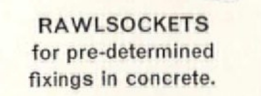
architectural design



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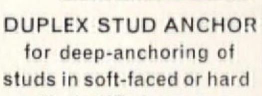

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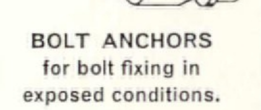

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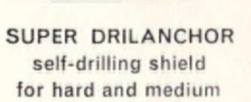
for bolt fixing in exposed conditions.



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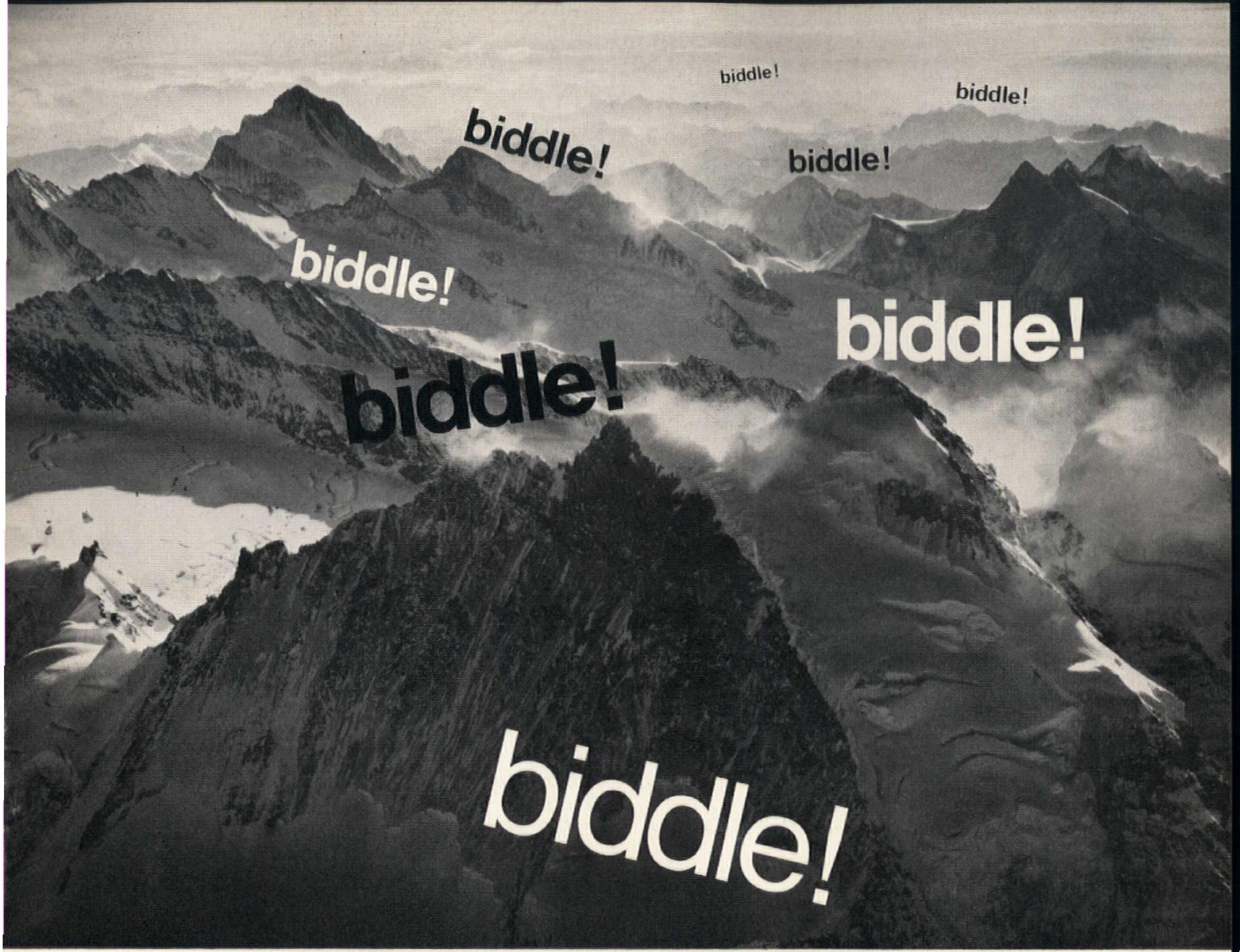

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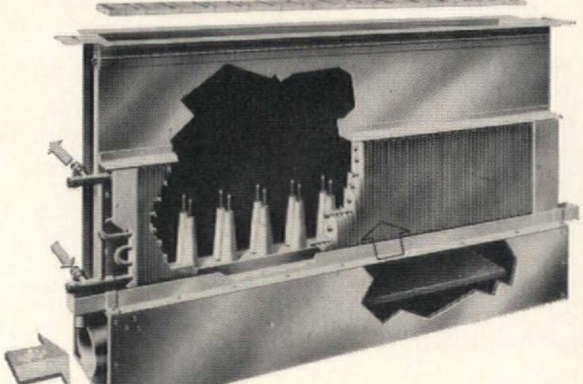

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Inductairs are available 23", 17" and 12" high for fitting below window sills or a horizontal model can be supplied for installation in a false ceiling.

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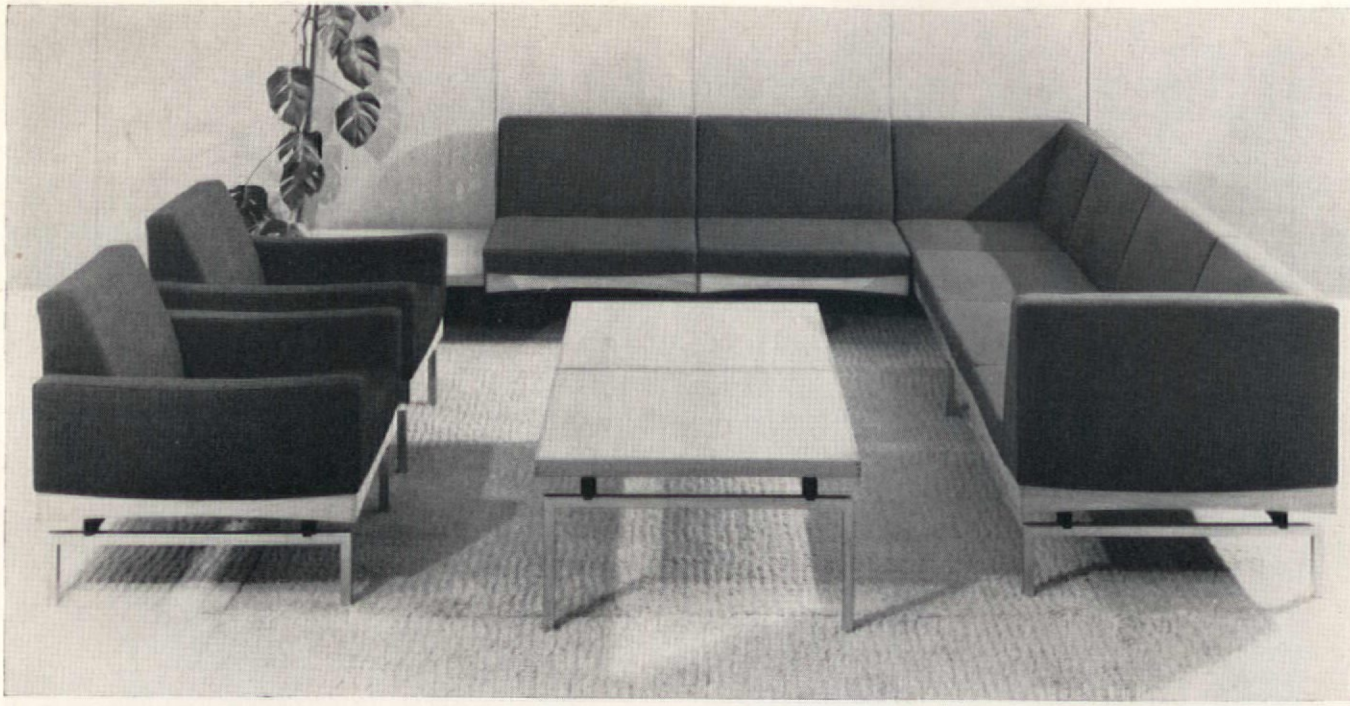

concave modular seating has been developed to provide the many combinations and the flexibility necessary to suit different schemes, from airport lounges and hotel lobbies to offices and small reception areas. Built on a 28½" module it is available on chrome finished steel or teak legs. The concave seat frames can be supplied either upholstered or in teak and the multiple seating units can be fitted with high or low arms as required. Further details on concave moduler seating can be found in the Westnofa catalogue or the system can be seen in our showrooms.

