer to this brief. It is a folded slab consisting really of separate 'beams' 6ft wide to fit in with the paving slabs, and varying in section so that most of the concrete is at the top where the moment is positive and at the bottom where it is negative—our interpretation of 'expressing the structure'.

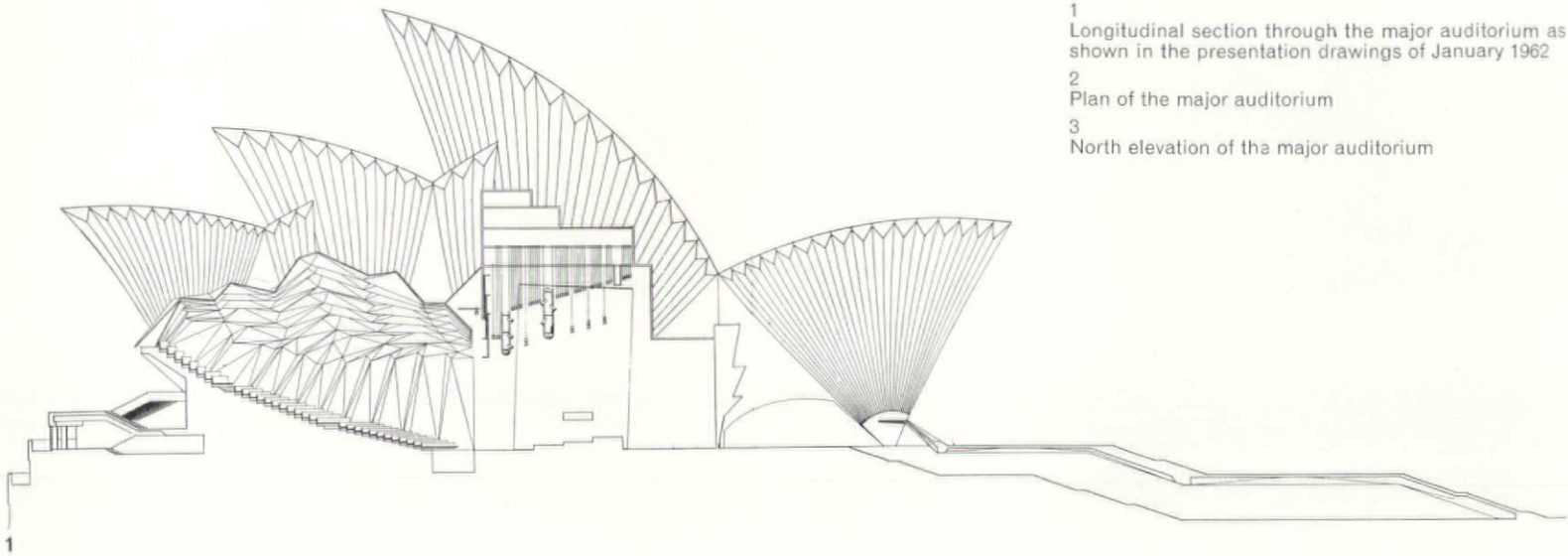
The angle between the horizontal slab and the inclined steps makes the whole thing act as an arch or a frame producing heavy compression stresses which must be absorbed by the foundations.

It was found, at a later stage, that the sandstone could not be relied upon to take this horizontal pressure, and prestressed concrete ties were introduced to prevent horizontal movement, and further, ship jacks are inserted in pockets to check and adjust the thrust during and after construction. The folded slab itself is also prestressed.

I have left myself very little time to talk about the so-called shells. When you realize that in the course of seven or eight years we alone have spent more than 375,000 man-hours on this job, and over 1800 computer hours then you will realize that a lot of things must have happened during all that time.

It has taken us six years to decide the final design of these shells, and we still have a strong team of high-powered engineers in Sydney and here to deal with the problems arising out of the erection.

Utzon's original design was only an indication of



1
Longitudinal section through the major auditorium as shown in the presentation drawings of January 1962

2
Plan of the major auditorium

3
North elevation of the major auditorium

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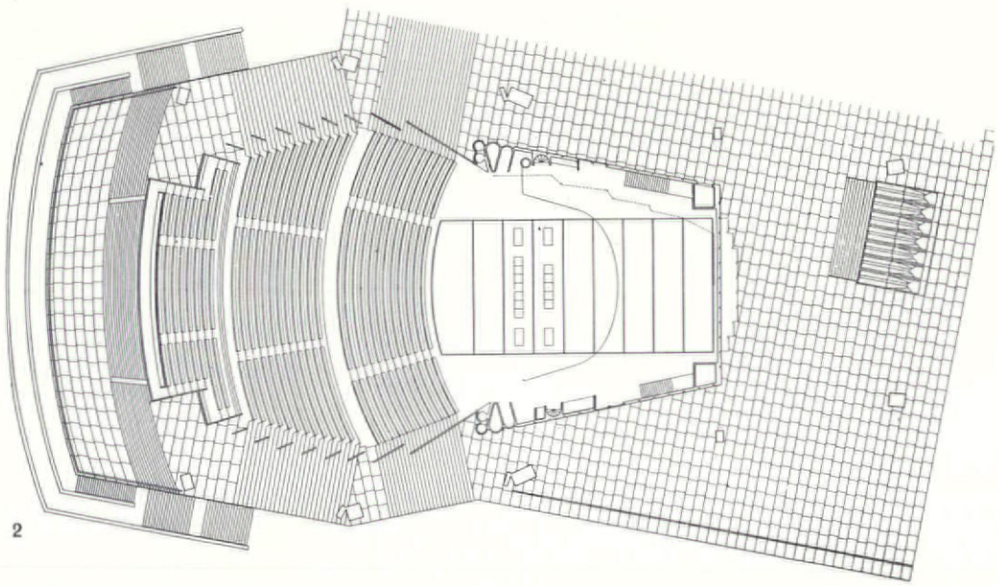

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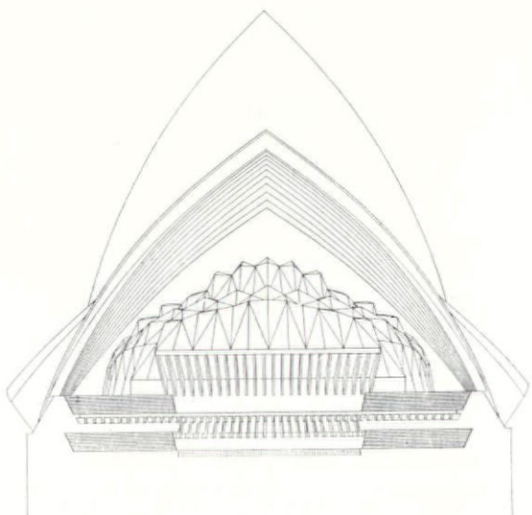

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his intentions, in the form of freehand sketches without geometric definition. Their form was chosen mainly for aesthetic reasons, but Utzon certainly thought that he had found a solution which was structurally reasonable. He was therefore very disappointed when I told him at our first interview that the shape was not very suitable, structurally, for he was particularly keen on the idea of an ideal marriage between architecture and structure. He was therefore quite willing to consider other solutions, and we did look into various possibilities.

Utzon's design for the roof of each of the halls consisted of four pairs of triangular shells supported on one point of the triangle and each of the two symmetrical shells in a pair leaning against each other, like a pair of hands or fans. The shape of the gothic arch formed between the two supports in each pair did thus not follow the line of thrust—it should not have been pointed at the top—so that the deadload would induce heavy moments. If we counted on the shells being fixed at the supports we were up against the fact that just where the greatest strength is needed, the width of the shell is reduced to a minimum. Moreover, each pair of shells is not balanced longitudinally, but transmits a force to the next pair of shells. Longitudinal stability can therefore only be obtained by considering the whole system of four pairs of shells as one. These shell-pairs are connected by eight side-shells spanning like vaults between the sides of two adjoining pairs of shells, and by louvre walls, which are cross-walls closing the opening between the two shells of a pair—in a rather unsatisfactory fashion, structurally.

It soon became clear that any alteration to the cross-section which would eliminate some of the heavy moments induced by self-weight would completely destroy the architectural character, the crispness and the soaring sail-like quality of the structure. To replace the sails with rabbit-ears would be disastrous. And to make a dome-like structure over the whole of each hall or both halls, which would probably have been easier, was of course out. So in the end Utzon and I decided that the scheme had to go forward as designed by Utzon, more or less. It is one of those not infrequent cases where the best architectural form and the best structural form are not the same.

If we had known at that time what we let ourselves in for, we might well have hesitated. We underestimated the effect of the scale of the structure. The trouble is that the thing escalates—the moments require more material, more material induces more moments, and so on. As you all know, one has to be very careful about transferring a statical system from one scale to another. We knew that, of course—but we realized that there would be a hidden strength in the longitudinal continuity and that we could utilize the louvre walls and perhaps combine stage towers and roof in some ways. And we had to say to the clients whether the scheme was feasible, and if we had hesitated on that score, it would probably have given the opponents of the scheme the upper hand. And we liked the scheme and the architect and the clients, and we knew we could do it somehow—so we went ahead. We were of course very careful not to commit ourselves to any estimate because we really hadn't got a clue.

If we had known what we know now, we could, I feel, have done quite a lot at the time to make our subsequent work easier. We could have made alterations improving the longitudinal stability without impairing the architecture, and we could have given up the attempt to make a rigorous calculation, treating the whole group of shells as one continuous structure. We tried this in order to exploit all the available reserves of strength in the form, to obtain the most elegant and economical solution. But it proved to be very, very difficult to evaluate the longitudinal transfer of forces.

We first fixed the geometry of the shells together with Utzon, prior to the presentation of the sketch scheme in March 1958. It was based on a system of parabola, and it greatly improved the appearance of the shells. The model used for wind-tunnel tests was based on this version. As the computer programme got under way the shape underwent several alterations, through elliptic paraboloids, and cubic parabolas to ellipsoids, but this was a matter of convenience

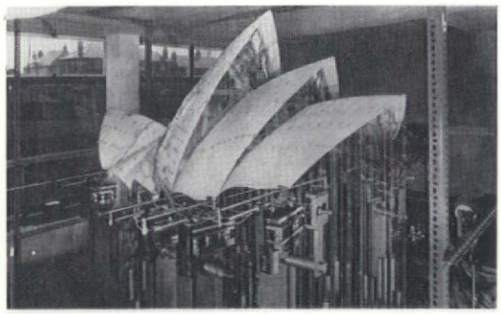
4
A model of an early version of the roof structure undergoing tests at Southampton University

5
Section through the screen of glass and bronze-clad plywood ribs proposed for the north end of the major auditorium

6
Aerial view of Bennelong Point showing the roofs during construction, with the casting yards in the foreground

7
The roof of the main auditorium during construction, showing the springing of the main supporting ribs with the transverse ribs already in position

Photos: 6 and 7 M. Dupain, C. Cane and Associates



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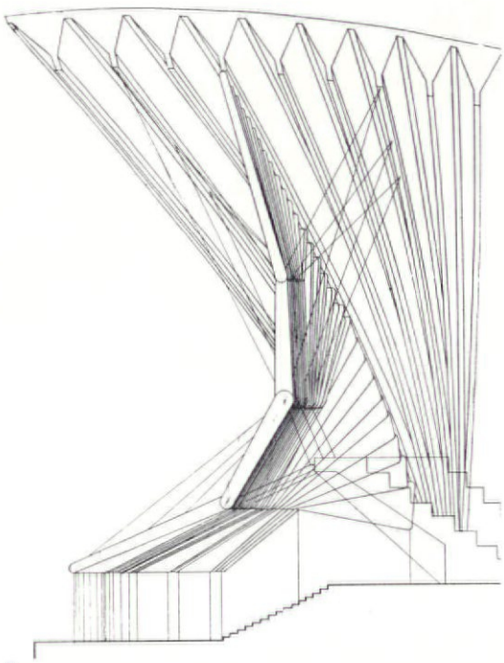

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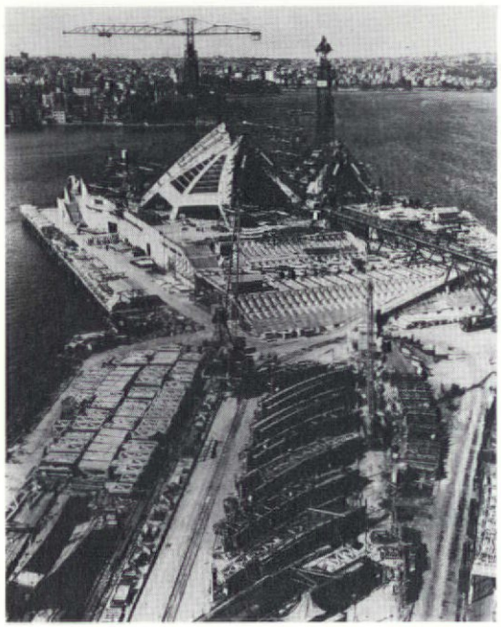

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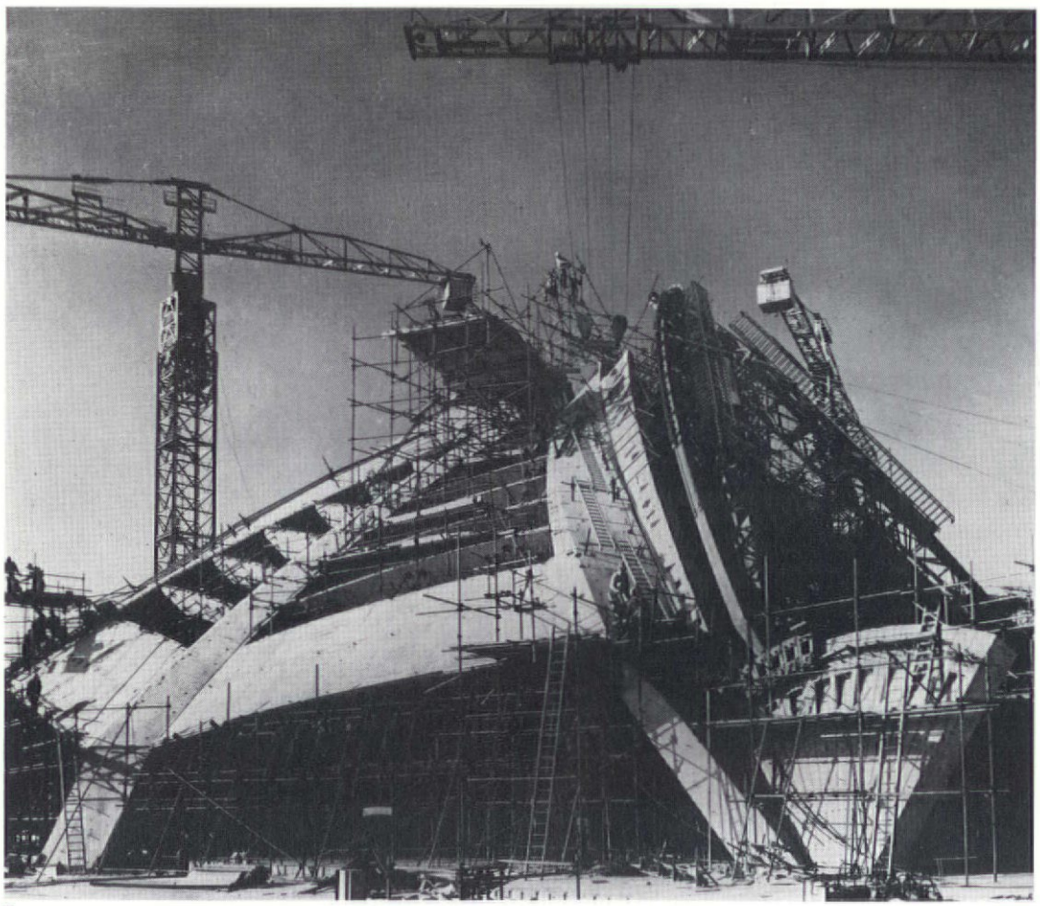

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of calculation, and had very little visual effect.

We had thought at one time that the shells could be constructed as shells strengthened by ribs —as shown in our sketch scheme. This soon proved inadequate, and our calculations and extensive model tests, which went on for nearly one and a half years at Southampton University with our own staff, were based on a scheme with double shells, about four feet apart.

Some time during 1961 it was clear that a slight inclination of the shells—which until then had risen vertically from their supports, would be very desirable and also the louvre walls assumed a much greater importance for the stability. And to reduce the weight we were also veering towards a solution with structural steel ribs, with concrete slabs inside and outside—required by the acoustical experts anyway—but this was heartily disliked by Utzon and I did not really like the idea, either. I now almost think that it might have been easier, if not better.

The change of shape meant in any case that all our computer programmes and model tests would not be correct any more. At the same time Utzon had become more and more convinced that these louvre walls were a mistake. He had realized that the problem of closing a shell with a glass wall had not been solved (see Candela's restaurant or the Paris CNIT hall) and he would not approve any of our solutions for this wall. He also very much preferred a ribbed effect on the underside of the shells. So after some heart-searchings we decided to start all over again, abandoning three years work.