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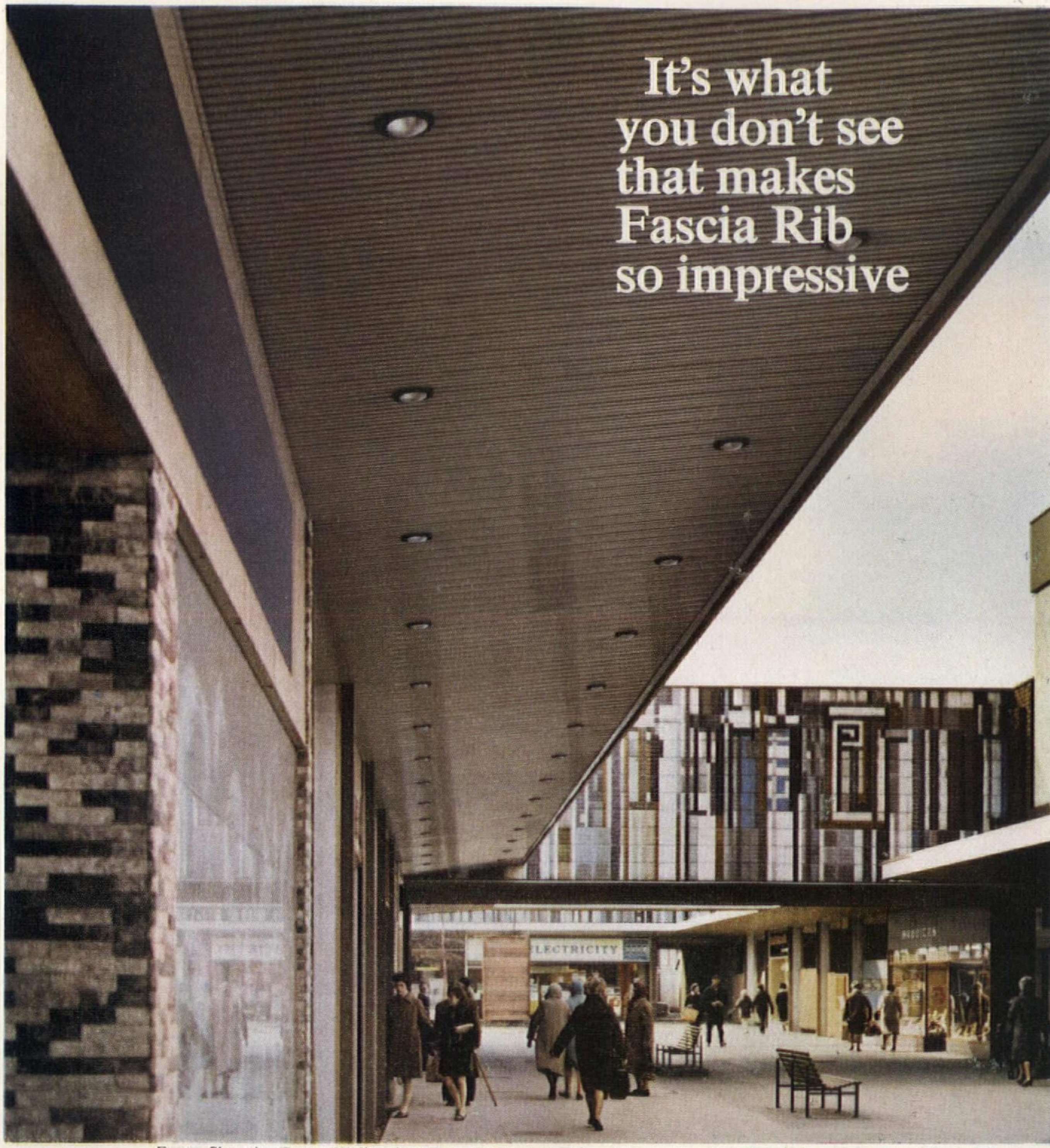

Forum Shopping Centre, Wallsend-on-Tyne. Contractors Token Construction Co. Ltd. Architects J. Seymour Harris & Partners.

You don't see the fixings, the joints, the weather and corrosion resistance, the in-built durability. All that's visible is colourful James Booth Fascia Rib making a big deal out of plain surfaces.

Formed from Duralcote permanently coloured aluminium, Fascia Rib can be fixed vertically, horizontally or upside down as illustrated.

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It looks just as good as the last one

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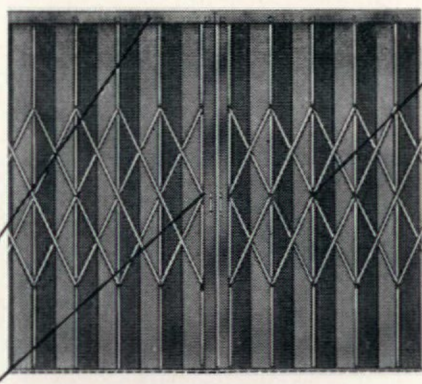

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8

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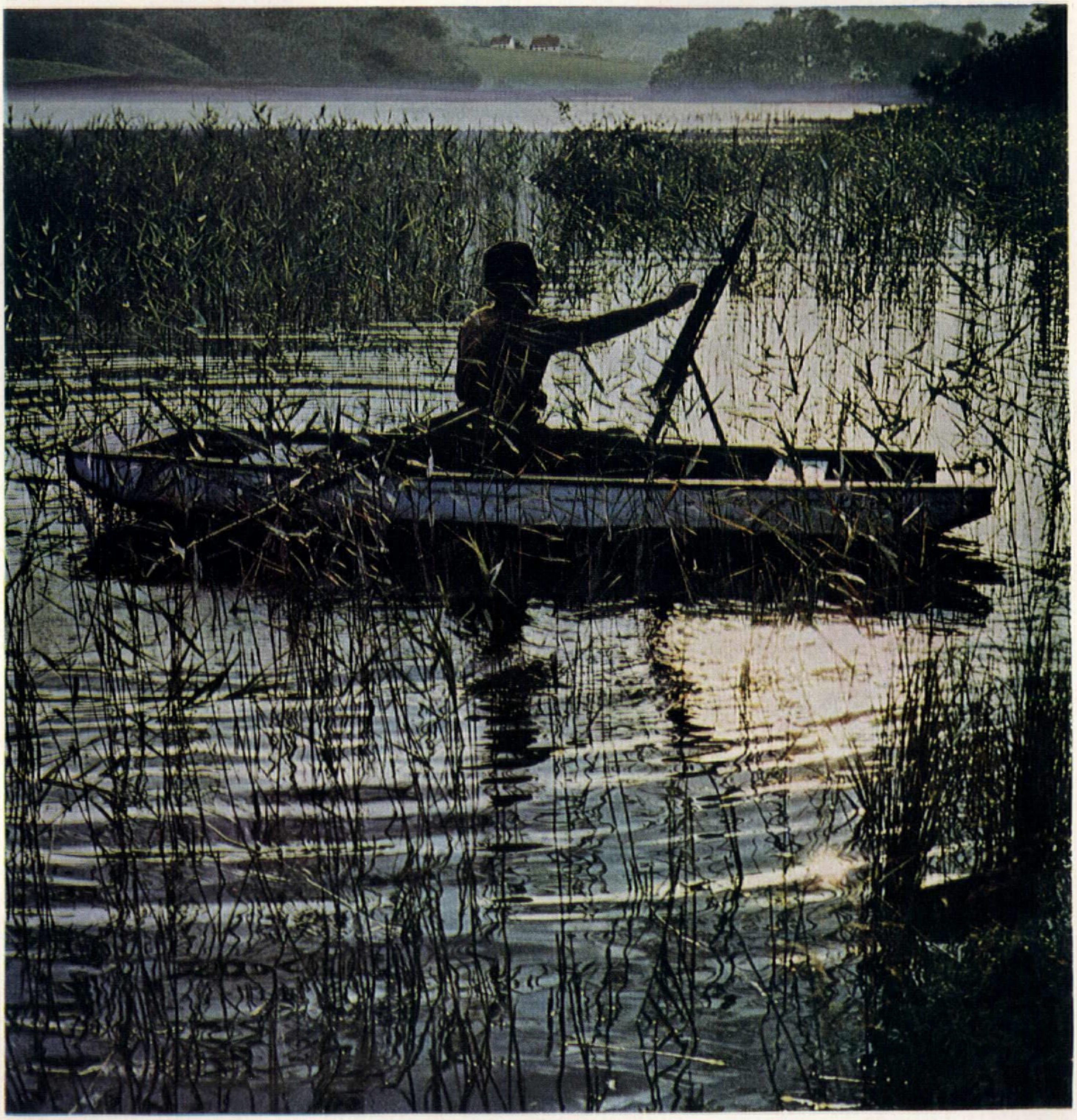

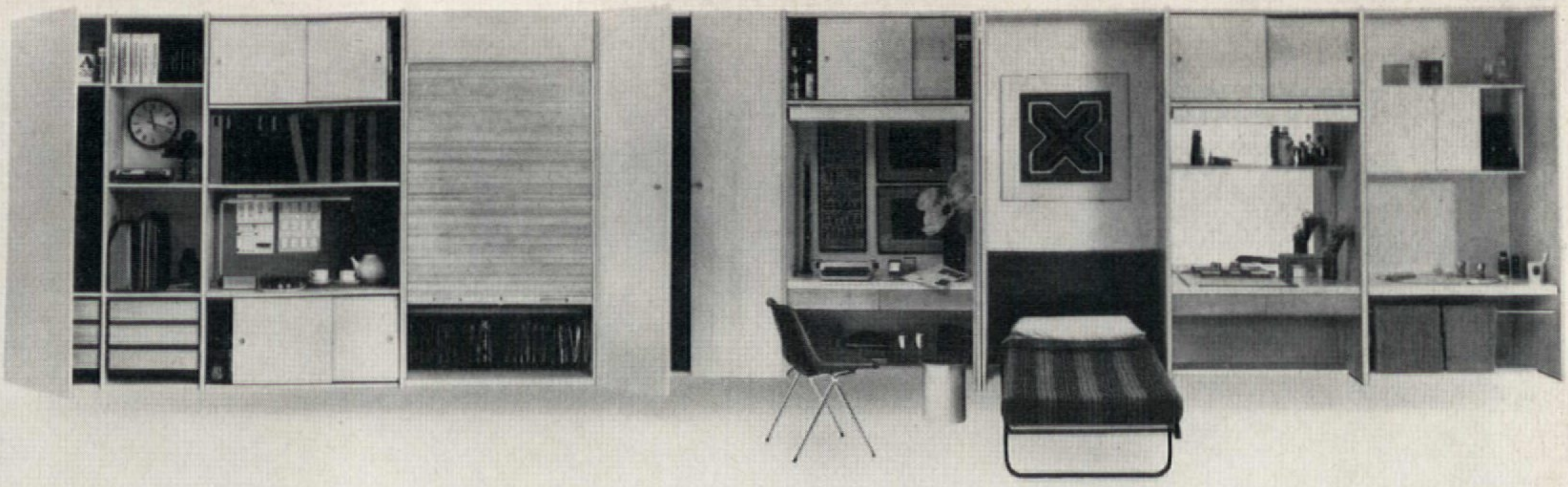

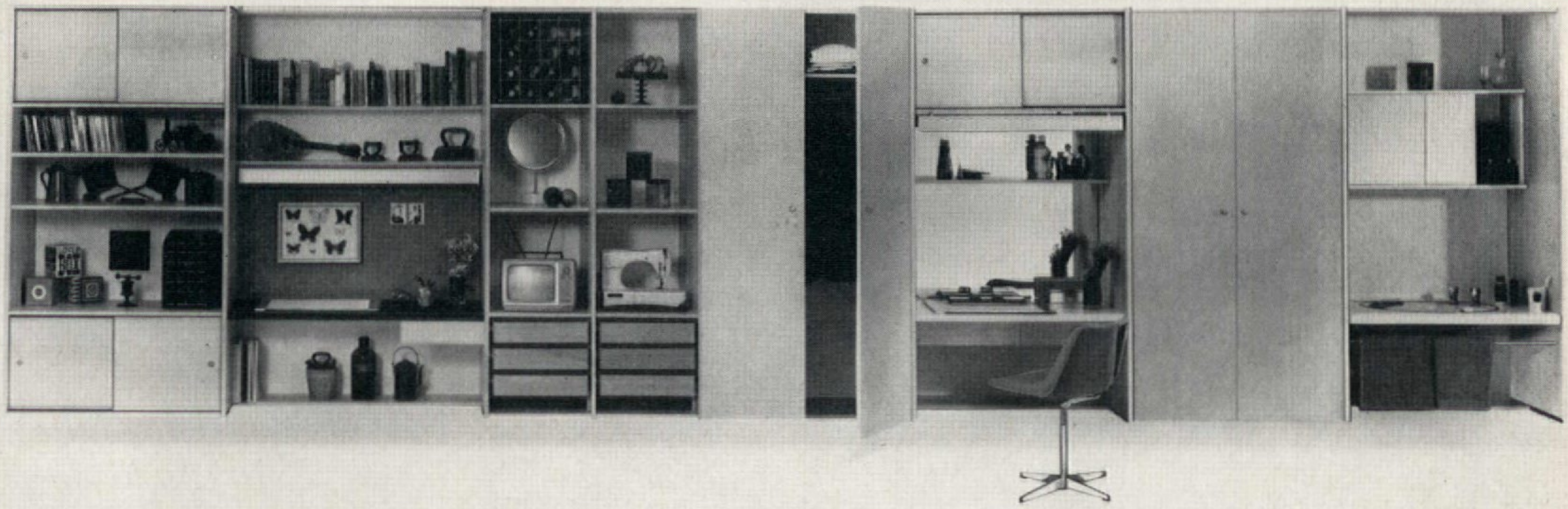

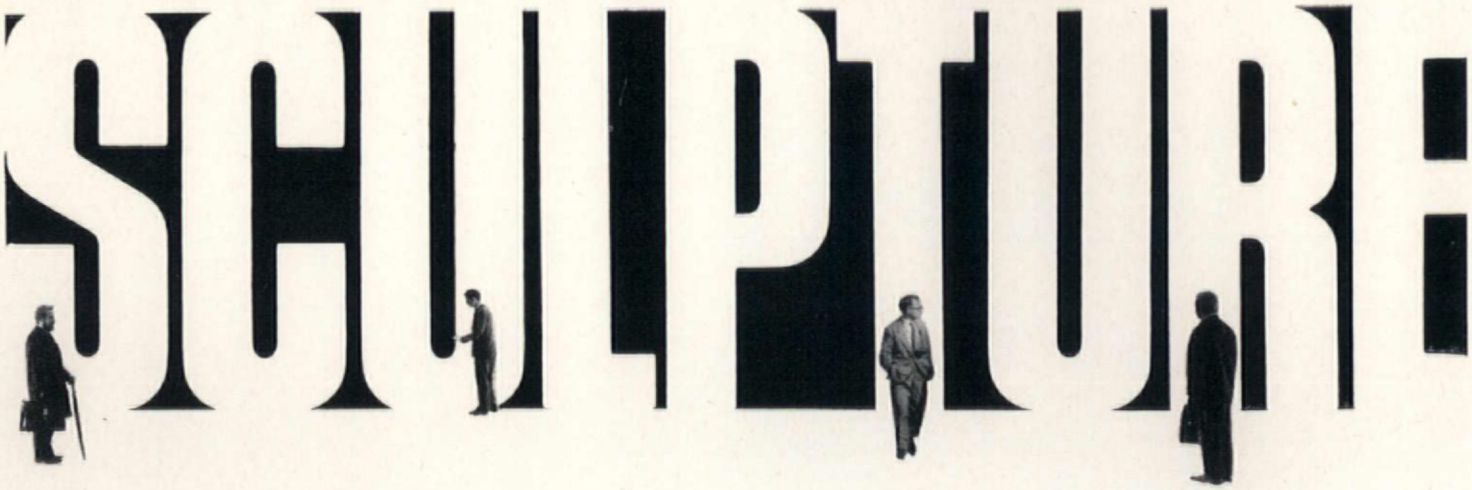

COMPETITION

To be judged by:

Mr. Norman Reid
Mr. Bryan Robertson
Prof. Bernard Meadows
Prof. Reg Butler
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£1,200 prizes

£6,000 for commissioned works

The Hammerson Group of Companies and Reunion Properties with the Westminster Bank and The Sunday Times are jointly sponsoring a competition for young sculptors under the age of 35 and resident in Great Britain. The competition is for two pieces of sculpture sited a short distance from each other in the forecourt of Woolgate House, Coleman Street, a new building in the city of London.

The theme or subject of the designs is left entirely to the competitors, who may submit not more than one design for each piece in the form of a three dimensional model (maquette).

PRIZES

Two first prizes of £500 each and two consolation prizes of £100 each will be awarded. If a prize winner is commissioned to produce a final full size work, the fee negotiated for this will be additional to the prize.

DATES

Entries will be accepted from 10 a.m. Wednesday, 29th May 1968 until midday Friday 31st May 1968.

ENTRY FORMS

Entry forms may be obtained (with full details of the site, position of sculpture etc.) from:

Sculpture,
Quadrex House, Park Lane, London, W.1.