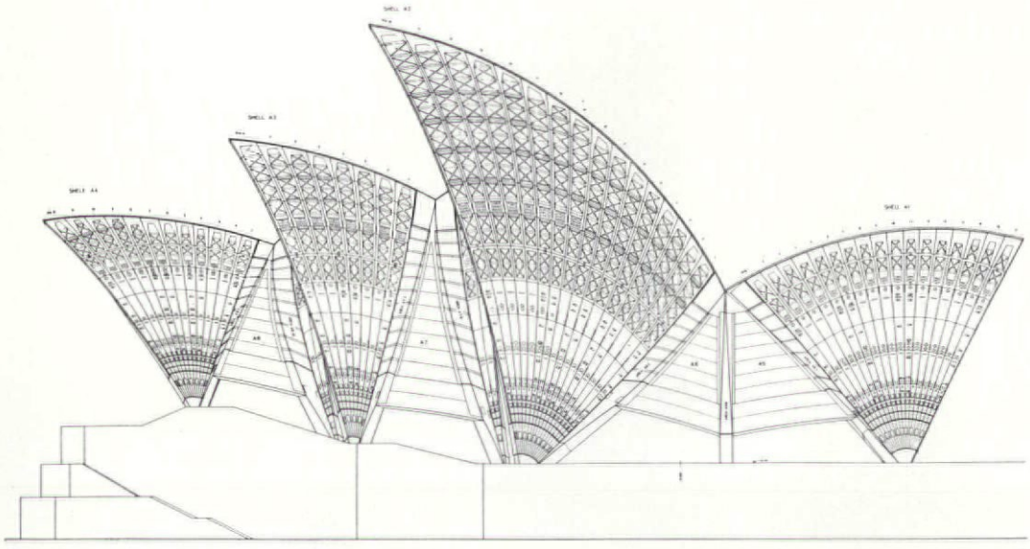
The structure was now divided up in three separate parts, and the louvre walls, except at the two open ends, were replaced by pairs of shells facing the other way and partially closing the end of the main shells, as you can see on the drawings. The remaining gap will be filled by a twisting glass wall. Very marvellous, very complicated and very brilliantly solved by Utzon with the use of bronze-clad plywood ribs.

This arrangement enabled us at least to know how the load would be distrubuted over the foundations with a resultant simplification of the calculations—although to talk about simplicity in this connection is perhaps a bit far-fetched.

The shells have given up the pretence of being shells, they consist now of triangular tubes reinforced with ribs fanning out from the supports to the longitudinal spine. These tubes or ribs, as they are called, are made of pre-cast sections, post-tensioned together.

When this change to a more articulated structure was decided upon, we were of course still thinking in terms of the old profile for the group of shells. Each shell was different, there was no repetition. This made pre-casting very costly. What we intended doing was to cast these shells on a piece of land adjoining the harbour, lying on their side, so to speak, on enormous timber beds, on which adjustable forms would be used to form the ribs. We intended adjoining segments to be cast against each other, to ensure exact fit.

But then Utzon phoned from Copenhagen that he had solved the whole problem of pre-casting. It transpired that he had changed the whole shape of the shells by cutting each of them out of the same sphere. So now they are all spherical, and the ribs follow meridian curves on spheres of the same radius, 246 feet. That means that all the ribs are identical, although of different length and cut off at different angles at the spine end. Also the side-shells are



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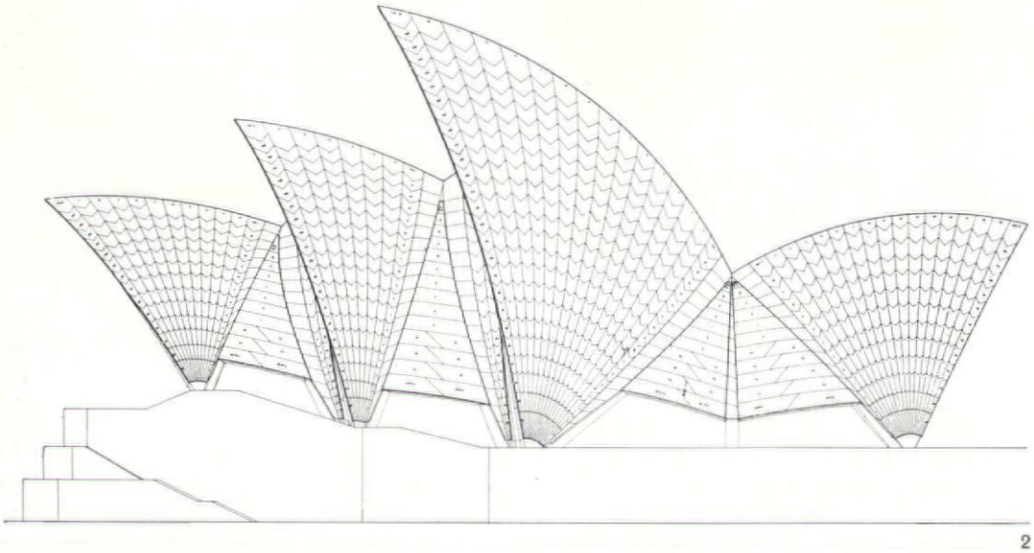

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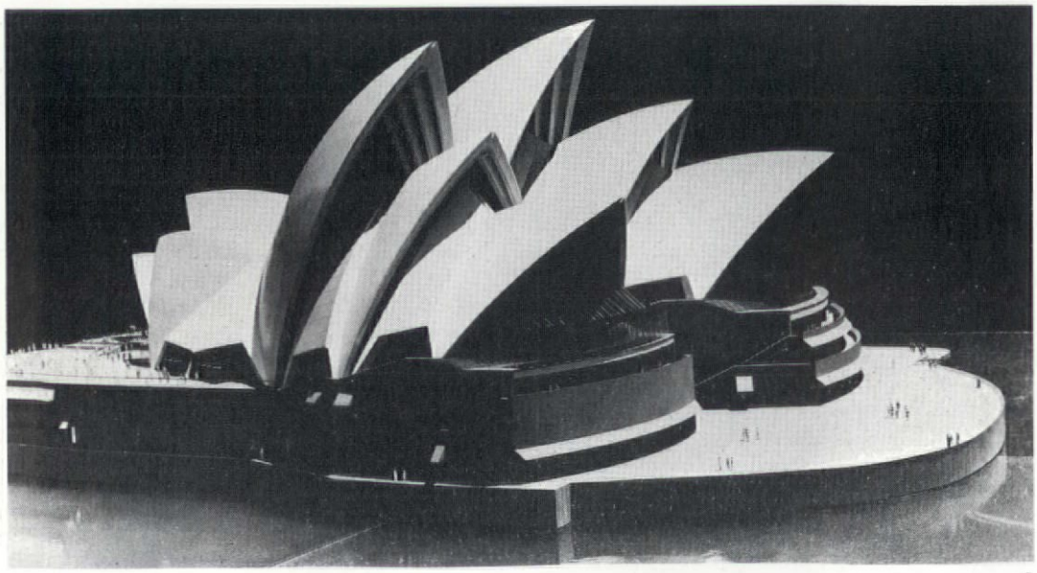
1
West elevation of the major auditorium, indicating the final version of the structural arrangement all to be covered, as shown in 2, with precast concrete 'lids' faced with Høganas tiles

3
Model of the opera house as it is being built, at present, seen from the north-east

Photo: 3 M. Dupain, C. Cane and Associates



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changed to consist of a piece of sphere, flanked by two twisted surfaces connecting the side shells with the main shells. These twisted surfaces form the upper facets of the main arches, situated at the valleys formed between the side shells and the main shells or louvre shells respectively, and these arches are the backbone of each of the three groups of shells in which each hall complex is divided. These arches are also made of rather complicated precast sections, and the side shells are made up of pre-cast beams and tile-lids.

It took about eighteen months to work out the geometry of all this and without computers it would have been quite impossible. It is even necessary to use computers for the setting out of drawings, because we are working in three dimensions all the time. But the use of spherical surfaces certainly made the formwork simpler. There are about 2500 concrete segments in the roof weighing seven to twelve tons each, and most of the forms for the rib segments, which are by far the majority, can be re-used 30 to 40 times.

The shells are to be clad with tiles, and Utzon has spent about two years getting Høganas (the large Swedish tile factory) to develop a special tile which meets his requirements and which reminds one of old Ming china. They are even cheaper than any other he has found anywhere. But the problem of placing the tiles and getting them to remain in place was a sticky one. The final solution is to make special tile lids backed by concrete—almost ferro-cement in Nervi's sense—waterproof and insulated, and place them on top of the shells. We could then partially dispense with the top slab in the concrete 'tubes' of the ribs. There are 4000 of these tile lids, weighing up to three tons each. There are 1,300,000 tiles.

The placing of the precast units to form the superstructure is a tremendous job. Actually the solving of and the calculations for the building process is by far the most difficult part of the job. When a unit weighing ten tons is placed a hundred feet up in the air and has to be supported temporarily on an adjustable steel erection arch and the last completed rib, which is not yet firmly attached to the rest of the shell, then all sorts of complicated things happen. The arch gives, the rib moves, the temporary prestress causes strains, temperature variations make their contribution—and we must know what happens. The whole structure acts as a mechanism with sliding joints and adjustable bolts and what not. There is ample opportunity for plenty of headaches to arise.

And I feel that I have only shown you a few glimpses of the complex activity which has been set in motion by Utzon's simple poetic idea—and these glimpses are of course very much viewed from the structural engineer's angle. But then all that has happened on the job so far is structural engineering—and at the same time architecture. And I should like to pay some tribute to the people who have sweated and toiled to get the job so far.

Many have worked for five years or more on this job. It is quite a sacrifice for a man at the height of his power to dedicate five years of his life to one job which demands so much, and to see so much of his work thrown aside because of altered dispositions or because the difficulties ahead were insurmountable. In our firm alone over 200 engineers have worked on the Opera House—not all at the same time, of course—and many of them have been outstanding and have made very valuable contributions.

The pavilion and the route

A. and P. Smithson

A descriptive analysis of the architecture of the Churchill College scheme, Wayland Young Pavilion, The Economist Building, and the Garden Pavilion at Fonthill by A. and P. Smithson

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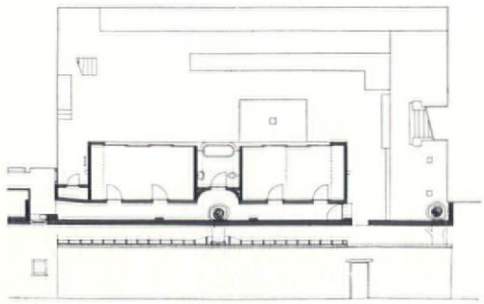

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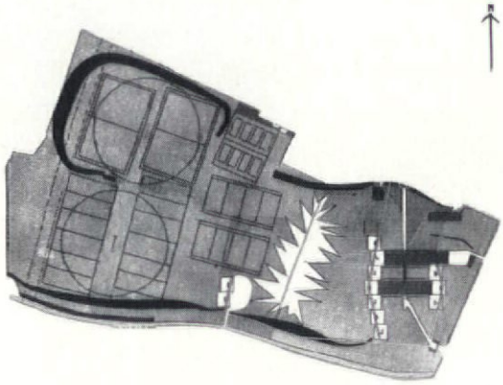

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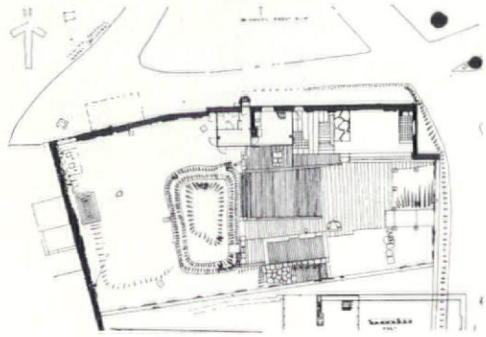

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1
Map showing the Economist site in St James's
2
General plan of Young Pavilion
3
Site plan of Churchill College scheme

4
General plan of Fonthill
5
Aerial view of the Rockefeller Center

1 Formal organization

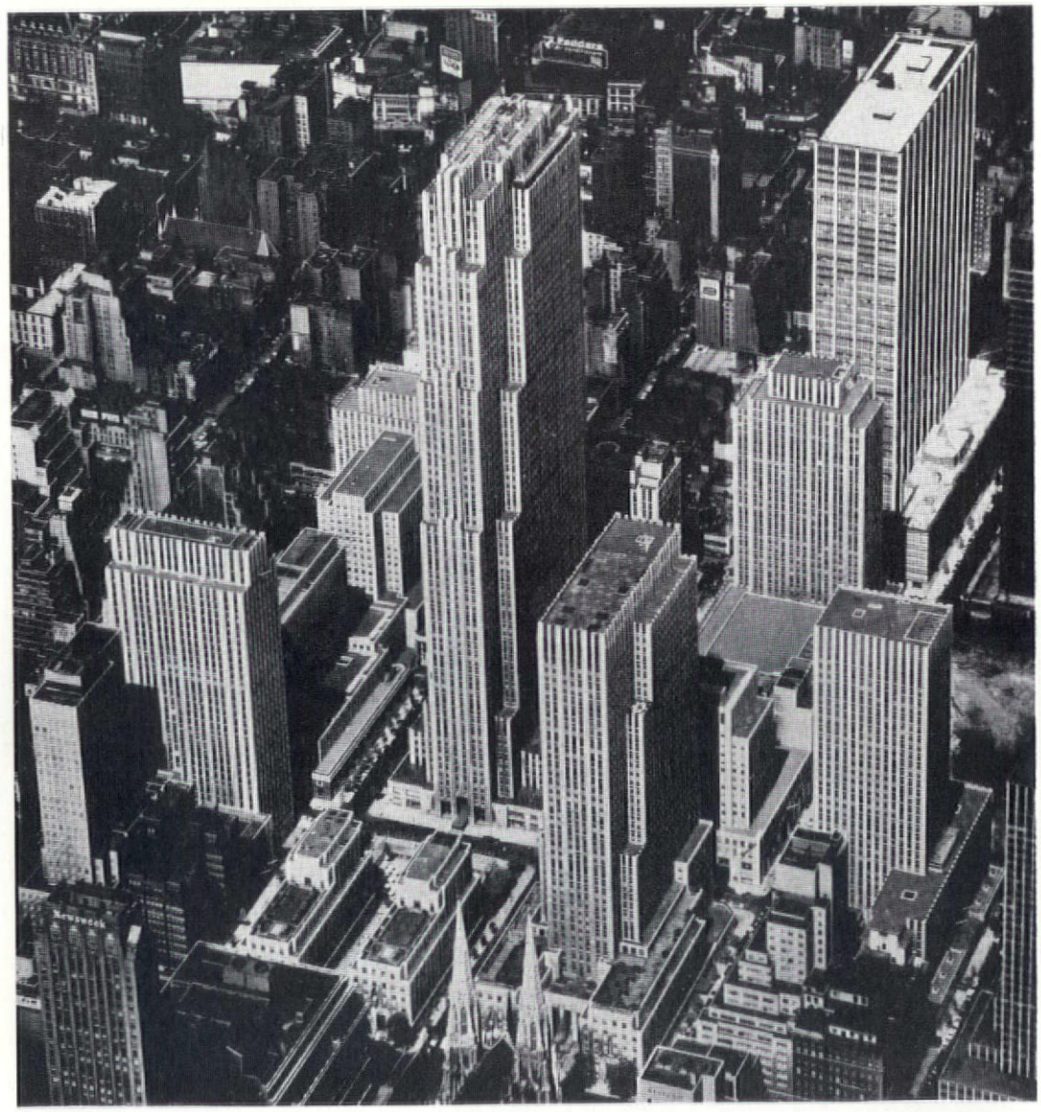
Each of these buildings or building groups has the same simple organizational base of clearly separate, near symmetrical elements (or element, in the case of the simplest) hooked onto, or bedded into, a much freer circulation system. It is the purpose of this analysis to put together the facts of this architecture, with the theories that preceded it, and to try retrospectively to explain their coincidence.

To deal with the building groups first.

The principal objective was to achieve a 'half open and half closed' space system such as would in a practical way free the urban structure and, in a symbolic way, illuminate our common situation. It is generally agreed that a freeing of the urban structure must involve an increase in size of the units in which we commonly build, or conceive of as needing collectively to be built. This increase in size has almost always been thought of as involving the building of vast 'mega-structures' in which many functions are housed; and this has been the almost invariable form of sky-blue thinking from High Paddington to the Boston Housing Project of Kenzo Tange. In these mega-structures the circulation systems and the humanly occupied parts are locked into an unalterable embrace.

It has been our counter-thesis that, not only are these dinosaurs un-negotiable (even un-achievable) as architecture, but that they are impractical.