Design in Steel for sport and recreation
Steel is helping to speed the task of giving Britain new recreational buildings, sports stadia, equipment and facilities that a modern society needs—for active leisure pursuits, entertainment, and social recreation.
British Steel Corporation

Strong, lightweight steel structures can give clear enclosed spaces for indoor activities. Top Rank Brighton Entertainment Centre: steel lattice girders 7 ft deep form a double-layer two-way grid to give economical clear spans. *Designed for the Rank Organisation by Russell Diplock Associates. Consulting Engineers: Phillips Consultants Ltd. Steelwork by Smith Jewell Ltd., Chichester.* COVER: Steel at Wembley. The vast stadium's cantilevered roof extends forward 80 ft. unsupported, giving excellent crowd cover. *Steelwork by Dawnays Ltd. Consultants, Sir William Halcrow & Partners.*

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Coventry City Swimming Pool.
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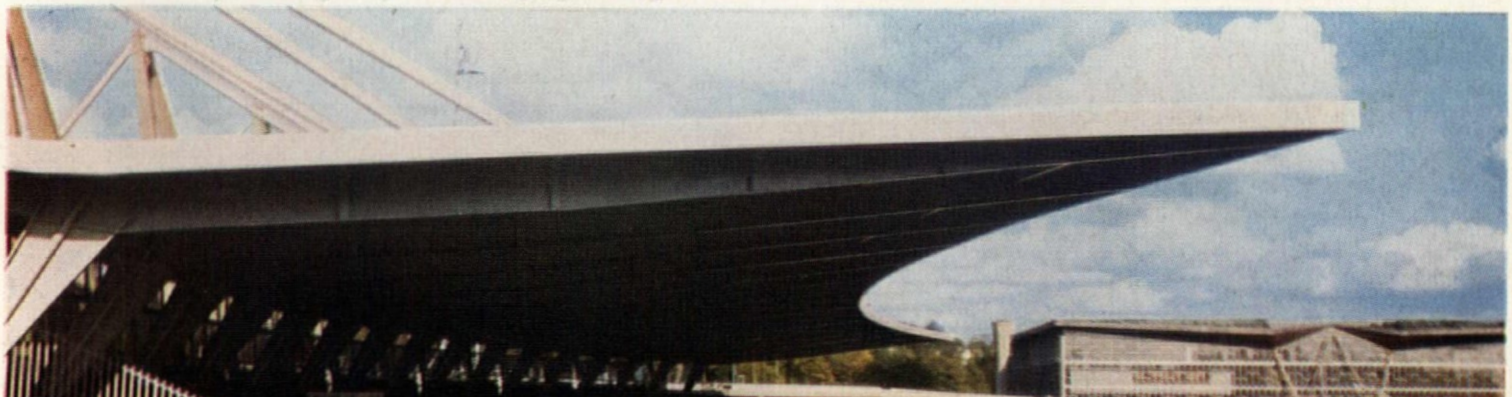
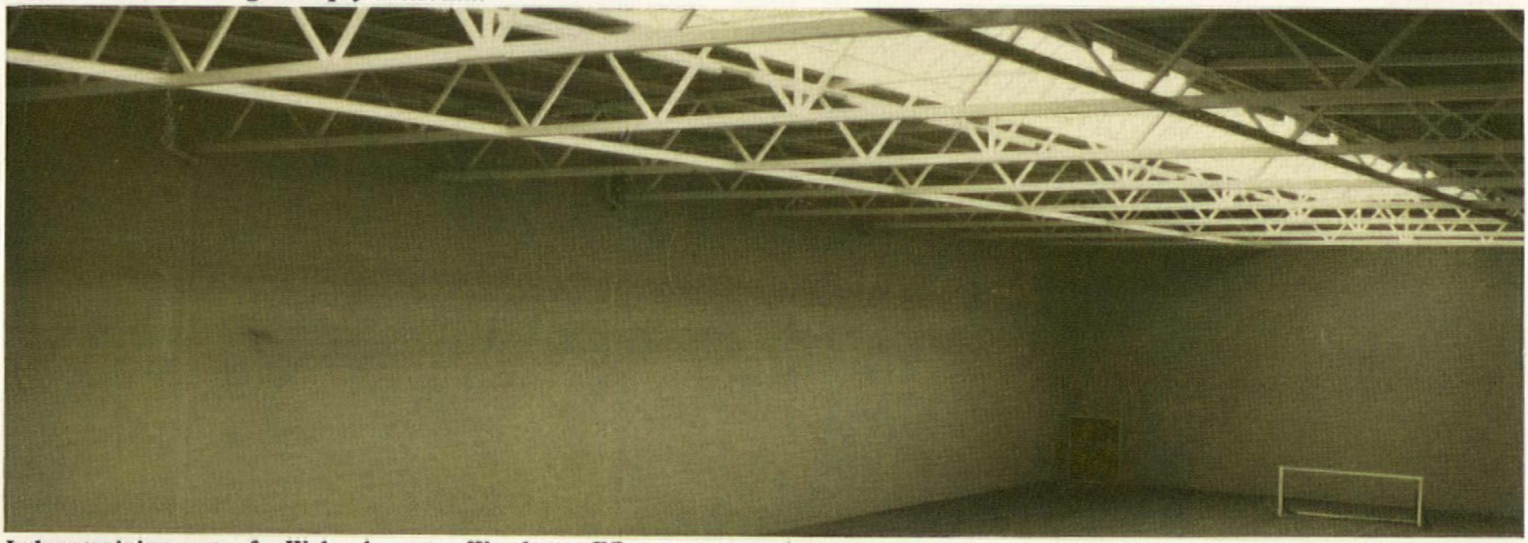
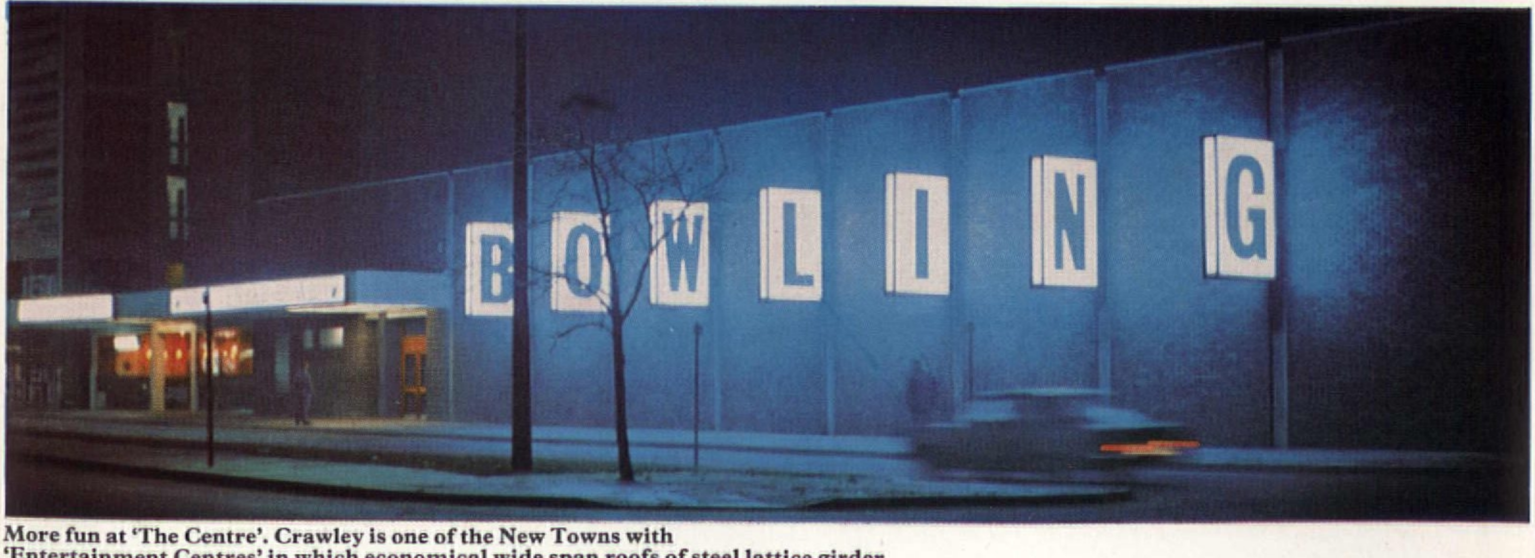


First-class facilities for sport at the National Recreation Centre, Crystal Palace.
Sports Hall: Partially prestressed steel lattice truss roof has herring bone bracing.
Stadium Canopy: Welded steel frames and purlins are suspended by steel tubes from tripod supports.
Designed by Hubert Bennett, architect to the GLC. Consulting Structural Engineers: Ove Arup & Partners Consulting Engineers. Steelwork: Hoveringham Eng. Ltd.