The very essence of a modern building is the flexibility of its mechanism and its servicing, and the same applies to the modern city. In some way this must mean more elbow room, a separation of elements so as to allow each to develop its own systems and, when necessary, to change. People are different from machines and people doing one sort of thing need a



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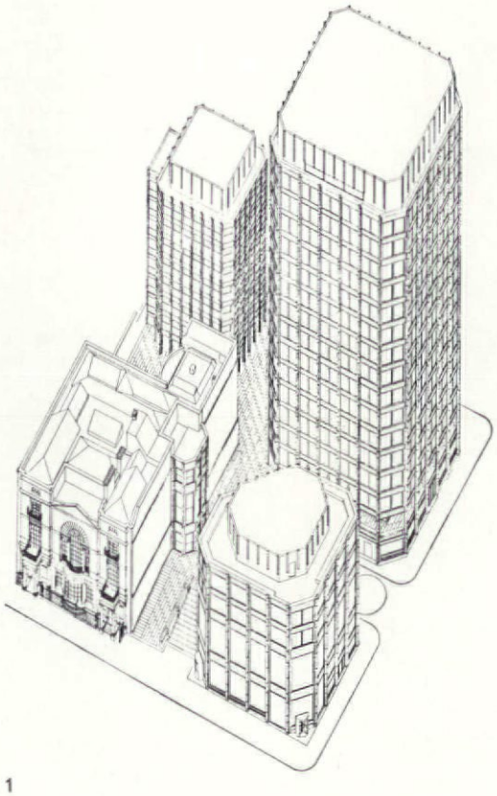

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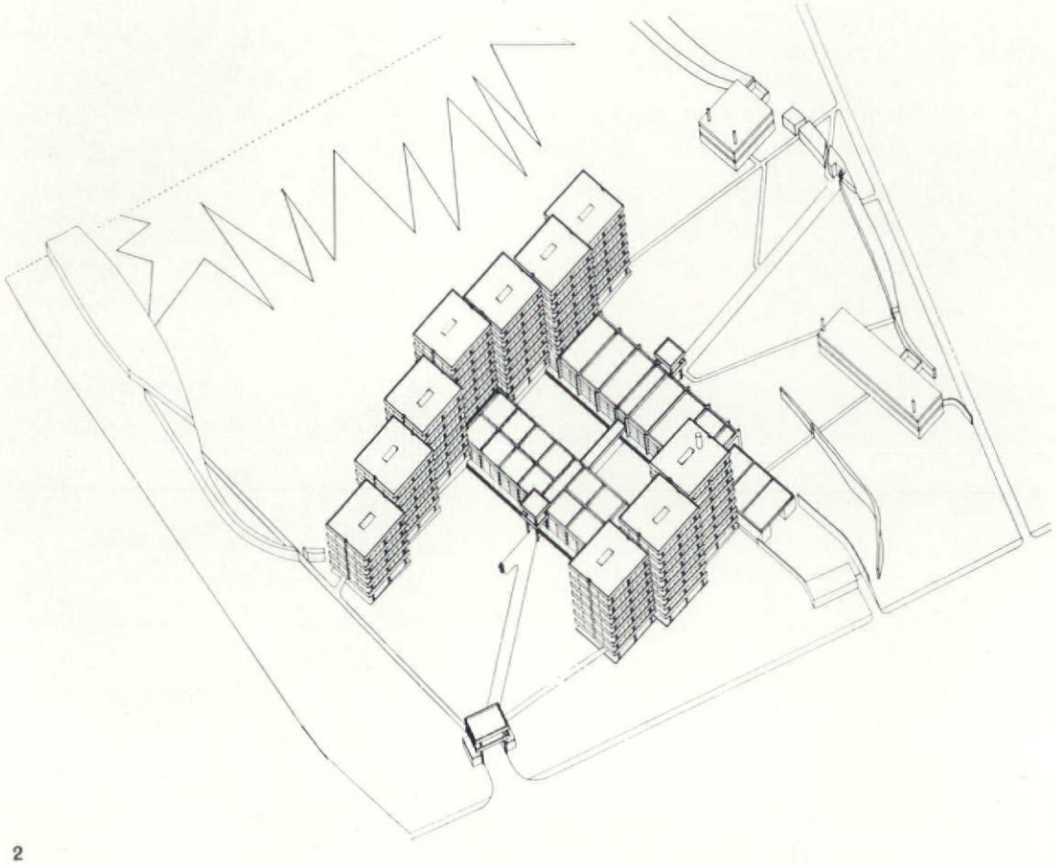

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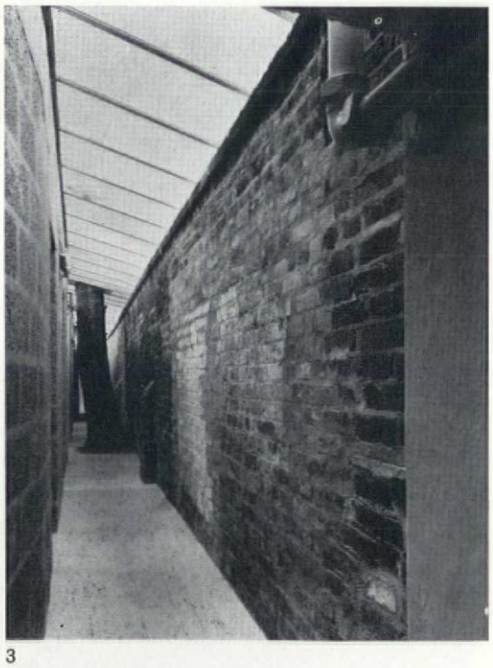
1
Axonometric of the Economist buildings
2
Axonometric of Churchill College scheme
3
General view of the passage in the Young pavilion
4
Skylight over the bathroom in the Young pavilion
5
View of Fonthill pavilion from the road
6
Aluminium flush door in the Fonthill pavilion

different environment from others doing other sorts of things. This sounds too obvious to say but we are still at the stage when houses go up adjacent to motor-roads and flats are banged down on top of super-marts without anyone even noticing the crippling effect each has on the other. All this and much more is a case for the separation of major elements in such a way that the systems of human living and of servicing can each develop to their mutual advantage

To this practical argument for separation can be added a formal one. The architectural unachievability of the mega-structure is in the first place due to the impossibility of developing and ensuring the compatibility of the structure and space systems across the change-of-function-lines, and in the second place to the near impossibility of these huge animals being able to weld one with another into the larger units by which cities are built and comprehended.

If, on the other hand, the major elements are clearly separated, and their formal expression edged towards the collectivity of the as yet unbuilt, as well as towards the collectivity of the existing as now, then that bigger unit of city may come into existence.

This is the sort of thinking that lies behind the layout of 'The Economist' Building, even though the scale of the operation is comparatively small. Each of the major functions is allowed to develop its own system, and each has a certain neutrality which builds towards the group. The group looks forward to other groups, as well as towards St James's Street. The very closed plan-forms emphasize the separation of the elements, particularly necessary on this very small site. The space between, is the collective of the spaces



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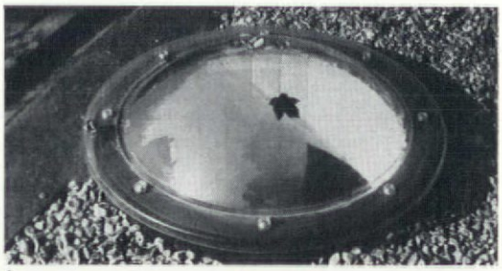

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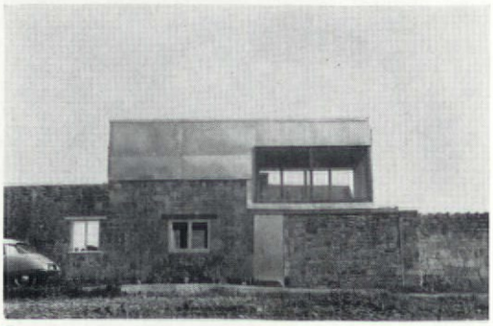

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that each of the buildings carries with it.

There is the same sort of anti-space space in the Churchill College layout.

In Churchill College the architecture is more obviously of pavilion and route—even though the pavilions are joined together. The three sorts of routes—vehicle, bicycle and pedestrian —are knitted up with the piled-up pavilions of the 'sets'.

And even more obviously in the Wayland Young Pavilion, conceived as a bead on a passage-string threaded through the old house from the front door to the old studio at the end of the garden.

The garden pavilion at Fonthill is a gate. A gate to a garden, to an open and closed situation. A play-house, a folly.

2 Construction

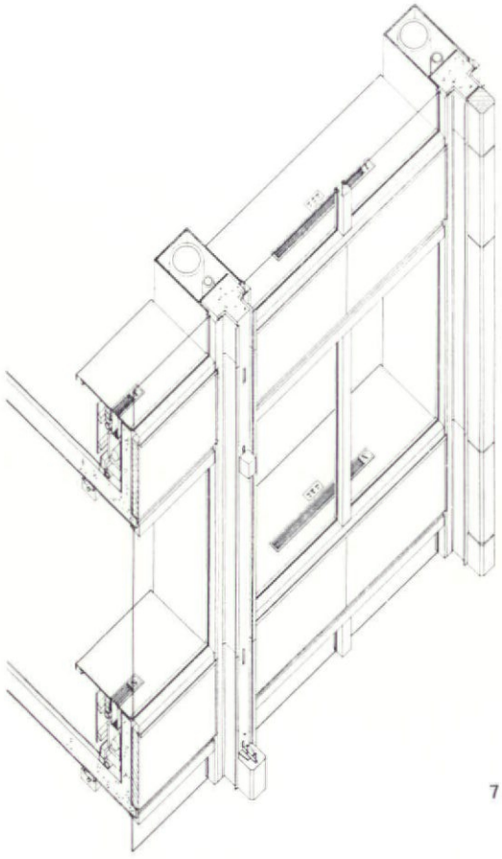
In India Le Corbusier's concrete-all-through is a near practical solution, as it is almost nowhere else. Even in India as room conditioners and air-conditioning become available it will be necessary to have the 'inner' and the 'outer' separated.

There then presents itself the problem of *an architecture* of inner and outer skins. All multi-storey buildings must have a fireproof structure and this means reinforced concrete or concrete covered steelwork. But a single skin of concrete is not weatherproof, and in conditions of urban air polution is not self-cleansing. Nor does dirt enhance it, it just gets dirty. If an outer weather skin is put over the surface there is present a potential architecture of the two skins, *the protecting and the supporting.*

One would have imagined that this sort of architecture would have already arisen in the countries of extreme climate. It certainly exists in embryo, and at its most poetic in the Shodhan House, with its shaded patios and hidden away living spaces, and also in the flats in Sweden by Ralph Erskine with an entirely separate outside skin and balconies hung from the top to avoid all possible cold bridges. But normally, techniques of separation are technical modifications of an architecture conceived in the gothic mode of all-way-through masonry.

In our climate the enemy is mostly dirt and rain and an architecture to respond to these needs a weather skin. This is the sort of argument that lies behind the development of the Economist façade, where the most self cleansing natural stone available in England—Portland—covers the reinforced concrete frame and the dirt-laden run-off from the glassed areas is directed away from the masonry facings. The channels of this run-off provide a sort of symbolic separation between the facing and the supporting. Where concrete is exposed it is clearly supporting, and it is only exposed when under cover and thus partly protected from dirt.

It is a similar logic of materials that led to the structure of the Fonthill Pavilion. The supporting elements in concrete and soft wood are not exposed to the weather. The external skin of two naturally weather resisting materials, teak and aluminium. The glazing is pushed against the outer skin of teak from the inside. With this in place, all the materials can perform



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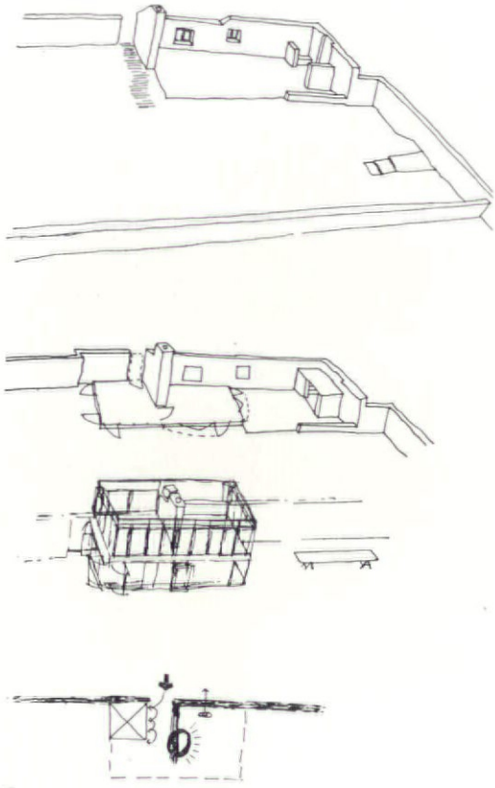

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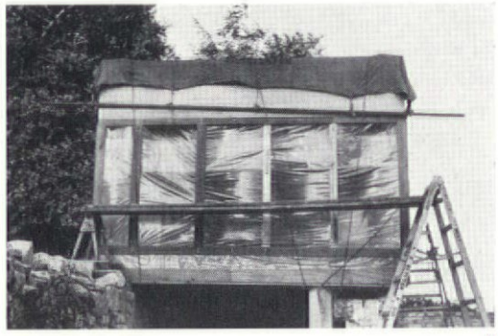
Construction detail of Fonthill pavilion

7
Diagram axonometric of Economist façade
8
Original sketches for Fonthill pavilion
9
Cladding the Fonthill pavilion
11
NW/SE section through Shodhan House, Ahmedabad
12
West corner of Shodhan House
13
View of Erskine flats



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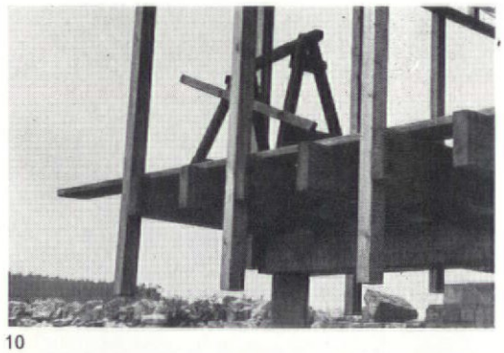

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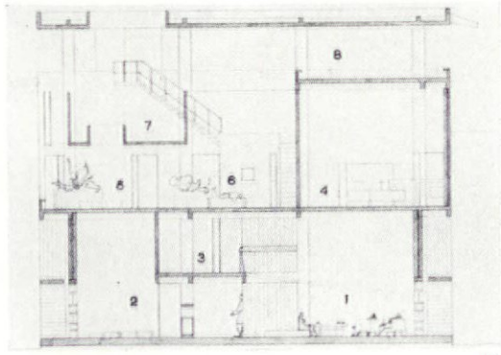

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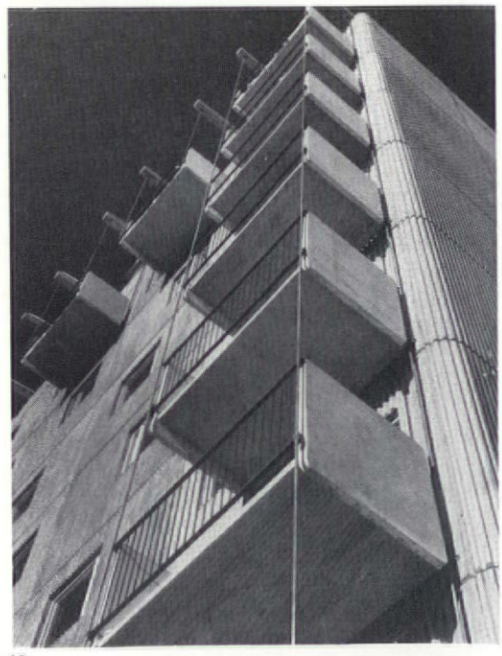

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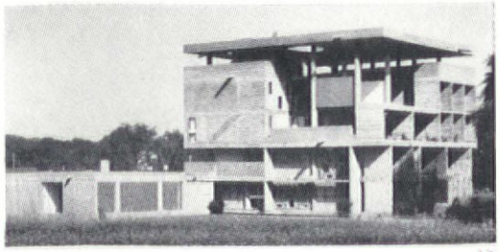

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and can speak, without further protective treatment or decoration.

(Since this essay was first written (1961) it has been observed that concrete in this part of the country, Wiltshire, acquires lichen and moss-growths, and in fact weathers visually exactly like stone. The 'two skins' have in fact been somewhat of a problem, since birds ate out the unpainted oil-based glazing compound in the hard winters of '61 and '62, letting in water between the skins at the sills. The sills have been subsequently pointed-up in gun-applied artificial rubber mastic which is unpalatable to birds.)

In the Churchill project the concrete structure is exposed to the weather, there being little rain-borne dirt on this site. The structure is separated from the system of the internal spaces, the windows being thought of as part of the system of internal linings and not part of the outside structure. On a minature scale this is the arrangement of the Young Pavilion.

(The exposed concrete of the roof beam at the Wayland Young Pavilion is now (1964) very badly streaked with dirt. Air-pollution in London is still too great.)

3 The pavilion notion

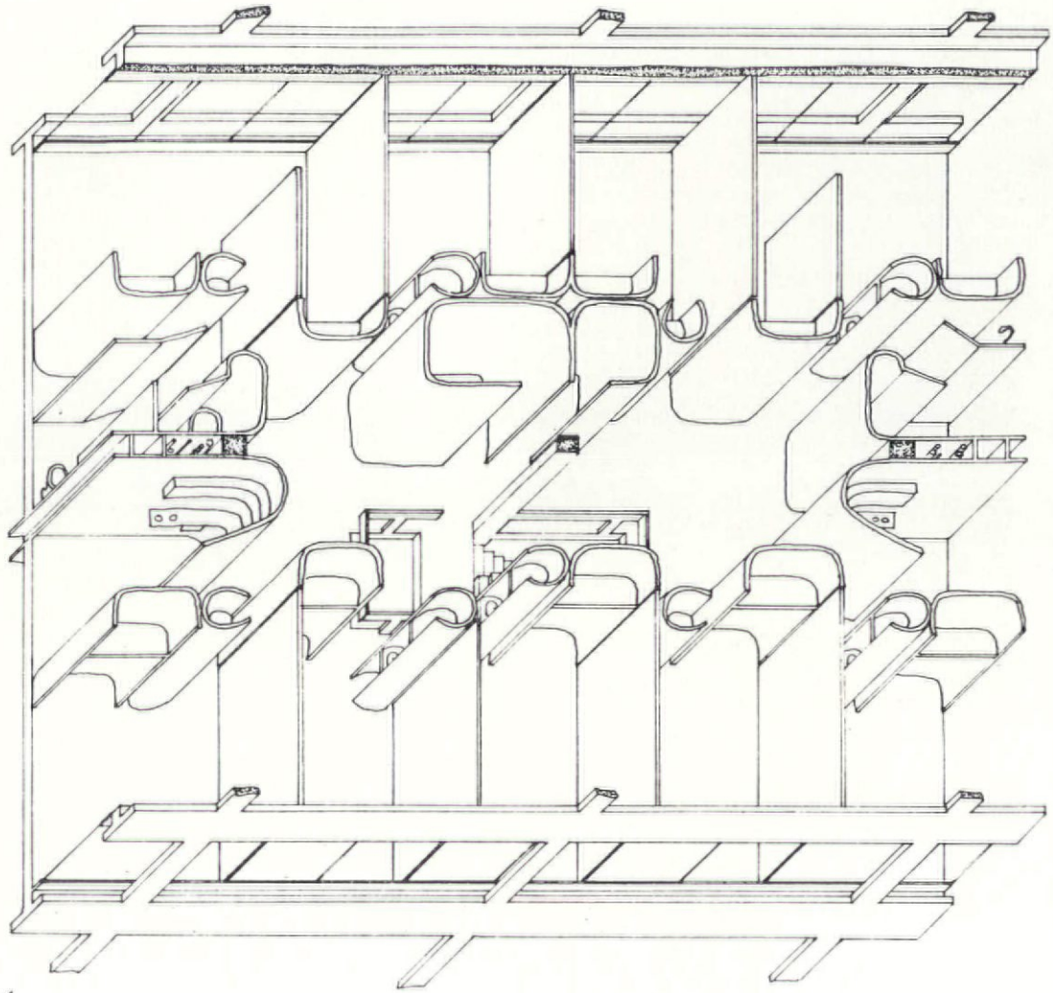
The essence of the pavilion seems to be that service and storage areas are enclosed and centralized, the living areas are open and peripheral.

As to style, regularity and neutrality of façades permits informality of the group and builds towards a relaxed and open town structure.

4 General urban application

In terms of the urban structure the principles used in the design of these buildings can be seen most clearly in the Hauptstadt Berlin Project. This was of such a scale that the various systems of circulation, the various building types could be developed so that each became perfectly clear. The danger of such clarity on this enormous scale is of course of oversimplification: one was capable of producing such a clear statement because one was so far from many of the real facts. However, it is quite a supportable dream that there could be a group of architects and clients, each seized of the fact that there are certain collective techniques of building which are mutually enhancing, and that a pattern of logic and clarity would emerge.

A. & P. S.



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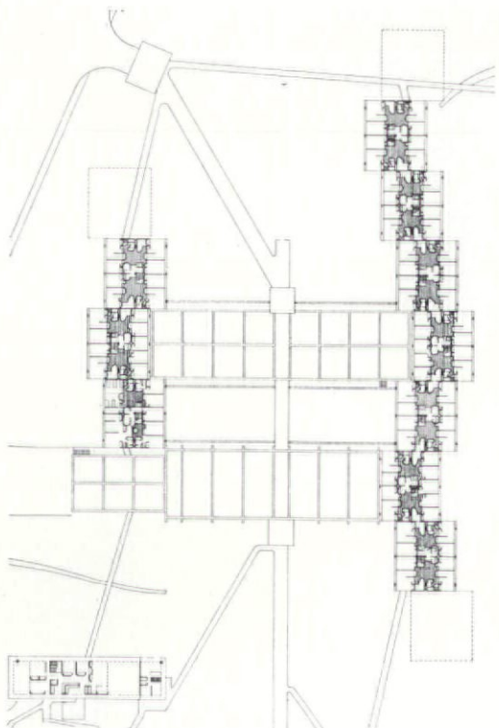

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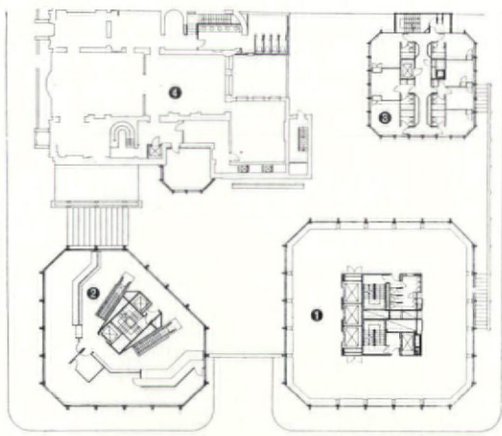

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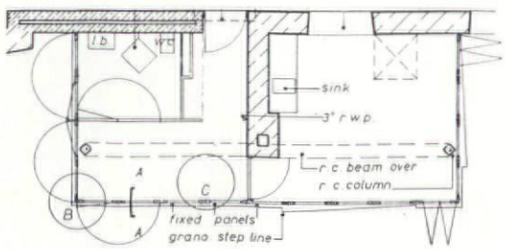

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5

1
Inside axonometric of Churchill College scheme

2
Plan of Churchill College scheme

3
Typical plan of Economist buildings

4
Floor plan of Fonthill pavilion

5
Diagram of Berlin scheme (*drawing Sigmond*)

We can't get it all in

It is simply impossible in one advertisement to do justice to the polypropylene chair programme. This complete, multi-purpose range of tough, attractive, low cost chairs has been described in the Architects' Journal as '. . . the most significant development in British mass produced chair design since the war', a judgement reinforced by the immediate success of the whole range. Unfortunately, in this limited space, we can't detail a programme which includes stacking chairs (two types), benches, armchairs, stools, pedestal-based chairs, upholstered versions—but please send for the brochure, it shows them all and explains everything.

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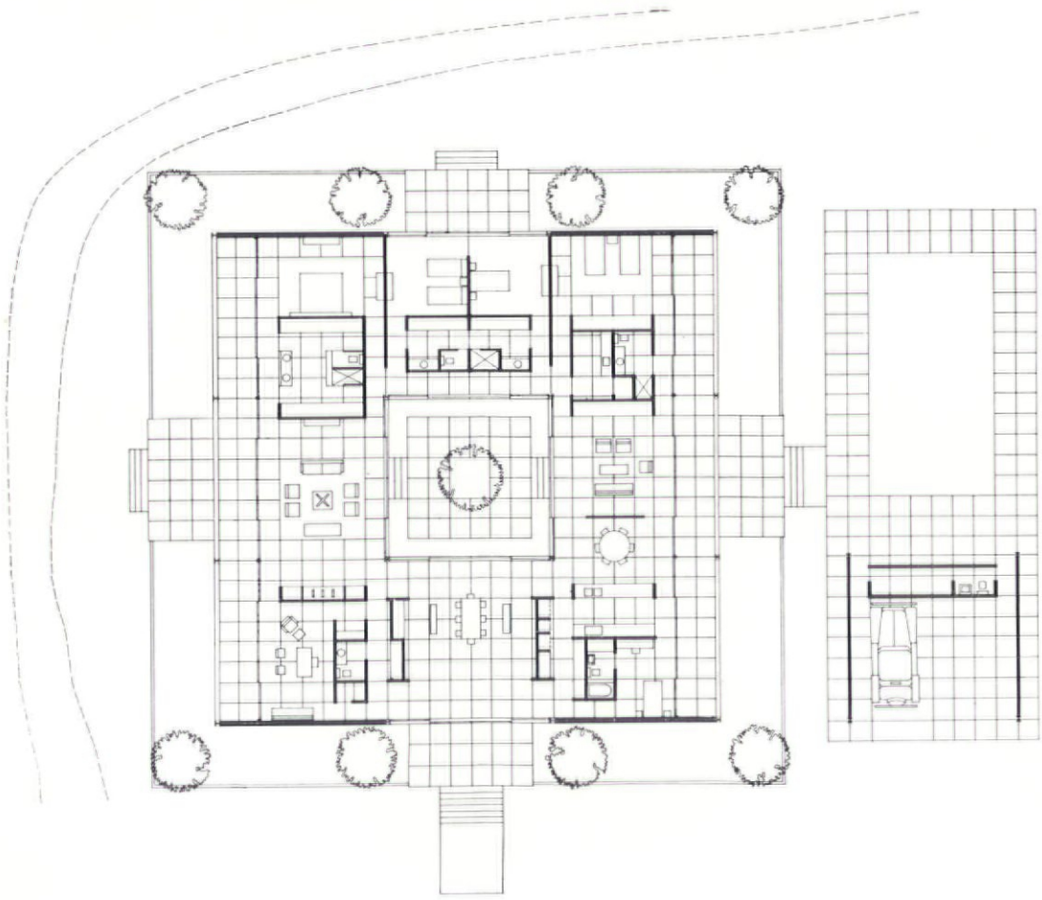
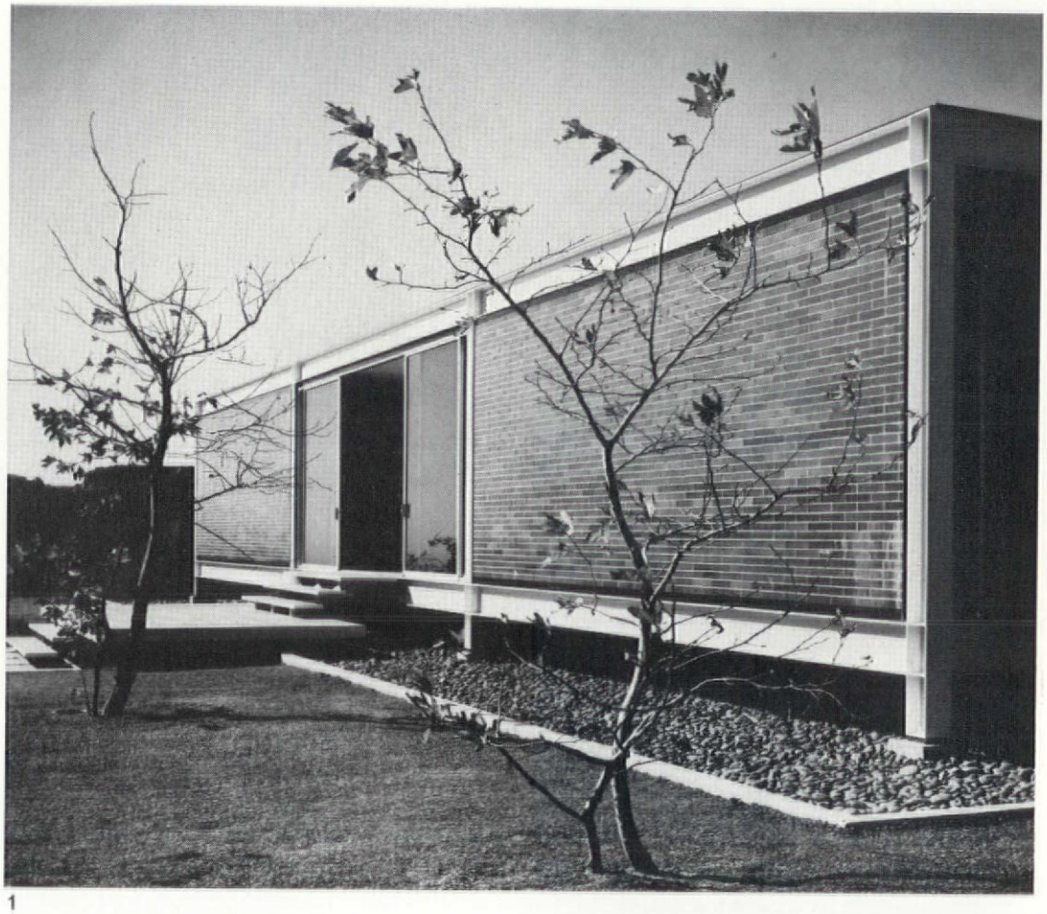


Rosen House, California

Craig Ellwood

The house, which is near Los Angeles, is intended for a family of five. The bedrooms, bathrooms and areas of greatest privacy are set away from the entrance along the west wall. The generous living areas are arranged on the other three sides. Flanking one side is a swimming pool and a garage. But this is subordinate to the house; it is sunken. The house itself is a study in symmetry and formal geometry. The plan is foursquare. It is divided into nine lesser squares, each made up of eight modules of 3ft 4in, with the centre one left open as an atrium. Stairways from the garden, placed in the centre of each of the façades, like that in the main entrance façade, serve to emphasize this focus on the void that lies at the centre. The void is not without its interest; at its centre is an old olive tree. Absolutely, the architecture has been contrived to skirt and flank and hover above the nature that is around it. The site is stupendously wild; a small plateau on the southern slope of the tree and shrub-covered Mandeville gorge. The plateau has been tastefully landscaped and planted with sycamores by Warren Waltz; but contact even with this man-made garden is eschewed. The floor of the house hovers 3ft above a bed of charcoal-grey sea-worn pebbles that flows in underneath it and through to the atrium and the olive tree. The stairs and landings leading up to this platform are designed to

further enhance this sense of unburdened mass. While internally bathrooms and cupboards and partitions have been arranged as free-standing volumes and planes, avoiding contact with one another and, as far as possible, the perimeter walls. 'Also remarkable', Craig Ellwood writes, 'is the fact that only two interior partitions touch the exterior wall'. But this is perhaps misleading. For the notion of a continuum of space with elements floating in it is surely destroyed by the fastidiously detailed sliding doors, concealed in the partitions that are needed to give privacy. If not, a glance to the right on entering the house is likely to reveal the maid in her bed. This obsessive interest in isolating the elements is sustained even in the detailing. Each element is strongly defined. The charcoal-grey glazed brick infill panels on the north and south sides are made to hover within the white-painted steel framework. The grouting between the stanchions and the foundation pads is darkened and recessed to diminish all sense of contact or visible means of support. Everywhere there is the attempt to render mass weightless.



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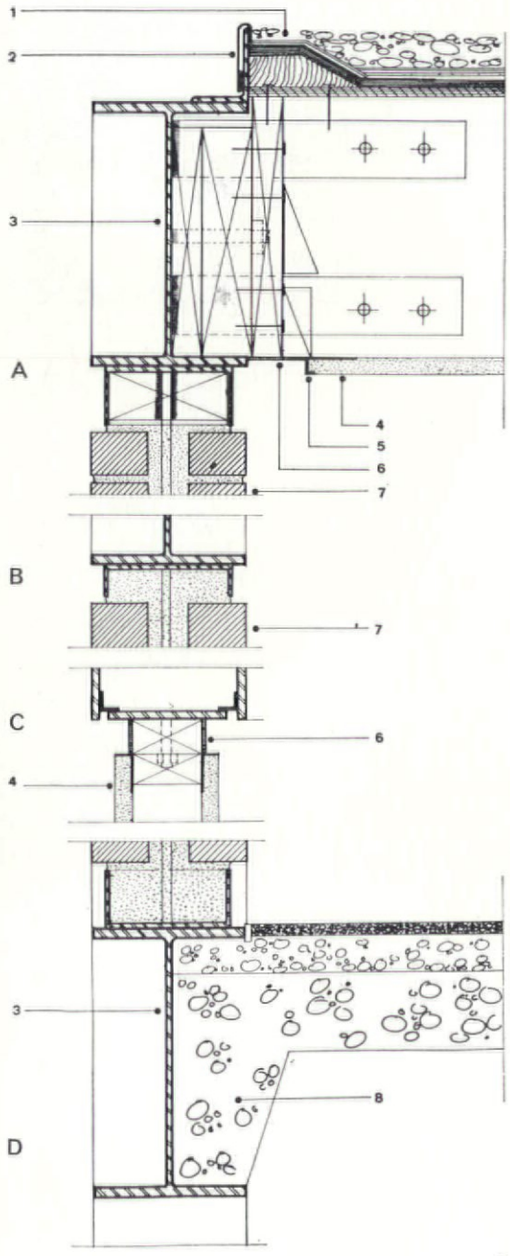
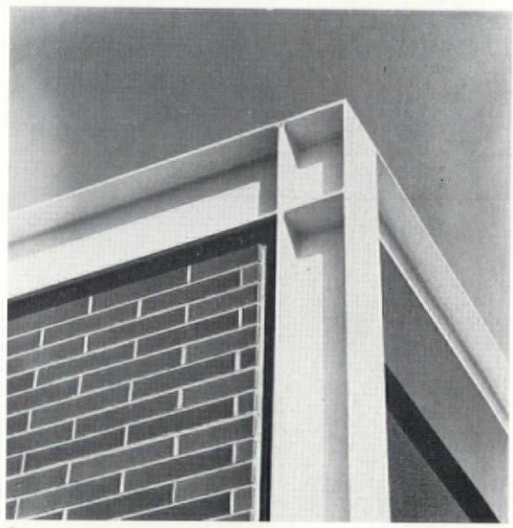


2

1
The main entrance façade

2
External wall details
A. Section through cornice
B. Plan showing junction of the brick wall with the steel stanchions
C. Plan showing the junction between the outer wall and internal partitions
D. Section at floor level
1 roofing
2 flashing
3 RSJ, sandblasted and painted white
4 sprayed white acoustical plaster
5 aluminium stop
6 Masonite panel
7 charcoal-grey ceramic glazed Norman bricks
8 reinforced concrete

3 & 4
Typical corner details, showing the junction of the RSJ stanchions and beams and the glazed brickwork of the infill panels at both roof and floor levels. The concrete footing is set in a bed of dark grey sea-worn 'San Quentin' pebbles that flows through to the atrium



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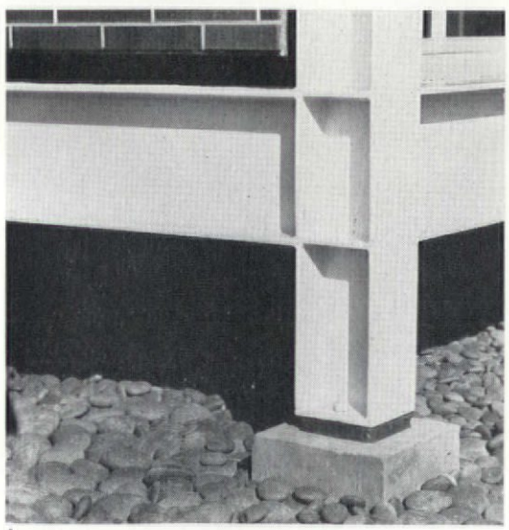