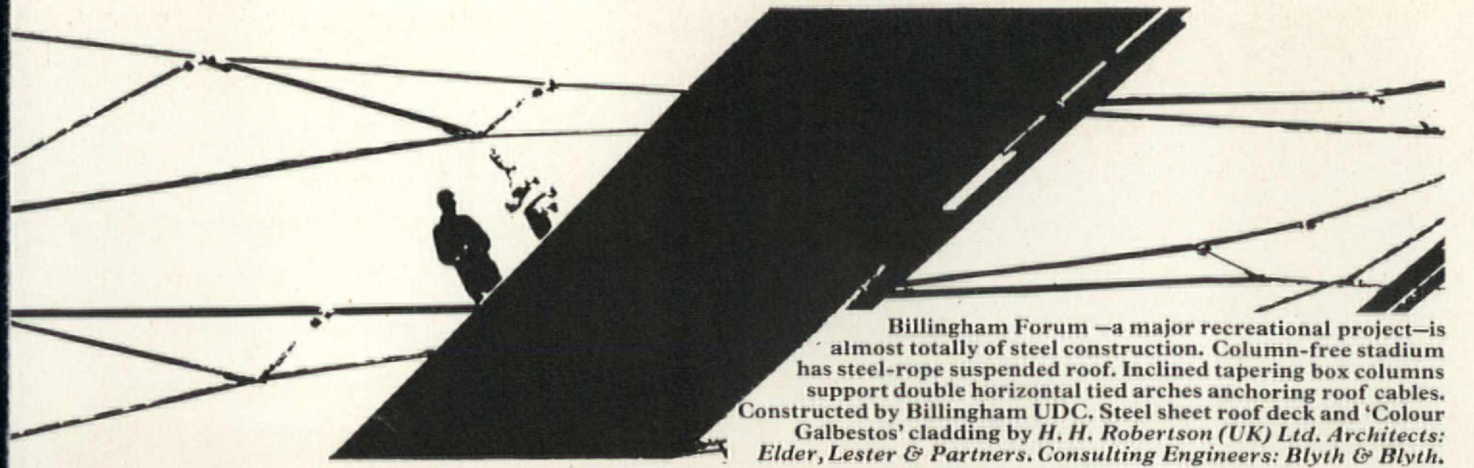
Steel—a winner at Ascot. Design of the elegant, steel-framed Queen Elizabeth II Grandstand takes advantage of advanced cantilever construction. New Royal Enclosure extension steelwork was completed in only 12 weeks.
Structural steel by Boulton & Paul (Steel Construction) Ltd.
Main Contractor: George Wimpey & Co. Ltd.



Indoor training centre for Wolverhampton Wanderers FC—teams can train in all weathers. Strong, lightweight, welded tubular steel roof structure is fabricated from Rectangular Hollow Sections in BS 968 high yield steel, giving 75 ft clear span over a 150 ft long training hall.
Architects: Johnson & Giles. Steelwork by Herbertson & Co. Ltd.



More fun at 'The Centre'. Crawley is one of the New Towns with 'Entertainment Centres' in which economical wide span roofs of steel lattice girder construction provide the required large clear areas for ten-pin bowling.
Architects: Russell Diplock Associates. Consulting Engineers: Bridges, Snow & Partners.
***Cover photo (top)*—Bowlers in action.**

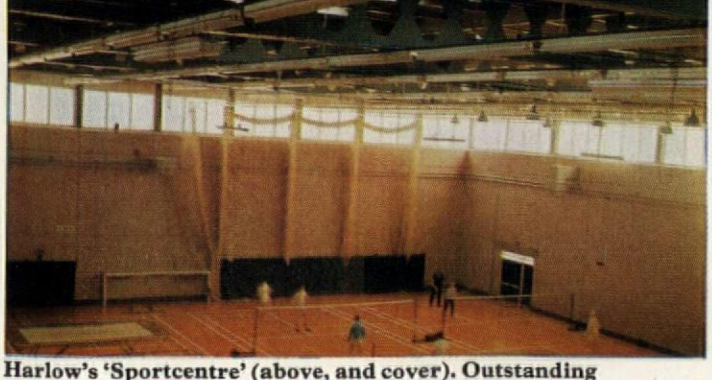


Billingham Forum —a major recreational project—is almost totally of steel construction. Column-free stadium has steel-rope suspended roof. Inclined tapering box columns support double horizontal tied arches anchoring roof cables. Constructed by Billingham UDC. Steel sheet roof deck and 'Colour Galbestos' cladding by *H. H. Robertson (UK) Ltd. Architects: Elder, Lester & Partners. Consulting Engineers: Blyth & Blyth.*

projects are quick to design, erect and carry through to completion. Site work can proceed with minimum interference from Britain's treacherously changeable weather.
Steel wins–on so many scores. **New types of steel, recent advances in fabrication, welding and structural techniques and an ever-growing range of newly-developed steel products yet further increase the benefits of designing new projects in steel, to achieve the better sporting and leisure facilities that modern Britain needs.**

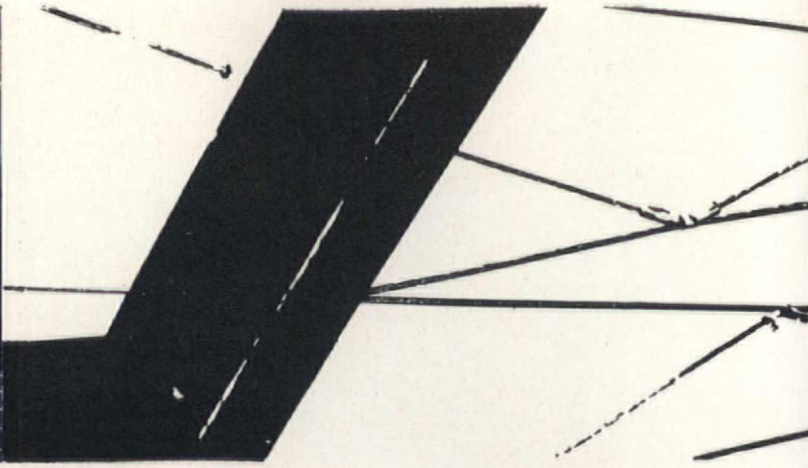
Structural steel for Leeds International Pool—with 3 pools, for tuition, competitive and recreational swimming, diving, water polo. 'Autofab' beams forming the 8 cruciform columns support steel lattice roof. *Architects: J. G. L. Poulson in association with Leeds City Architect, E. Weston Stanley. Consulting Engineers: J. G. L. Poulson Associates.*

(Left) Economical steel-framed gymnasium with light tubular steel roof grid. 'Space Deck' structural system at Ladysmith Secondary Modern School for Boys, Exeter, allows wide clear spans which will accept loading at almost any point for suspended 'gym' equipment. *Designed by the Department of the City Architect, Exeter. Space frame structure by Space Decks Ltd.*



Harlow's 'Sportcentre' (above, and cover). Outstanding example of a purpose-designed community sports hall. Economical steel-frame structure employs weight-saving 'castellated' beams for wide, clear spans. *Architects: Frederick Gibberd & Partners. Steelwork: Redpath Dorman Long Ltd.*

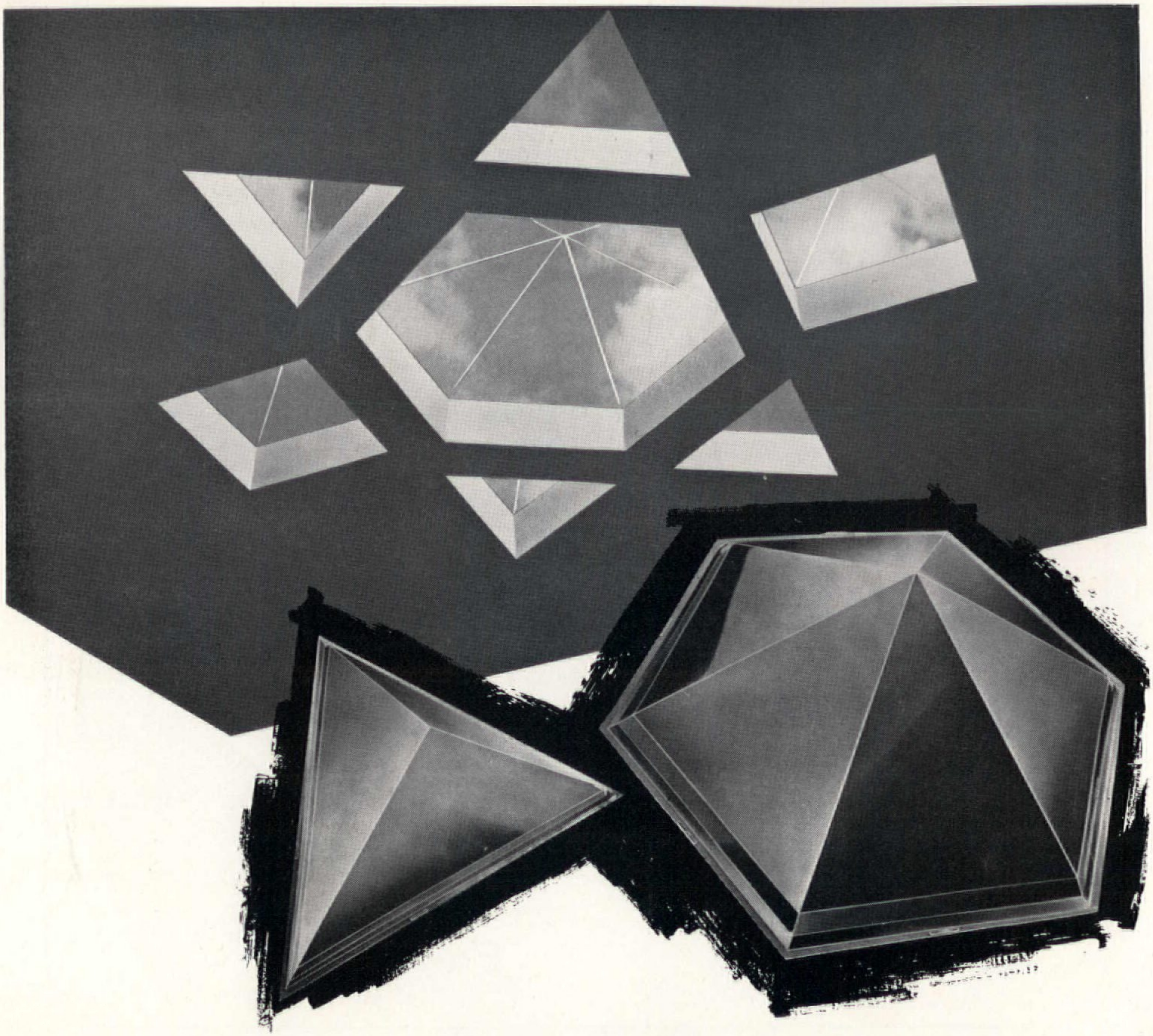
Multi-sport centres reduce costs with shared amenities. Steel-framed Sports Hall at Easthampstead RDC's Bracknell Sports Centre caters for many sport and leisure activities. Galvanized pvc-coated steel sheet vertical cladding by *William Briggs & Sons Ltd. Architects: John Rice & Partners.*