4

5

6

5
The living room seen from the atrium, with lighting under the house to enhance the hovering effect

6
The kitchen, the lower cupboards with walnut doors, the upper ones with grey plate glass

7
The morning room, on the north side opening to the atrium and to the swimming pool

7

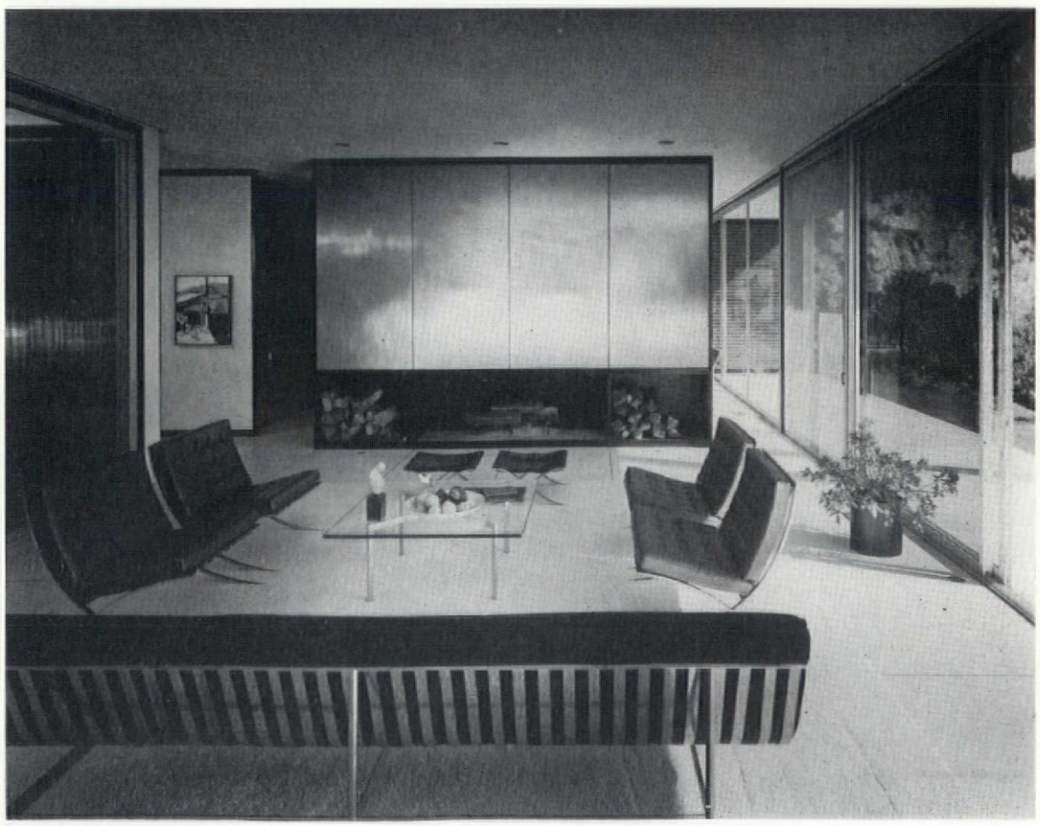
1
The main living room looking out towards the gorge. The ceiling, as throughout the house, is sprayed acoustical plaster. The floors are of white terrazzo. The furniture is chosen from Mies van der Rohe's Barcelona group. Other furniture is by Breuer, Eames, Saarinen and Ellwood Associates

2
The living room, looking towards the fireplace, which is panelled with stainless steel

3
The formal dining room, as seen from the atrium, looking towards the polished grey plate glass screen that divides it from the entrance hall

4
The main entrance at night

1



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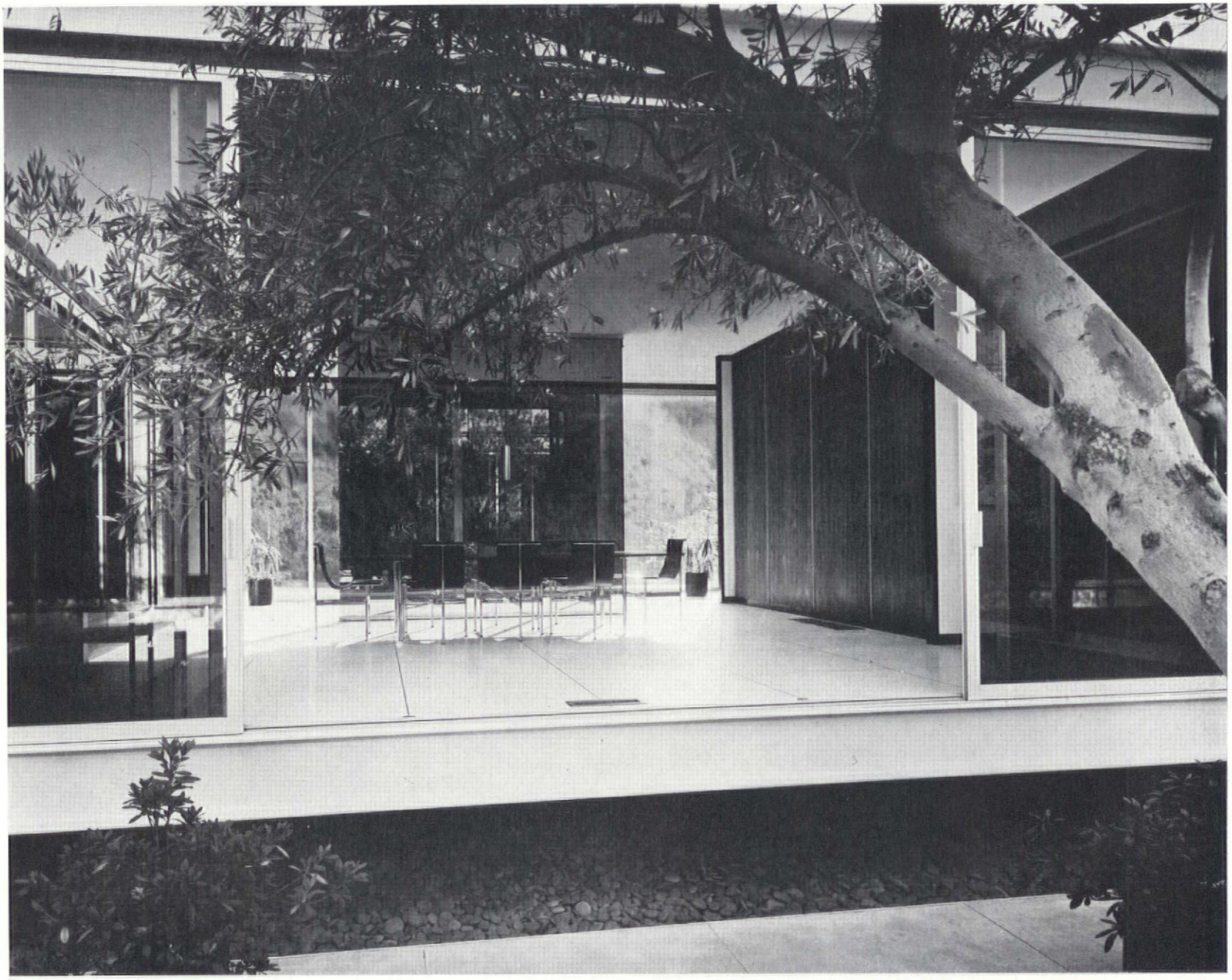

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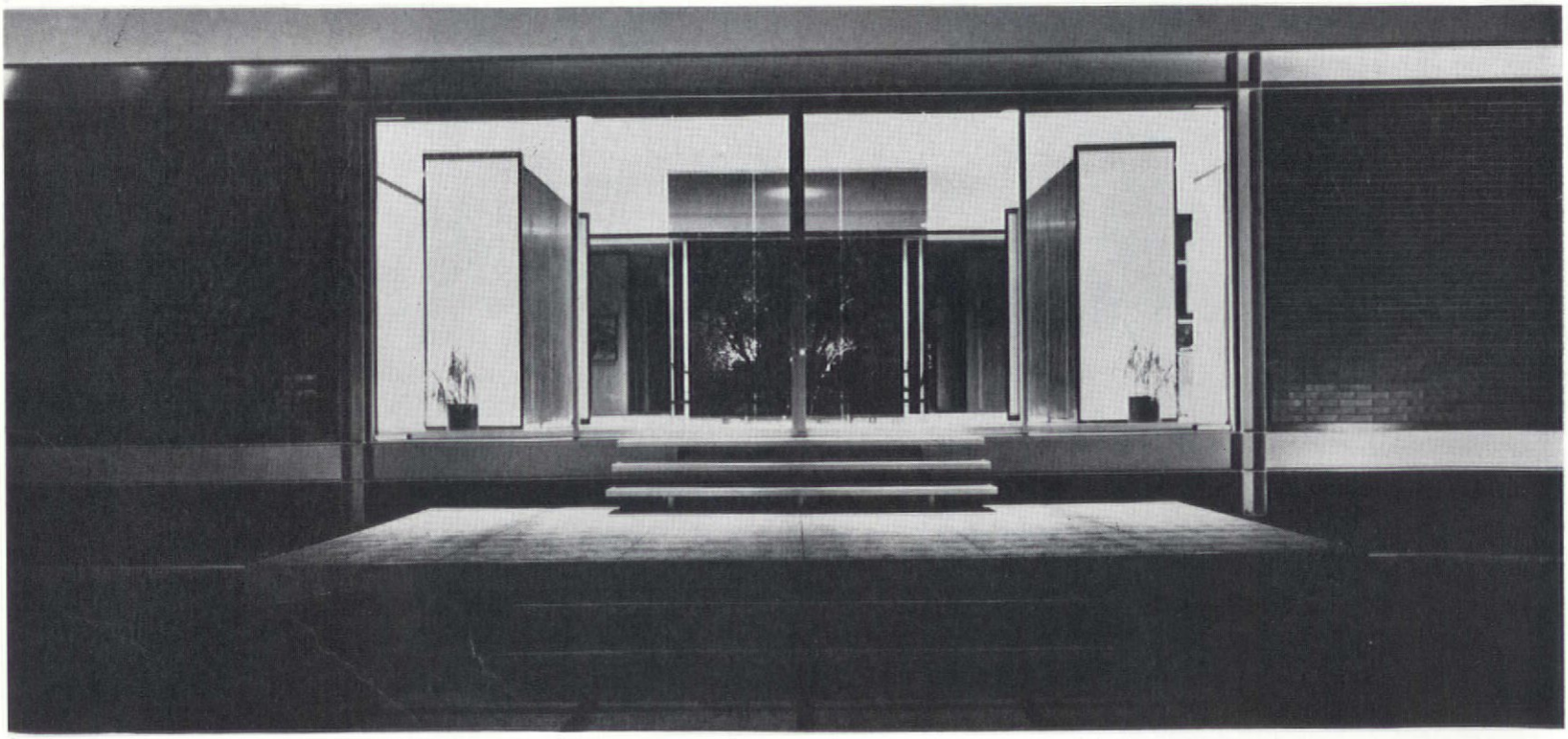

4

new fissured minatone

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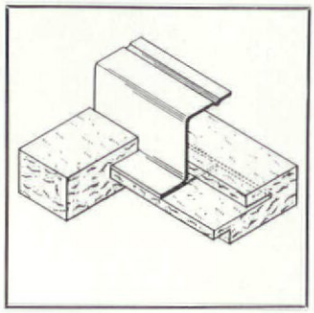

Fissured Minatone fitted to a 'Z' suspension system.

Again Armstrong design hits the ceiling with a new tile—Fissured Minatone. Fissured Minatone combines low cost with the incombustibility of felted mineral wool and its excellent room to room sound attenuation over the top of ceiling high partitions makes it highly suitable for use in office buildings. Architects will find the directional fissuring adds an attractive design element to the decor. The special finish of the square edged tile ensures a level ceiling, monolithic in appearance, particularly suitable for large areas.

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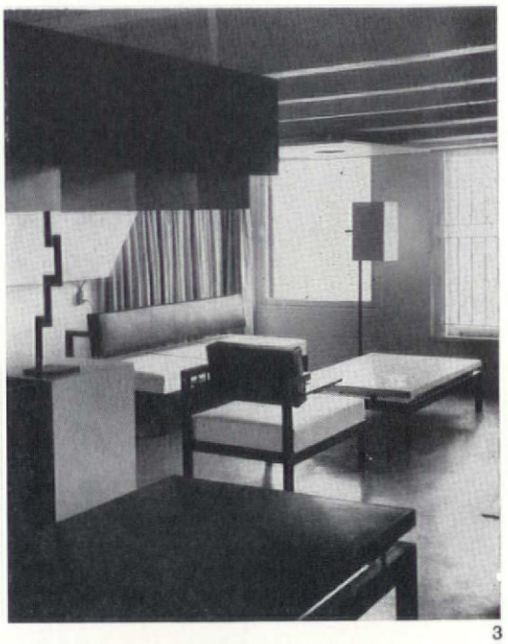


3

Attic in Amsterdam

An attic measuring 14×5·25m, and at the highest point 2m, was redesigned from a cramped interior into a functional and roomy living space by Joost Baljeu and Dick van Woerkom. This attic situated in a beautiful position on the Amstel river in the centre of Amsterdam belongs to Herman Swart (the head of the Dutch Art Foundation) and his wife. It was redesigned totally in every detail a few years ago, and today is probably one of the best examples of integration between activity, available space and objects set within it.

The total space is divided with a cube which contains the bathroom, cupboards and sliding doors. The doors give access to two bedrooms. The kitchen is built into the side of the cube facing the sitting area and is divided from the rest of the room by a bar (which also provides washing-up facilities) and, when required, a venetian blind.

The basic colour scheme for which Baljeu was entirely responsible is black and white. He introduced three bright, vertical colour planes in the form of red sliding doors, blue bar and yellow side of the low cupboard-unit facing the sitting area in front of the stair-well. The floor covered in grey lino forms another unbroken colour plane. The structure of every single piece of furniture or fitting is entirely orthogonal. No element introduced into the total design is based on curves, and the sole exception—the telephone receiver—serves to stress the fact that all other items are */Continued on page 153*

4

5

1
Mr and Mrs Herman Swart in the attic flat before conversion

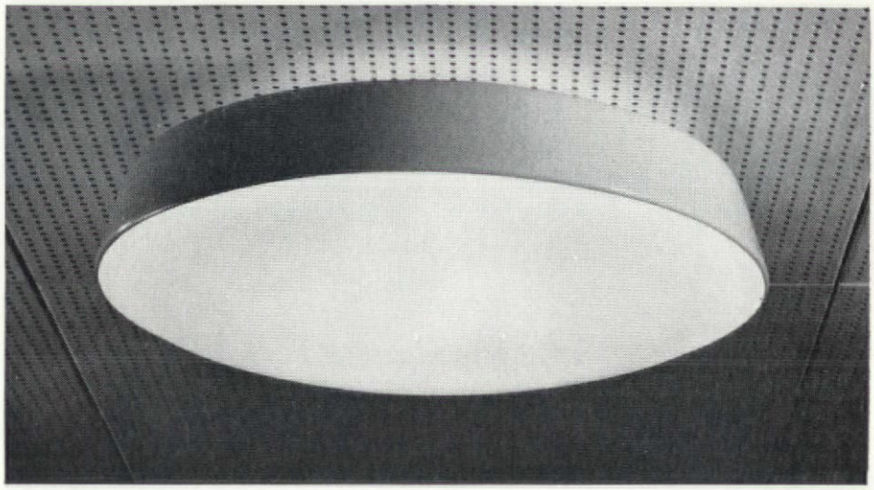
2 & 3
The same end of the attic after conversion—the living area. The windows overlooking the Amstel river. The furniture and the lamp are in black and white and based entirely on straight lines and right angles. The sculpture is by Carel Visser

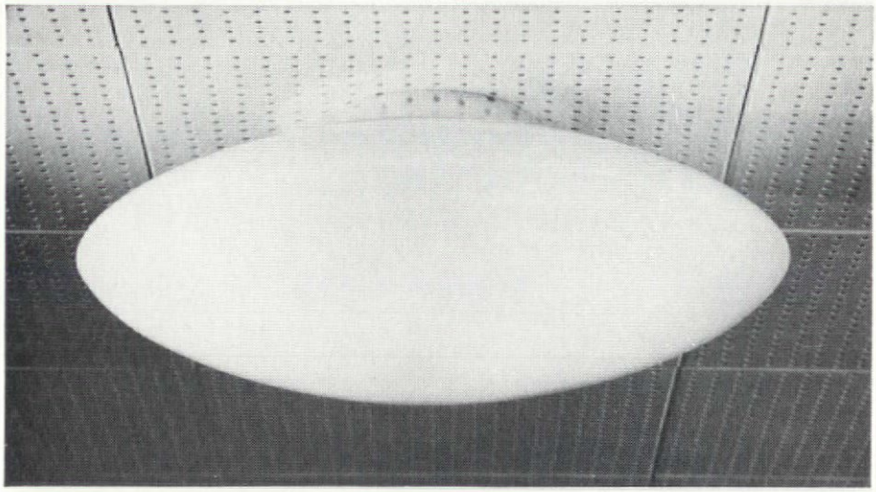
4
The opposite end of the living/dining area. The cupboard in front of the stair-well is yellow, the bar blue, the sliding doors red (showing under the partly closed Venetian blind). Note the relationship between the planes of primary colour. The sculptures are by Carel Visser

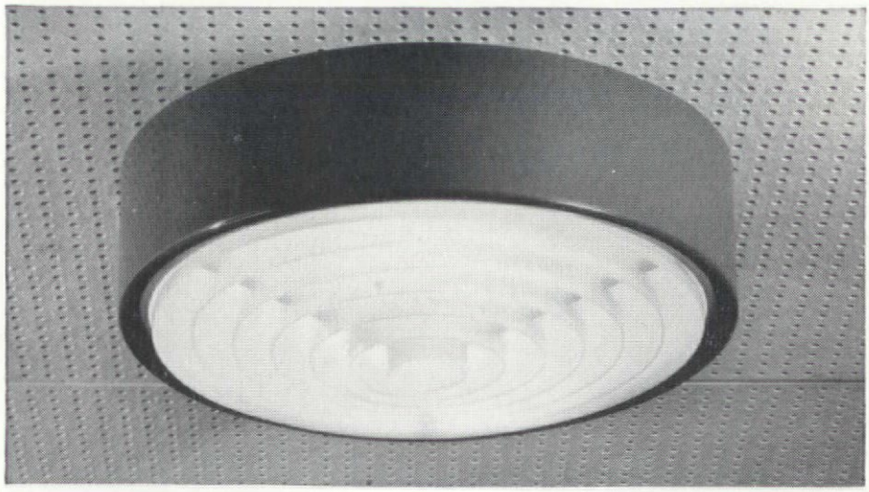
5
View of the bar and kitchen unit with the venetian blind raised. The sliding doors to the main bedroom are open

Merchant Adventurers

of London Limited







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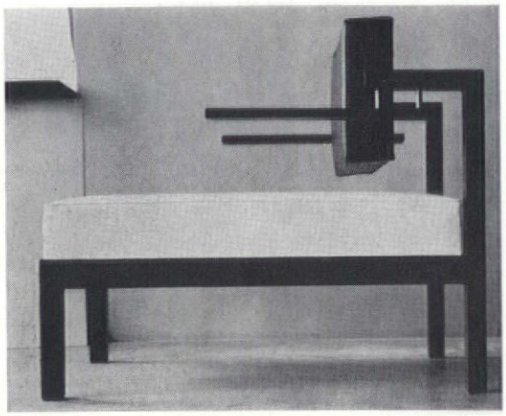


1

Attic, continued/based on straight lines and right angles.

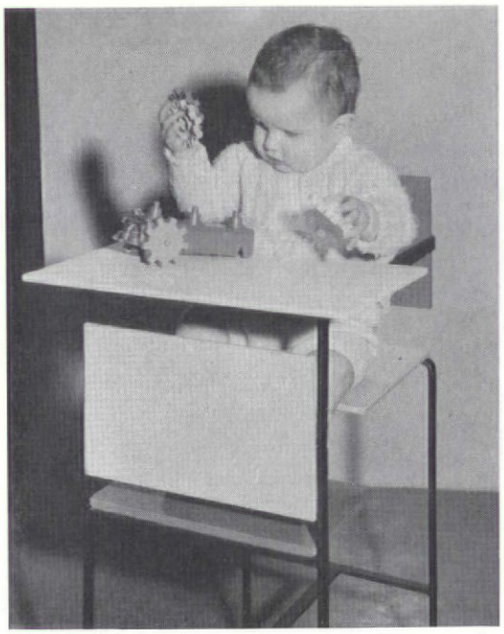
All fittings and pieces of furniture were designed specially for Swart by Dick van Woerkom, and this includes light fittings and a plant stand with an asbestos pot holder. The furniture is made of wood, plastic and metal. Features of particular interest are the raised table-tops (which in the case of the coffee table is white and dining table black), and the fact that in place of dining chairs van Woerkom has substituted stools. The large armchairs, 16½in high, are probably closer to sculptural form than any other piece of furniture one is likely to have seen during the past few years.

The structural plan devised by Baljeu and van Woerkom together, was accepted without any reservations by Herman Swart, in the maquette stage. The scheme took one year to complete and was supervised entirely by its creators. The finished result is one of the most harmonious and extraordinary interiors to be seen anywhere. It has served to suggest spaciousness where area is very limited, and to provide comfort and sense of opulence within the very formal design based entirely on straight lines, pure forms, plain surfaces, and primary colours.

Jasia Reichardt

1
An armchair specially designed by Dick van Woerkom. The back and seat are covered in black and white plastic respectively. The frame is in metal and arm supports in wood

2
Baby chair designed and made by Carel Visser, to go with Dick van Woerkom's furniture. It is painted in primary colours and constructed around a metal frame



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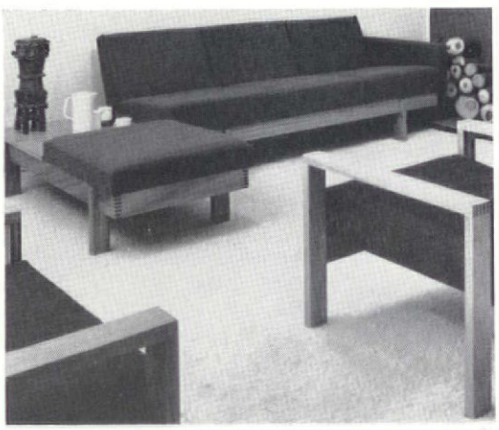

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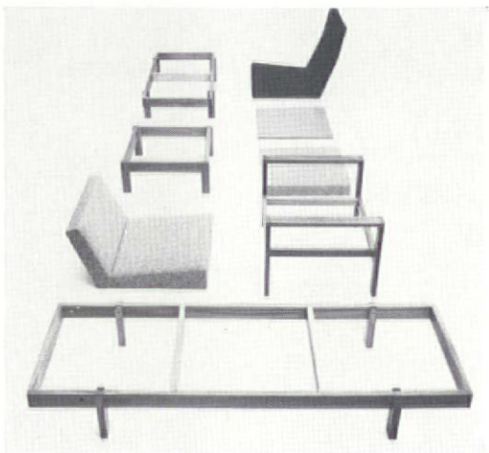


6

Design notes

International furniture exhibition, London

The 1965 Furniture Exhibition at Earl's Court tried hard to become international but its claim was tenuous. Apart from an exquisitely arranged exhibit of period and modern chairs of all nations, assembled and designed by Dennis Cairnes, and a large officially-sponsored Danish stand, there was little else from abroad to write home about.

But the British exhibitors in the 'public' section made a better showing than last year, and included one or two newcomers such as LM.

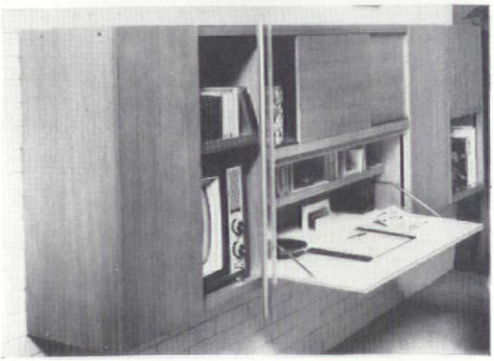
Hille, staunch supporters of the Exhibition, and one of the firms most responsible for putting over a modern British image, showed several new lines. They showed two easy chairs designed by Robin Day; one of which was 'Leo' **1**, a reclining one with latex foam cushions upholstered in leather, PVC or fabric, and available on a teak or polished steel frame, or on a 5-pronged chromium-plated swivel base **2**. It is knock-down for easy transport and export, and the back cushion is detachable. The price is between £46 and £73, depending on the base and upholstery materials.

Robin Day has also designed a medium-priced range of seating units, the 'Plus Group' based on a 2ft module. African walnut frames take 2, 3 or 4 units, which can be seat slabs, high or low-backed chairs with or without arms, or plain table tops. Frames cost from about £7 to £12; table units £3 12*s.* 7*d.*; seat slabs from £10 17*s.*; chair units from about £15 15*s.* to £19. The Group also contains free-standing armchairs costing between £21 and £24.

Last year, Hille put on the market a prefabricated wall storage and partitioning system designed by Alan Turville and John Lewak. They now amplify the series by introducing high, medium and low units, with overall heights of 87in, 60in and 29in, and alternative/*Continued on page 154*

3 & 4
Hille Chair 'Leo' by Robin Day
5 & 6
Hille 'Plus Group' by Robin Day
7
Original Hille storage system
8
New 'medium' units for Hille storage system

7



8

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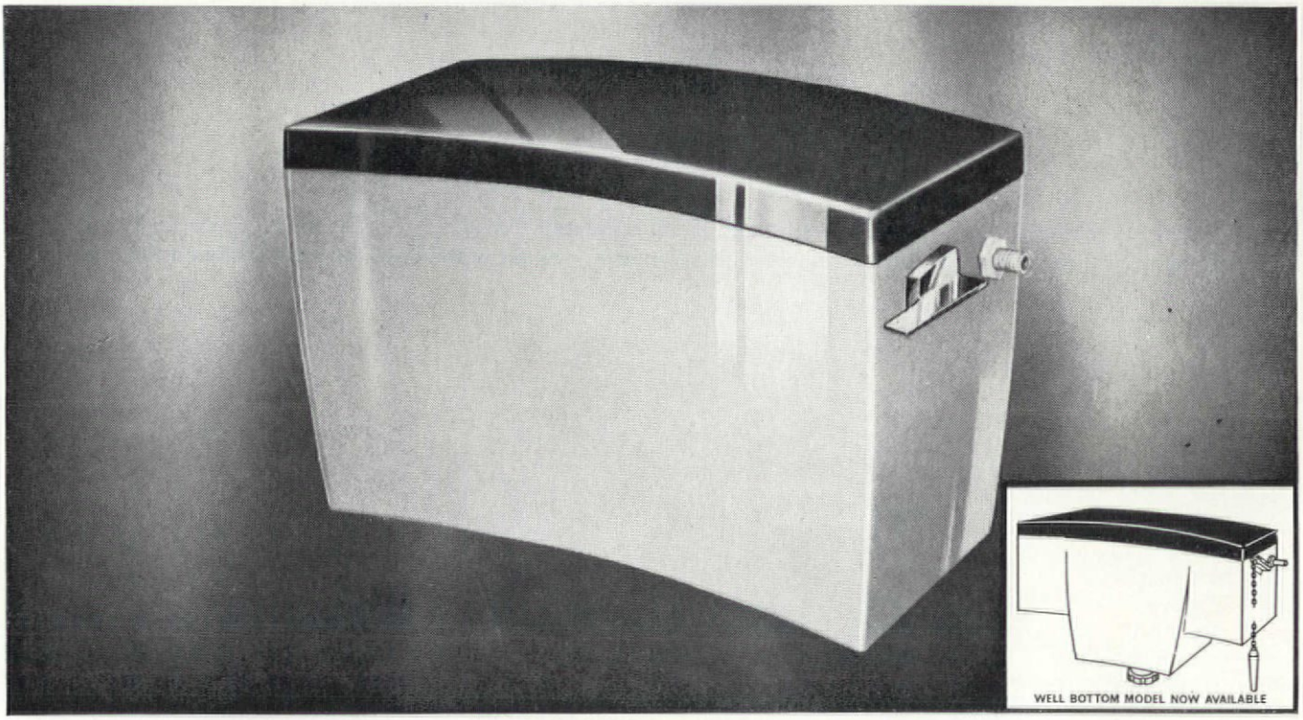

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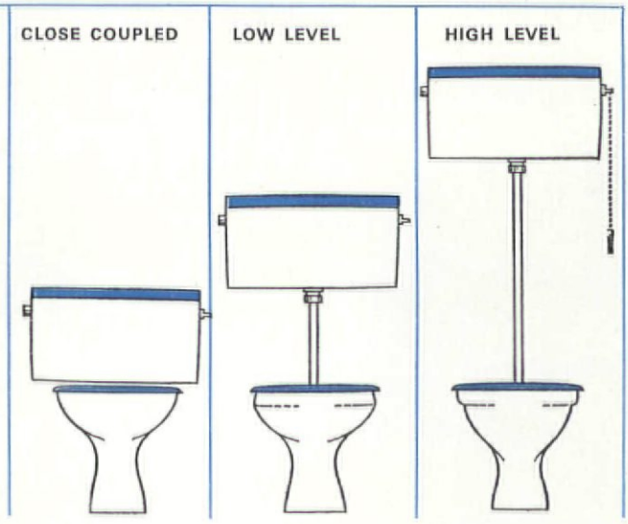
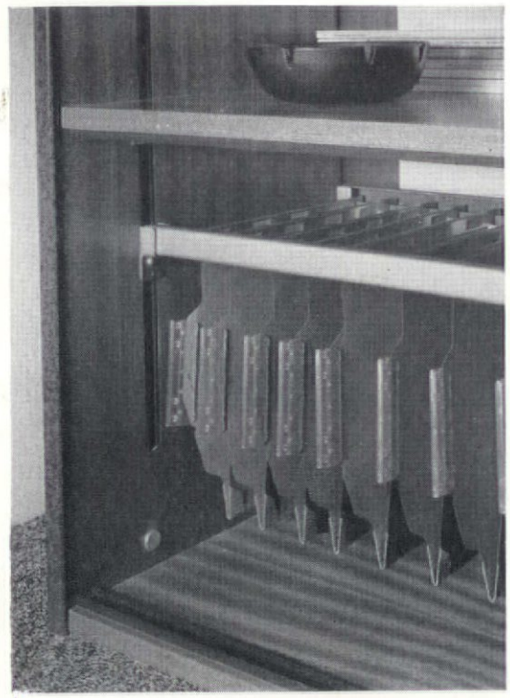




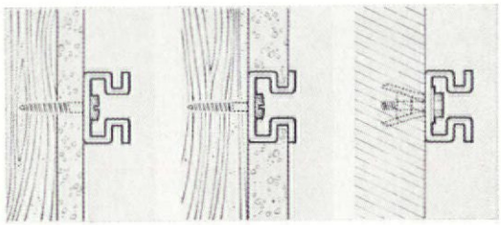
1

Design notes, continued/ bay widths based on the international 4in (10cm) module (20in, 24in, 32in, 40in and 48in). The panels are finished in pencil striped end grain veneer and in mahogany. Shelves and horizontal working surfaces can be in melamine.

Retail sales of the three new HSW (Hille Storage Wall) systems have been simplified by 264 suggested bay assemblies shown on a broadsheet with the retail prices and a code number for ordering. It is unlikely that any individual requirement could not be met from these assemblies. Delivery is initially expected to be eight weeks. The systems are in effect built-in furniture. The work involved is the boring and plugging of walls, and ensuring that two concealed rolled steel channels are truly parallel and horizontal; for the whole assembly of end panels, centre panels and horizontal fittings hangs on these. First the channels are fixed in place, then the vertical panels are bolted to the channels, and lastly the intermediate components are bolted on by self-locking plates. Detailed assembly drawings are available.

Bevelled edges to drawers and doors take the place of handles.

41 Albemarle Street, London W.1



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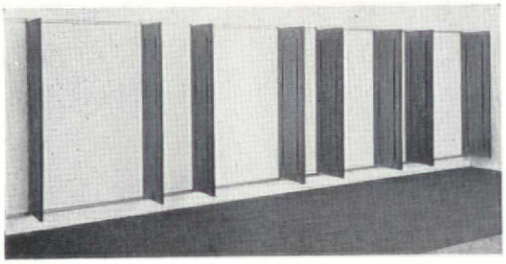

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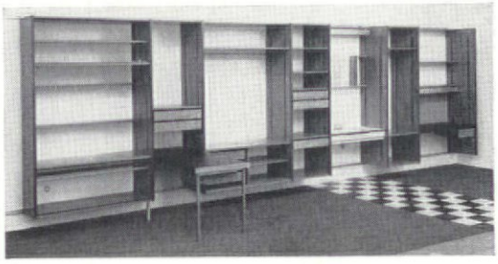
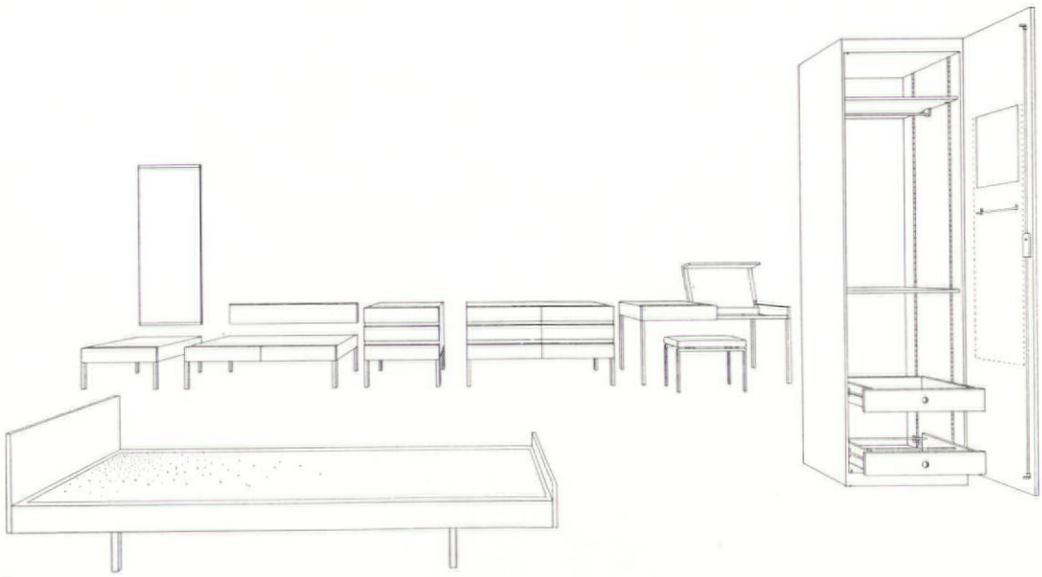


4

Stag

The Stag Cabinet Co. Ltd. showed a handsome range of Swiss-designed storage furniture which they are making under licence in this country, and which they call 'Opus 22' because it is based on 22in wide units. Sectional wall units are 7ft $4\frac{5}{8}$in wide and can be fitted inside in any way wanted—with drawers, shoe racks, shelves, hanging rails, mirrors—all white lacquered. They can be used free-standing or fitted in, and there is a series of matching bedroom pieces —chests, night tables, dressing table and bedsteads, and linking wallboards. Cupboard doors are supplied in either American walnut or white lacquer. A single unfitted wardrobe unit costs £34, two cost £61 (each addition is £27), eleven cost £304. To this must be added £1 5s. for a shelf, £2 10s. for a drawer, etc. Night tables are £9 and £13 10s. Chests are £16 10s. and £26. The dressing table is £21 10s.