For providing new sports stadia and recreational buildings of all kinds throughout Britain, steel frame construction is regularly preferred. Steel design continues to be selected again and again on grounds of faster construction, greater convenience and speed at the design stage, superior flexibility and adaptability to changing needs, as well as for lower costs to make maximum use of available funds. This is yet another field of building design in which steel offers the important advantages of fast, dry construction. Steel is a precise and accurately calculable design material;

More accessible snowfields. Steelwork for the Cairngorm 'Chairlift', Aviemore, incorporates tubular and angle lattice construction–corrosion-protected by hot-dip galvanizing.
Consulting Engineers: Blyth & Blyth. Steelwork by R. W. Hay Ltd, Edinburgh. Cables by British Ropes Ltd.

Lords new Tavern stand–economies were made using $\frac{3}{16}$" pressed steel plate for channel section main beams and terraced decking.
Steelwork by John Booth & Sons (Bolton) Ltd. Architects: Louis de Soissons, Peacock, Hodges, Robertson & Fraser. Consulting Engineers: R. T. James & Partners.



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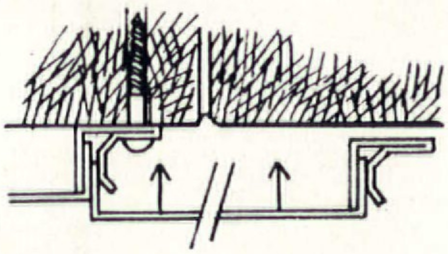

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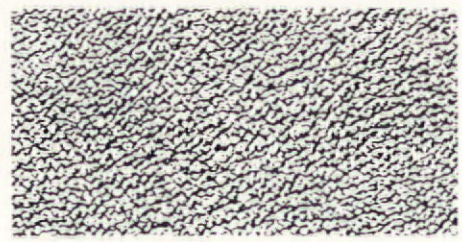

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sq ft

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Volume XXXVIII April 1968

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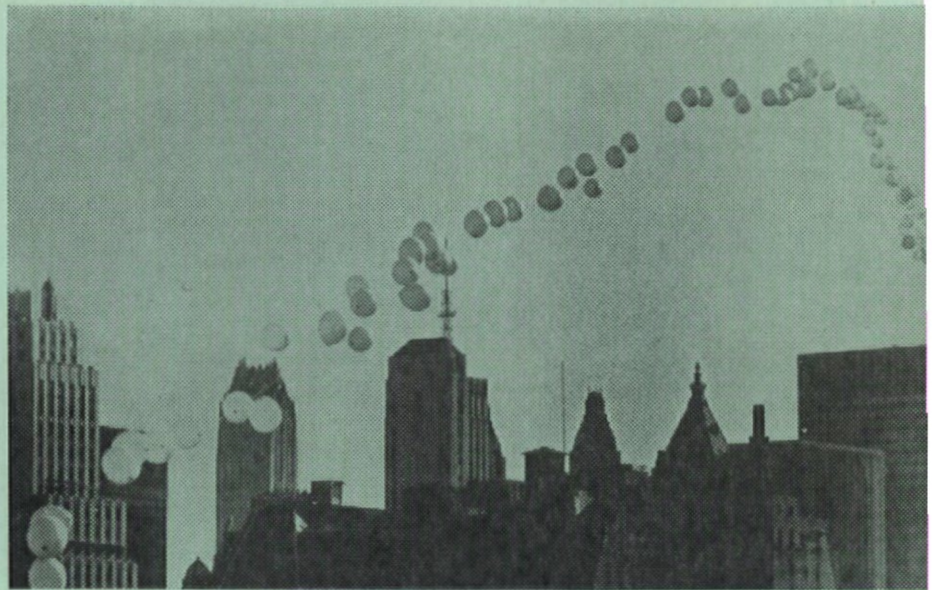


Hans Haacke *Balloons*

The purpose in a medium

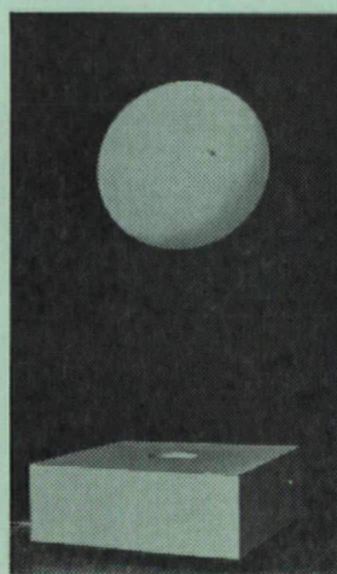
Jasia Reichardt

Two recent exhibitions in New York demonstrated the opposing approaches in the use of those materials which until recently did not belong to the realm of the visual arts. With both examples one can examine what justifications there are for an artist to turn to a very specific medium—in this instance clear transparent plastics and Formica. Material is never accidental, it is as deliberately selected as the form and image that the artist uses, and plays a no lesser role in the total effect of the work.

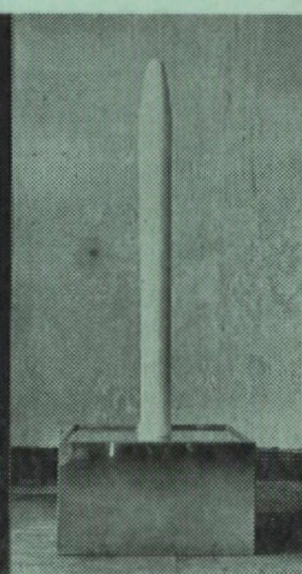
In the case of Louise Nevelson, best known for her mysterious wall cupboards made up of old pieces of furniture and sprayed black, white, or gold, her uses of new media involve the manipulation of numerous transparent Perspex boxes. These are arranged in elegant orthogonal piles and joined together with visible chrome screws. Abandoning the untidy, fetishistic conglomerations of boxes full of chair legs and stair railings, Louise Nevelson has turned to the impersonal finish and various refinements which cause the finished work to be reminiscent of bits of transistor embedded in cubes of clear plastic.

By comparison with the young German artist, Hans Haacke, who also employs transparent plastics, Nevelson's sculptures fail to transcend the attractiveness of the material itself. Haacke's purpose behind his use of media is to capture and contain the elements. For instance, to make water more easily observed in its various forms as vapour, condensation or ice. Perspex here exists solely to support, enclose and reveal the subject matter. In Haacke's case the material is subservient to the idea behind the work, in the case of Nevelson, the material is the idea.

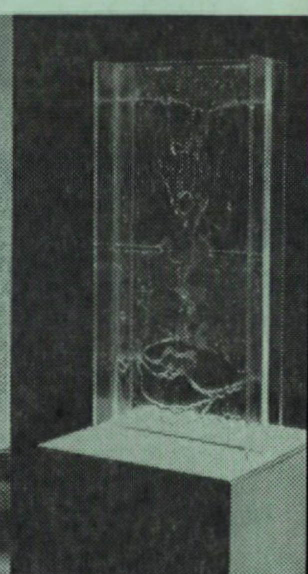
Haacke's originality is not only limited to the use of new media and those natural elements to whose visual qualities our attention is not normally drawn. He has succeeded in demonstrating something about the formal qualities of entities which are essentially organic and which are rarely seen out of context. The artist does little beyond articulating natural phenomena, by separating wind and steam from their natural environments, and presenting them, with all the necessary deliberation, like works of art.