Haydn Road, Nottingham



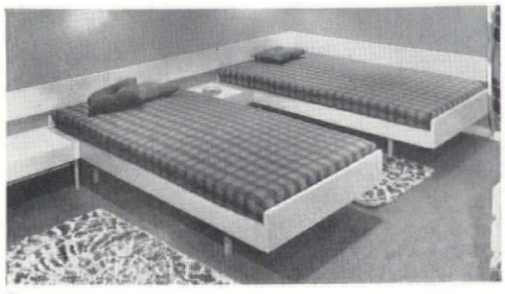
5

1-4
Hille storage system

1
Detail showing possibilities of shelf adjustment

2
Sections showing methods of fixing the rolled steel channels to alternative wall surfaces

5, 6, 7 & 8
Stag's 'Opus 22' range of storage units



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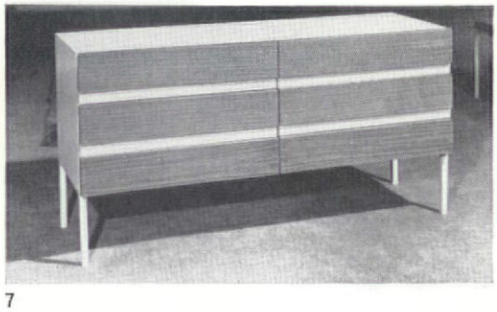

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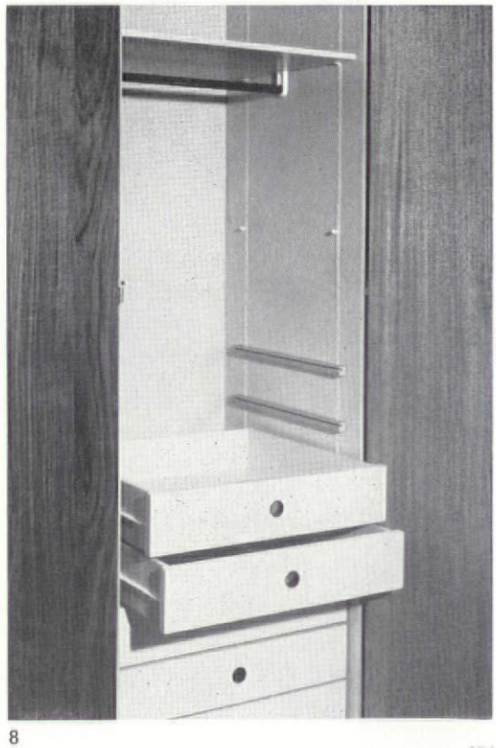

8

The new "Lincoln" Suite—designed to fit small spaces

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They did—and came up with the "Lincoln" Suite.

From front to back the "Lincoln" closet projects only 25" (a good 3" less than average). And you can choose between a double trap siphonic or wash down bowl.

Small wonder the "Lincoln" Suite is opening up new areas (literally) in bathroom design.

The "Lincoln" is made of Vitreous China in eight wonderful colours, and white.

Best of all—the price is low.

All of which is, we think, pretty big news.

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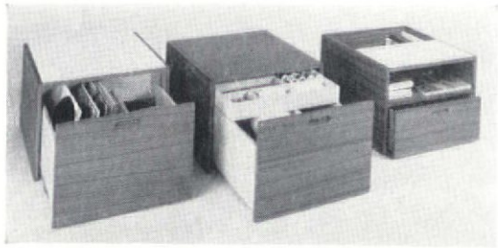


1

Design/Continued

Meredew

D. Meredew Ltd. are also going modular. Their design team, Planning Unit Ltd., have worked out a complete living and bedroom unit system called 'Mereform' which is extremely flexible as the units are based on a 4in module. They are supplied in either tola or oak with alternative fronts in a light coloured plastic finish. Particularly attractive are three variations of free-standing fireside unit—for records, or sewing things or magazines and papers—which come in teak and white plastic and sell for about £18, £14 and £14 respectively.

Letchworth, Herts

Race

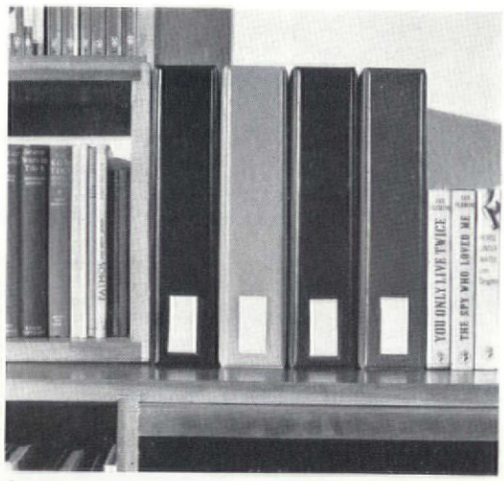
Race Furniture showed a number of pieces of hospital furniture which they are going to import, as well as their 'Flexible' knock-down chair (FXTI) which Nicholas Frewing designed. The hook-together principle enables the chair to be assembled or taken apart in no time without the use of tools. The side members are of preformed laminated beech; arm rests are of solid hide, aniline-dyed; and the supports for the polyester-foam seat and back cushions are of high-tensile steel mesh, nylon coated, which hook onto the side frames. The price is about £16 16s. and the chair weighs 15½lb.

Sentinel Works, New Road, Sheerness, Kent

1
Meredew fireside units
2, & 3
Race 'Flexible' chair

2

3



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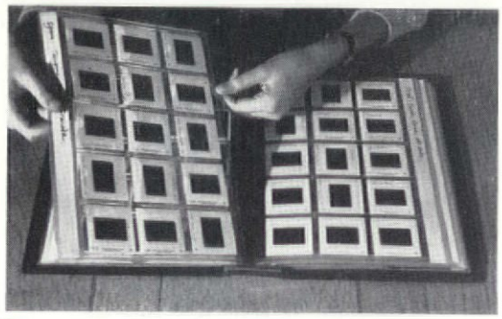

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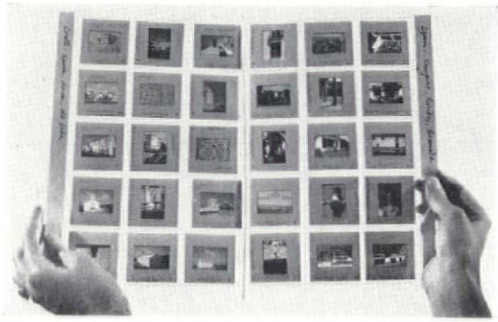


6

Brainos Slide Library

The filing of colour transparencies has become quite a problem in this camera age. Several ways of doing it already exist. Slides can be filed in the sort of boxes that won a COID Design Award in 1963, or kept in projector magazines ready for immediate use, or just stacked up in little cardboard boxes that multiply alarmingly fast—all three methods, however, requiring meticulous indexing if they are to prove in any way efficient.

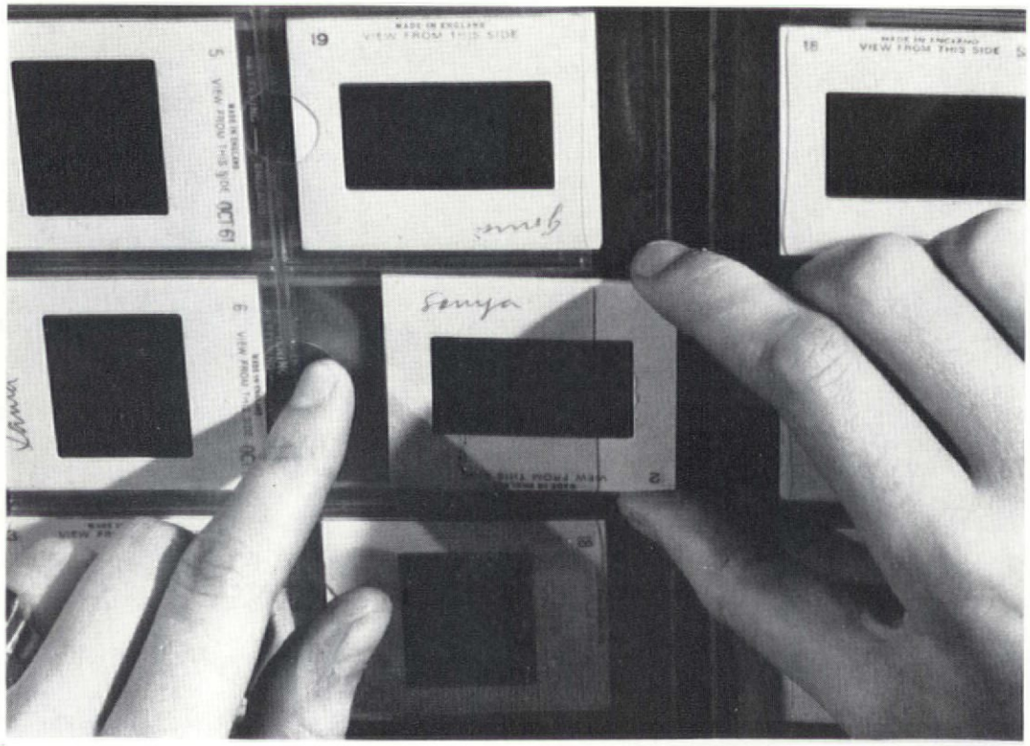
Or there is a better method—already in use in one or two university libraries—in which the slides are stored in compartmented transparent plastic sheets for filing in standard metal filing cabinets.

Such a system—whose main advantage is that a number of slides can be studied simultaneously—is the Brainos Slide Library now being marketed by Koroseal Trading Co. Ltd., but using looseleaf A4 folders instead of depending on filing cabinets. The plastic sheets each hold 30 slides plus 2 indexing strips and since up to 12 sheets (360 slides) will fit into a folder with a 2½in spine, a run of 10in on the bookshelf can contain 1400 slides.

The plastic 'pockets' are arranged in such a way that the slides cannot fall out even if the sheet is turned upside down. Both sheets and folders can be bought separately, though there is no reason why anyone should want the sheets alone. A folder complete with 10 sheets costs 49s. plus packing and postage. (Special quotations for large orders.)

225 Southwark Bridge Road, London S.E.1

4-7
Brainos Slide Library
4
Four folders on a bookshelf can contain over 1400 slides
5
Each plastic sheet is easily detachable from the folder
6
Viewing a sheet of slides against the light. The index strips are along each side
7
Removing a slide from one of the transparent pockets



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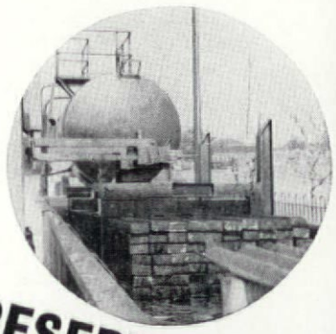
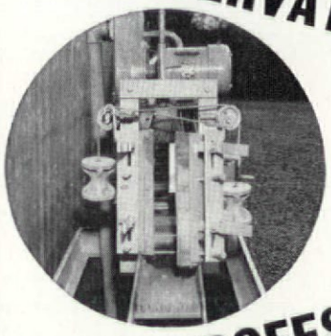


WOOD PRESERVATIVES



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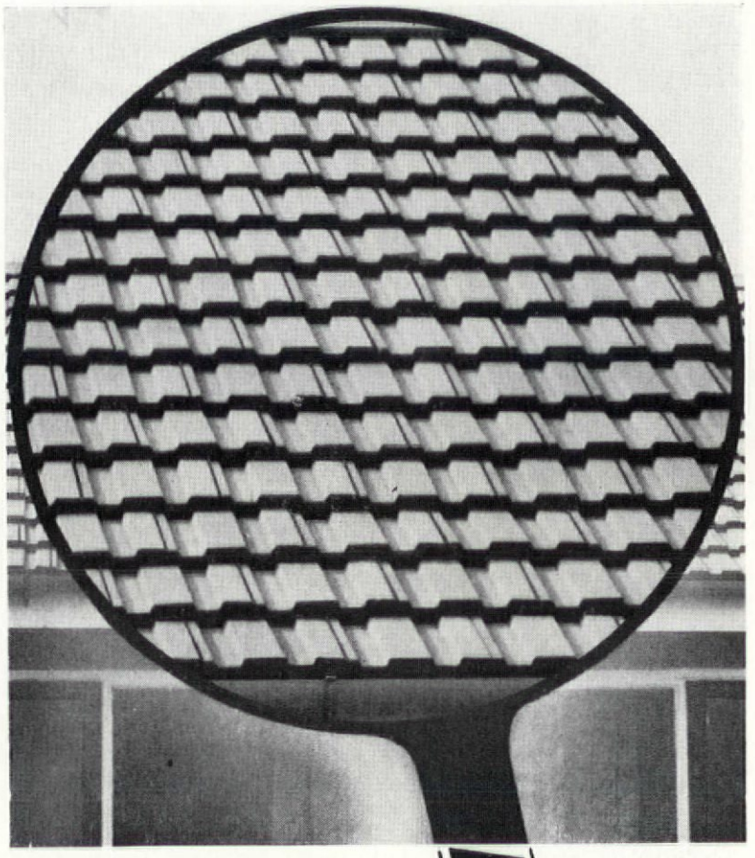

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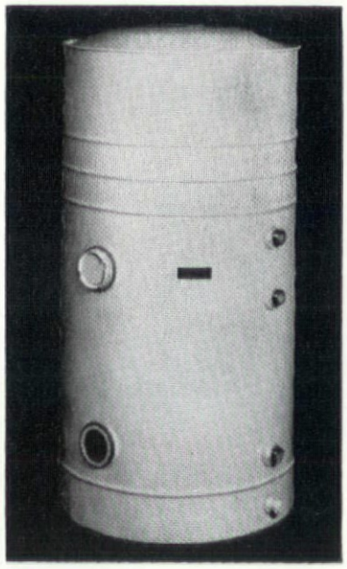

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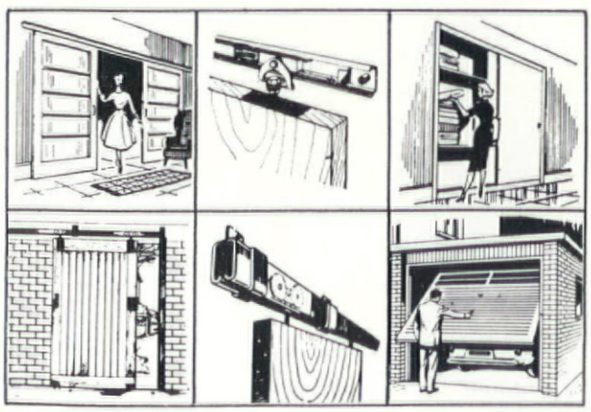

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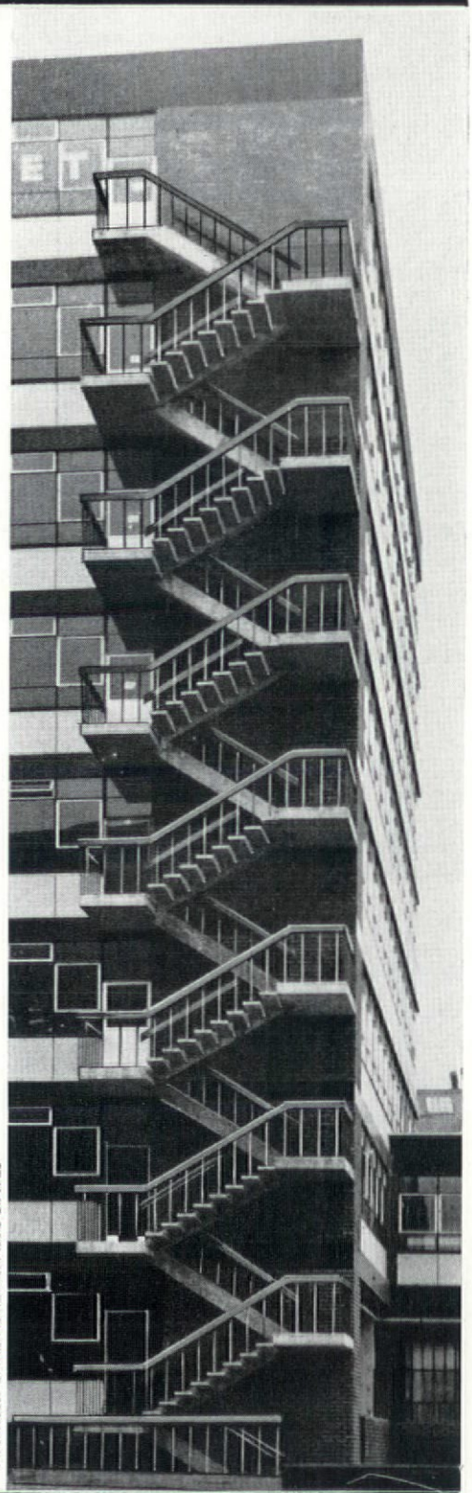

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Please write for a catalogue or see the **Quantum Range** in our showrooms at Westnofa (London) Limited, 24 Rathbone Place, W.1. Telephone : Langham 0747.

Aula

Forum

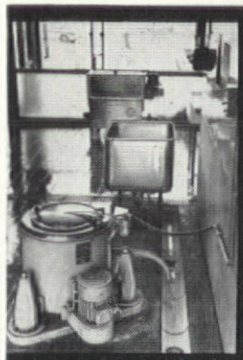
Bango

Casino

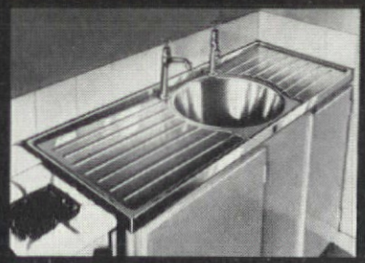
Focus

City

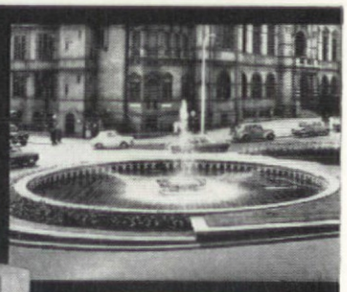
inside or outside

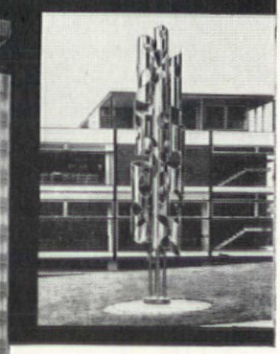


The Park Hill Development Scheme, Sheffield.



The Goodwin Fountain, Sheffield.





Stainless Steel Sculpture, Sheffield University.

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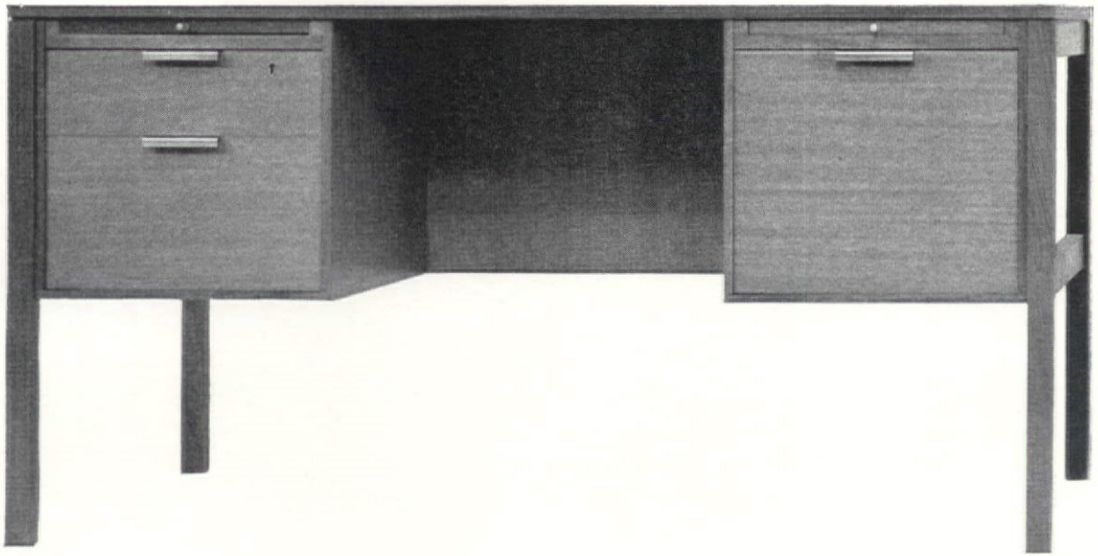
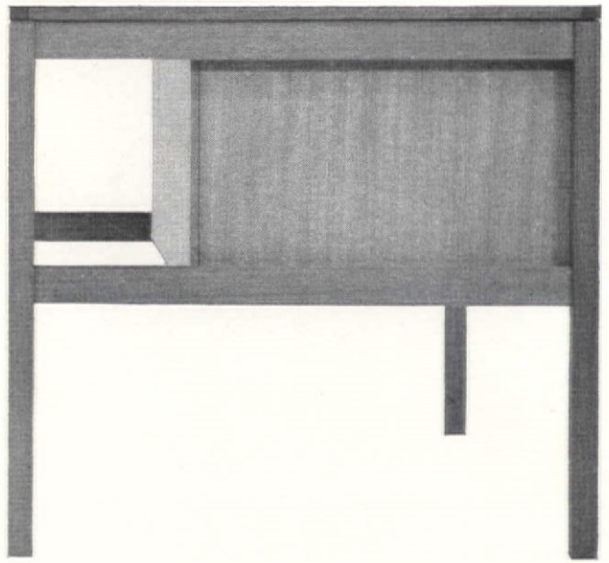
Stainless Steel

Millbank Tower, London. *Architects — Ronald Ward & Partners.*

Firth-Vickers STAINLESS STEELS LIMITED

Staybrite Works Sheffield





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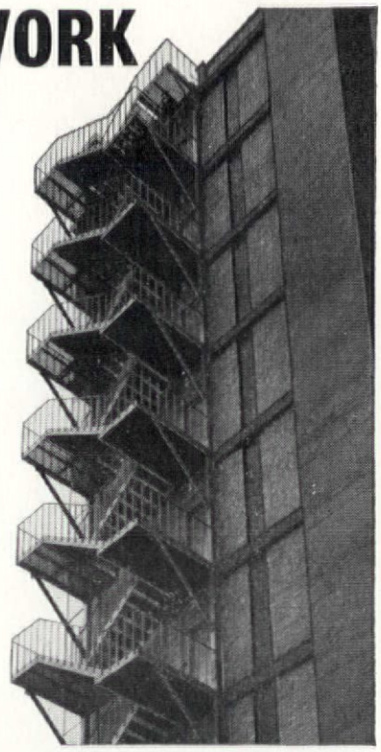

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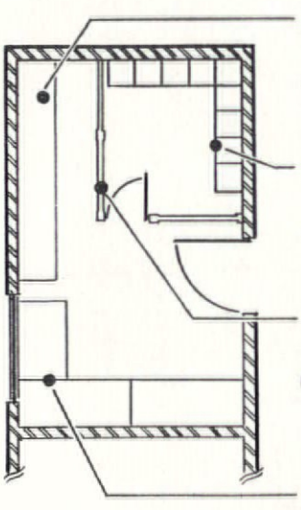

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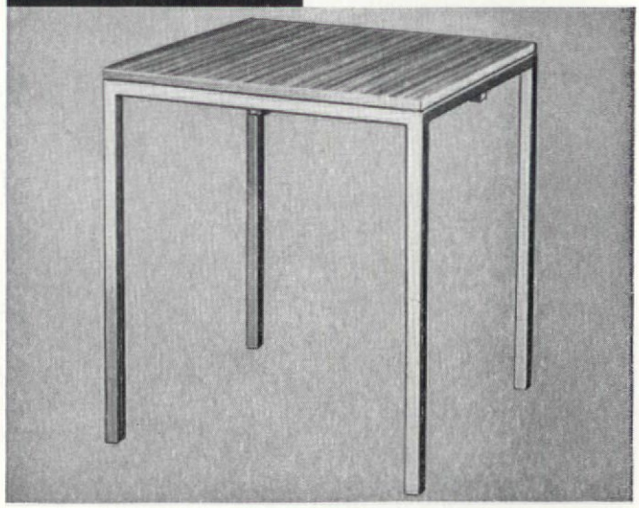

Illustrated is the Modular Stacking Table (1" square tube, 16 g. frame). The Tecta range of tables is comprehensive. Lightweight or heavyweight, rigid or folding, stacking or non-stacking, in all shapes and sizes. Tops are available in Durite Melamine, Formica or natural wood surfaces, widths from 16" to 30", lengths from 24" to 72".

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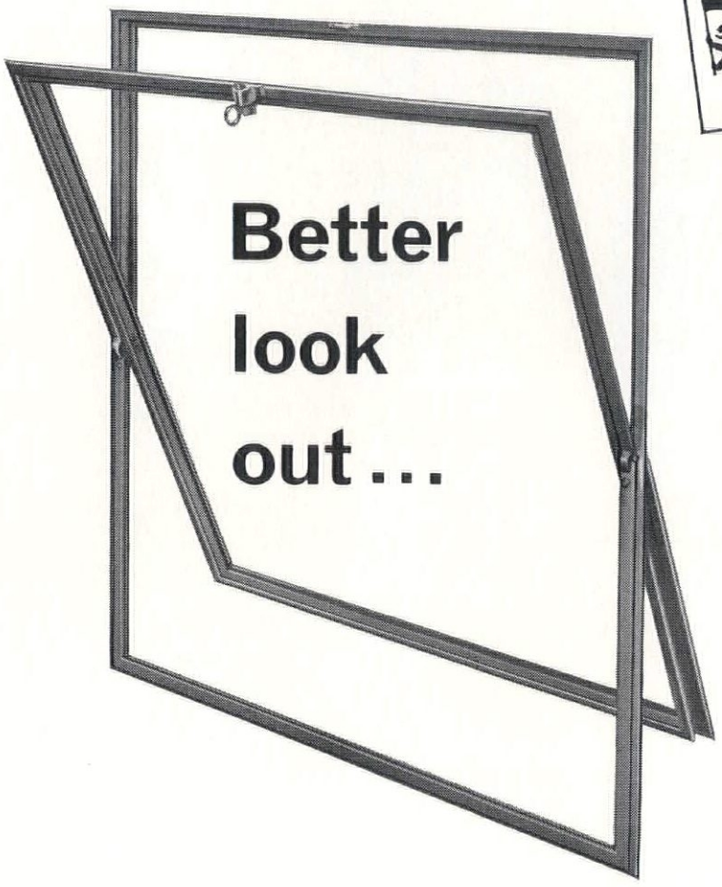

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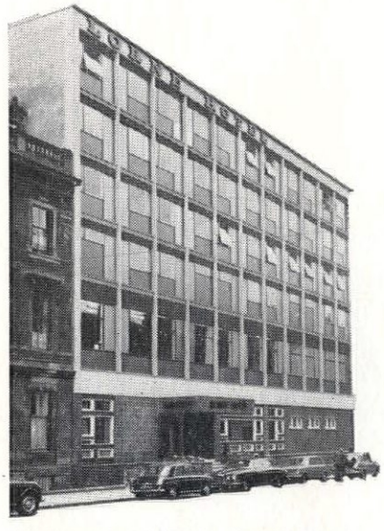

The Lorne Hotel, 923 Sauchiehall Street, GLASGOW, C.3.
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New office block for Cincinnati Shaper Co. Ltd., East Kilbride
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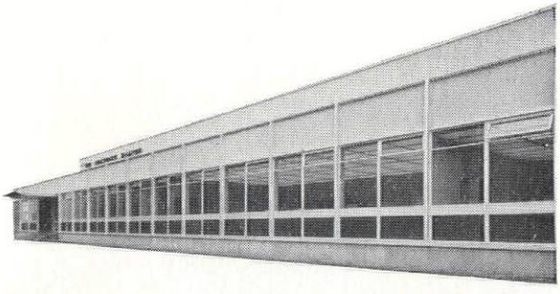

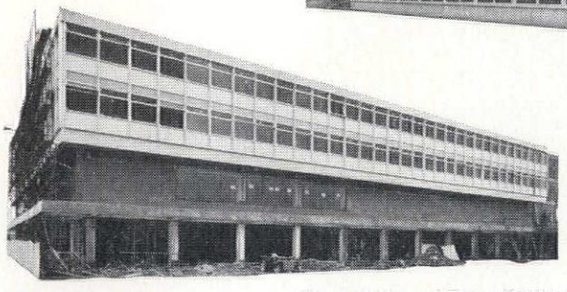

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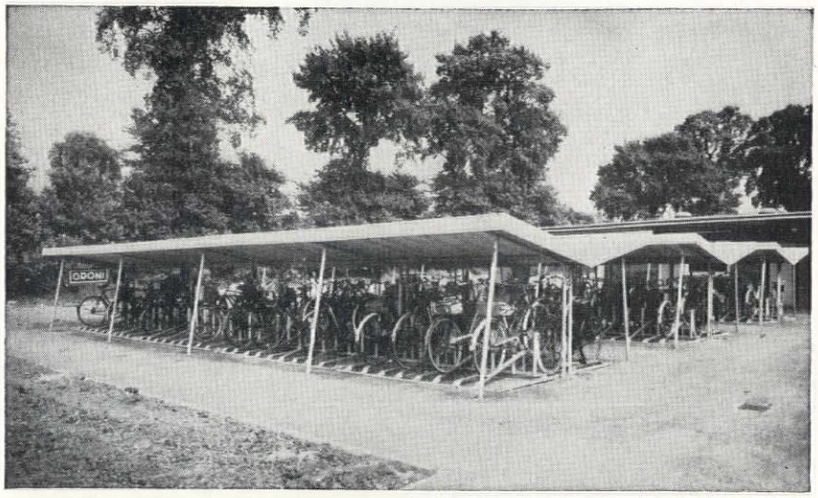

Type TD2A-R-LR ODONI Tubular SHELTER (R.D.899573) with Type 5A Pedal Cycle Stands at Gable Hall School, Corringham, Essex.
Photo by courtesy of Messrs. Brown & Moulin, A/A.R.I.B.A., in Association with H. Conolly, C.B.E., F.R.I.B.A., County Architect, Essex County Council.

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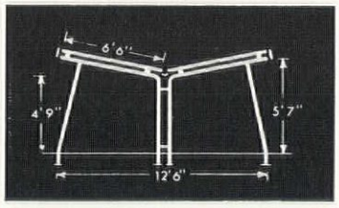

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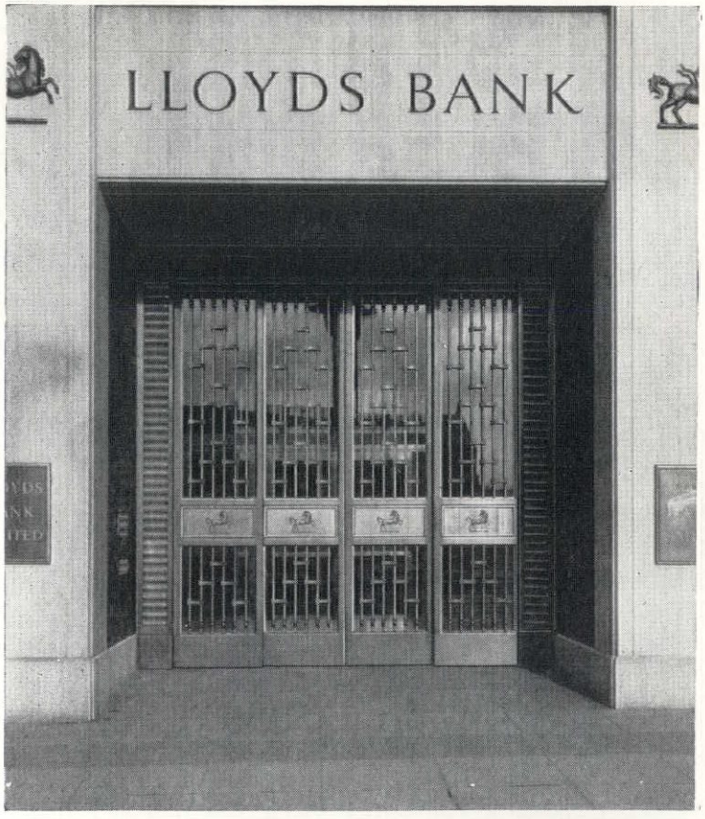

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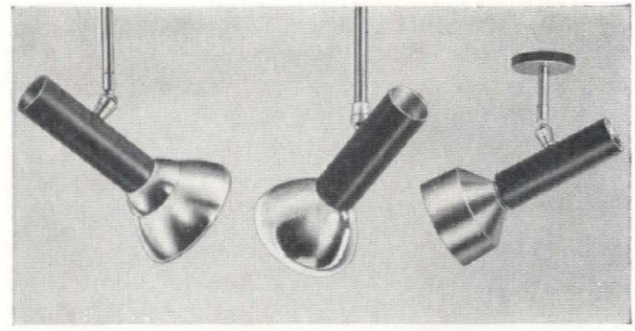

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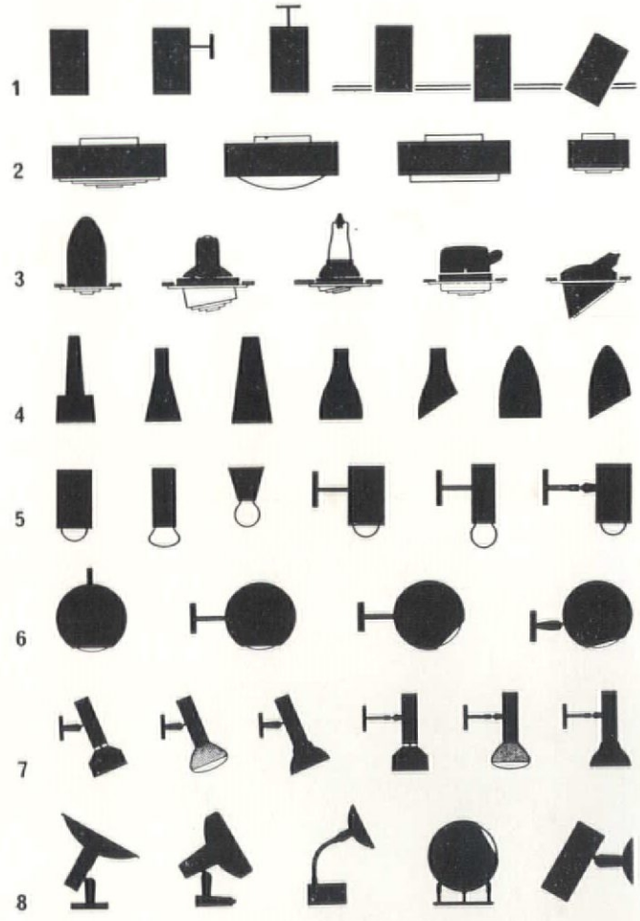

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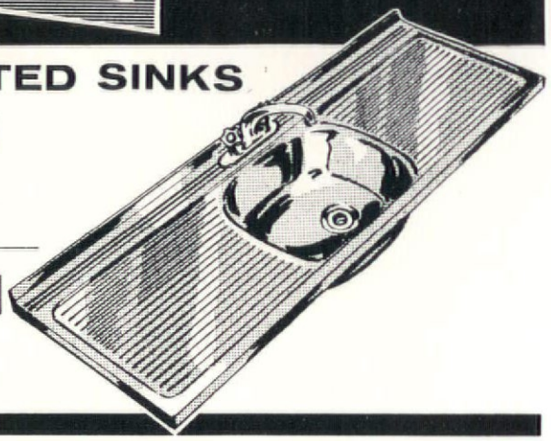

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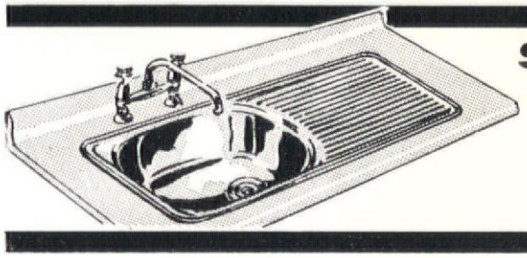

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