Hans Haacke
Floating Sphere 1964/66
wood, formica, fan, rubber
photo: Haacke

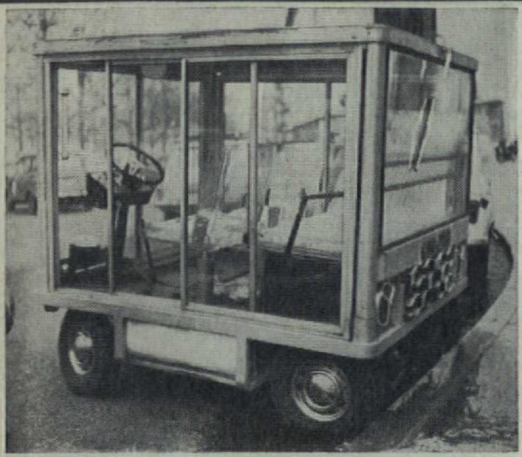


Hans Haacke
Ice stick 1966
photo: Haacke



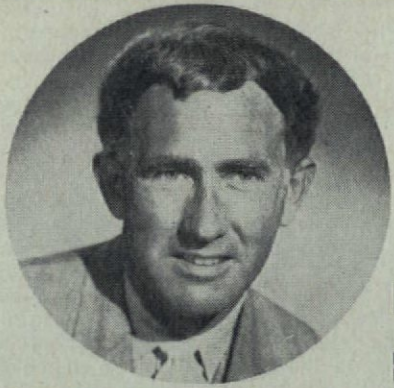
Hans Haacke
Obstructed flow 1966
photo: Geoffrey Clements

Cosmorama



Khanh car

The Quasar Khanh car mentioned last month (p. 100) was snapped by our correspondent outside the *Structures Gonflables* exhibition in Paris—this particular prototype looking like something from a window manufacturer's catalogue.



Man of the Month

Photo: Rex Coleman

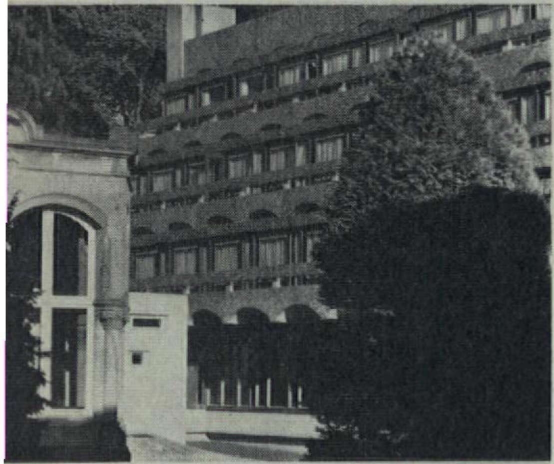
Three qualities identify Peter Womersley (left), the exciting and imaginative relationship between his buildings and their sites, the convincing formal expression of their structural systems, and the impeccable aesthetic sensitivity displayed in his choice of colour and materials.

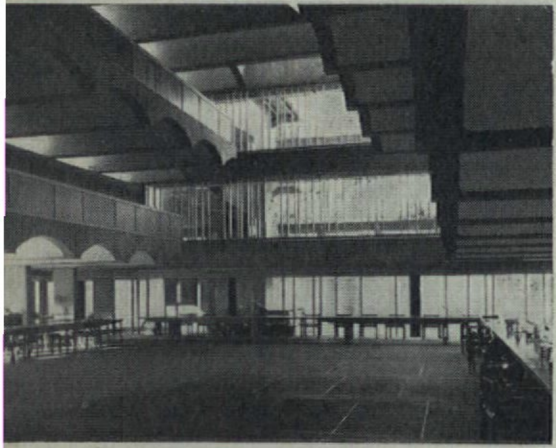
These qualities can be distinguished in everything he says, or does. He is concerned with the creation of beauty, through the medium of architecture, for the pleasure, inspiration and spiritual stimulation of his fellow men. (See his latest completed work, p.156)

From the dry, frame construction of his domestic period, Womersley is now turning towards a richer, sculptural expression. He has recently been commissioned as Development Plan Architect to the Edinburgh College of Art. *Iain Watt*

AD May 1968 issue

By way of contribution to the RIBA conference at Cambridge in June—Building for education. Looking forward—*the May issue of* AD *is devoted to the future pattern of 'learning' (as opposed to 'teaching'). Cedric Price is the guest editor, and contributors from America include among others Dr Jonathan King (Vice-President of Educational Facilities Laboratories Inc.), Sol Cornberg (Sol Cornberg Assoc. Inc., Designers in Communications Arts), John Tirrell (President of Oakland Community College, Michigan, and Director of Planning and Consulting for Education, U.S.A.). From Britain there are contributions from Michael Pearson, Basil de Ferranti, the Department of Machine Intelligence and Perception (University of Edinburgh) and from Cedric Price himself.*





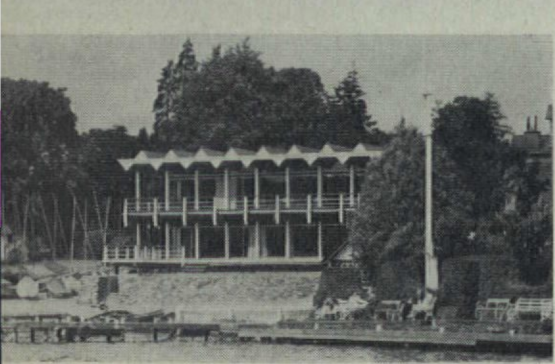
Credit

Seminary

A rain-soaked wood in the west of Scotland may seem a long way from the archetypal Corb site, but the master has had his followers in all sorts of places. At Cardross, Dunbartonshire, Gillespie Kidd and Coia have designed a £400,000 seminary which must be just about the best thing built in Scotland this decade at least: no fatuous Ronchamp gimmickry but sound discipleship in the genuine succession.

St Peter's seminary—arranged around the existing Kilmahew House—accommodates 100 student priests whose study bedrooms wrap a three-storey cellular jacket around each side of the vast triangular prism spaces of the chapel and refectory. These together constitute the main bulk of the building group. At right angles to this is the lecture room and library block—a dramatic jagged cantilever across the conifers growing up from the slope below. Gravel exposed aggregate, used on the cladding of the main study bedroom block, has been carefully chosen to blend with the stonework of Kilmahew House. Copper, roughcast and raw concrete are the other external materials while inside extensive use is made of varnished pine detailed in a straightforward way with a simplicity which here and there amounts to inverted affectation.

And Corb? Yes, there are the nautical vent rooflights to chapels, even the La Tourette fenestration . . . and why not? For the building shows not only how much the architects have been influenced by their unseen mentor in the choice of established forms but how much farther they have been able to go in sympathetic formal development particularly in the soaring angularity of the library block. Corb has been blamed for many architectural aberrations. Cardross however is the real thing. *Frank Arneil Walker*



Yacht Club

In recent years, with little publicity, successive Governments under an Act of 1937 have been giving out grants of up to 50 per cent to sports clubs for new club houses and improvements to their facilities. This has produced, of course, many nondescript package deal timber shacks, but several more enlightened organizations have commissioned architects whose imagination has produced lively and stimulating results.

One of the more exotic and successful examples from the North West which has benefited from these grants, is the Royal Windermere Yacht Club on the shores of Bowness Bay, designed by Gill and Rhodes.

Photo: Lakeland Photographic *Keith Ingham*

Heroic relics

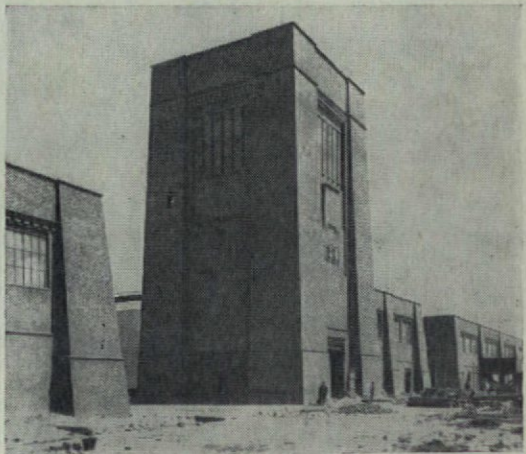
Owing to the great demand for the December 1967 special issue of AD entitled 'Heroic relics', a limited reprint is now available at 7s. 6d. per copy, p. & p. inc.

AD map guides to architecture

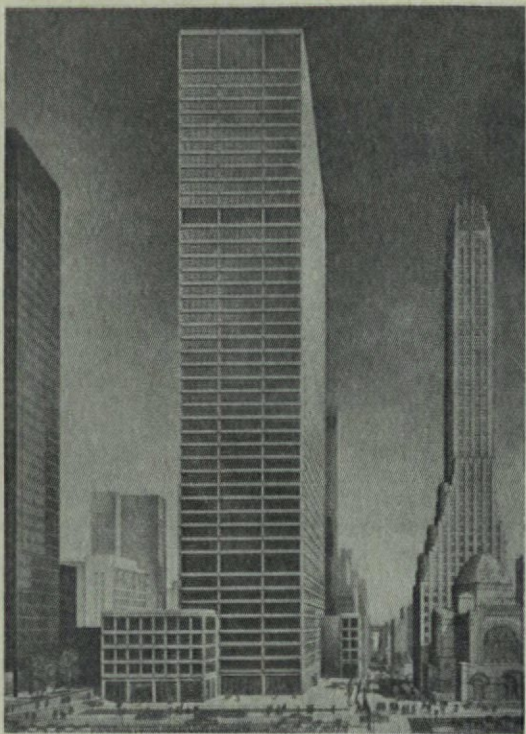
Maps still available: London, Rome, Milan Helsinki. 5s each p and p. inc.

What Where Who When?

Once again only one person identified last month's building correctly—Richard Chafee. The house illustrated was built by Charles Garnier, architect of the Paris Opera and the Monte Carlo Casino, for himself in 1872, at Bordighera, on the Riviera. The house is now occupied by nuns.



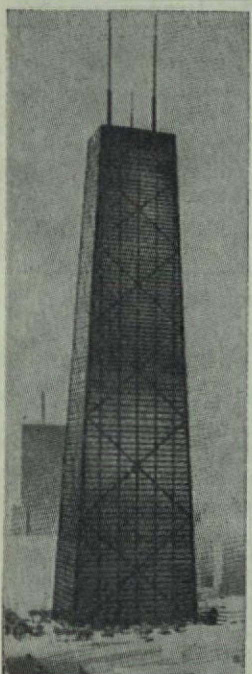
This month there should be a lot of correct answers. The sender of the first correct entry—naming the architect of the building illustrated above, giving its name and address and date of construction—to be opened in our office on the 20th of this month, will be awarded £5. The entry form is on p. *AD*28. Envelopes should be marked *Competition*.



Neighbourliness

The pattern set by Mies van der Rohe at the Seagram Building in New York—a neat tower, of unbroken silhouette, set well-back from the main street on its own formal plaza—was bound to be emulated, despite the high cost of such a layout. But few architects, one imagines, would have either the opportunity or the temerity to repeat the composition on an adjacent block. Emery Roth and Sons, unabashed, are building a 44-storey office tower one block south of the Seagram Building. The main façade will be set back 110 ft from Park Avenue to align with Mies van der Rohe's famous façade, it will be of buff precast concrete however, rather than bronze, and horizontally rather than vertically stressed. Mindful of the fatuity of repeating the Seagram plaza alongside, the architects have deliberately made their plaza asymmetrical; it opens out on the south, opposite the somewhat lumpish church of St Bartholomew. To north it is cut off from the Seagram plaza by a clumsy four-storey projection. Ungainly as this projection is, it might at least help to preserve some of the coherence of the precisely designed Seagram plaza.

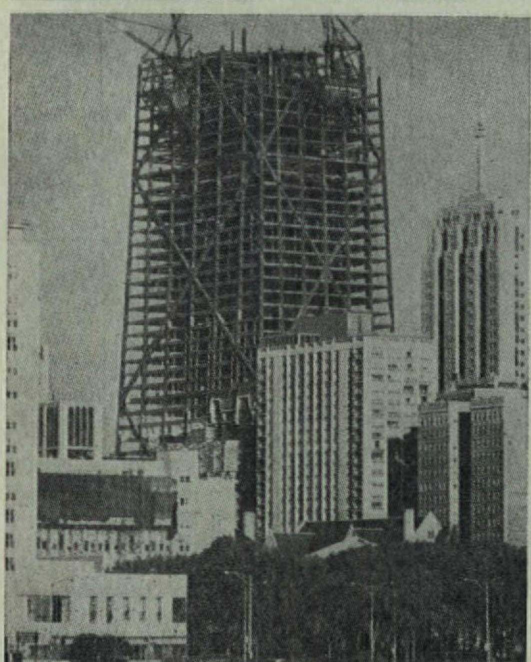
Progressive Architecture, October 1967



Leviathan 1

Skidmore, Owings and Merrill's design for the John Hancock Center, Chicago, which in its model form so successfully emulated a nineteenth-century iron and timber cooling tower or an off-shore oil rig, appears, now that it is under construction, a far more terrifying and gargantuan structure. Only fifty storeys high—half the proposed total—it dwarfs its surrounding buildings. It is intended as a single community structure, with parking for 1200 cars, shops, 28 floors of offices and 700 apartments, with a swimming bath and restaurants. On top two 344-ft television antennae—total height 1451ft.

Forum, November 1967



Leviathan II

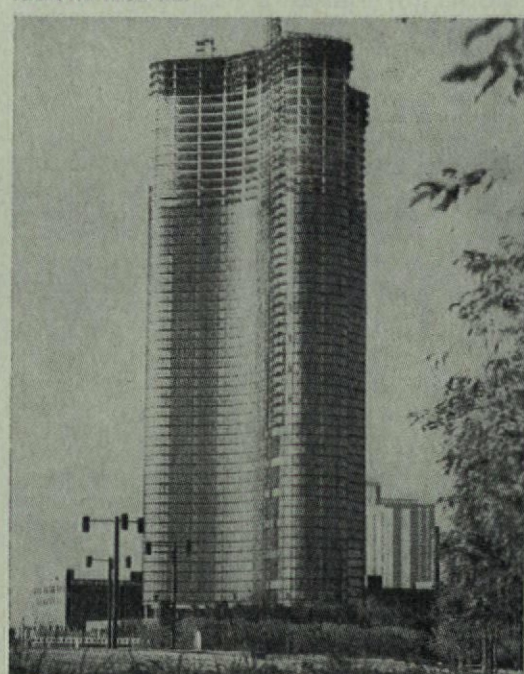
Another giant office tower, for the US Steel company, containing 2,000,000sq ft of floor area, rising to 50 storeys, is to be built in Manhattan by Skidmore, Owings and Merrill. This structure, which will have 48ft clear spans internally, will be divided into five 50ft bays on two faces and three 55ft bays on the others. Girders 6ft 6in deep are to support each floor and take the required wind loads. Bracing between the columns will be in the form of X's, giving a diagonal patterning to the facades. Windows will be recessed to reveal the top and bottom flange of the horizontal girders, providing a further degree of 'modelling'. The structure will be painted a matt blue-black externally.

Architectural and Engineering News, December 1967

Regularization

A pedestrian and dull, though no doubt more commercially sound variant of Mies van der Rohe's famous glass skyscraper project of 1920 is nearing completion now in Chicago. Designed by two of his pupils, Schipporeit and Heinrich (associated with Graham, Anderson, Probst and White) Lake Point Tower will contain parking space for 700 cars, shops, restaurants and 900 apartments. Total height 70 storeys.

Forum, November 1967



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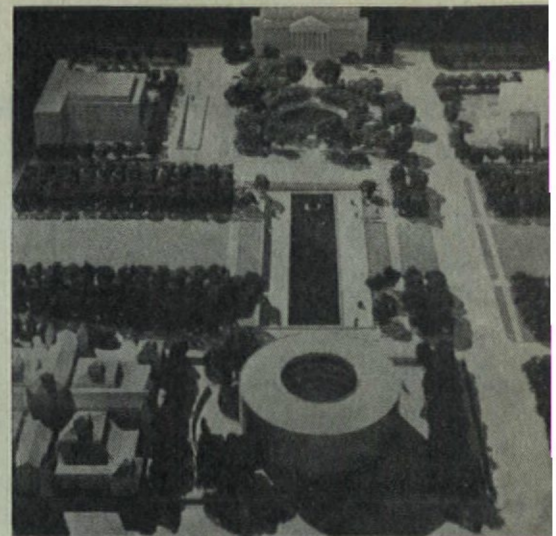

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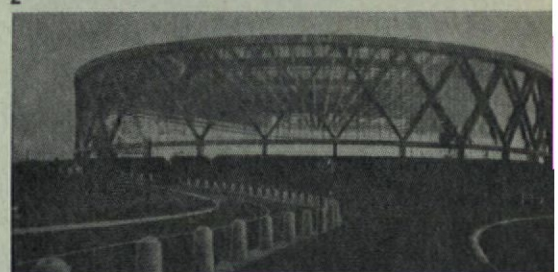

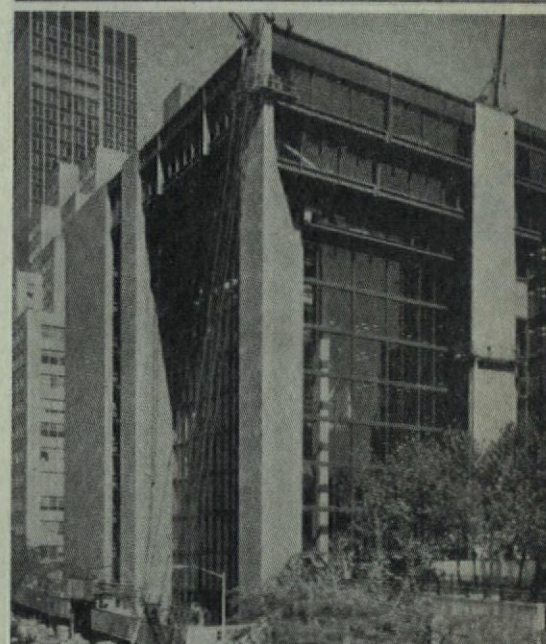

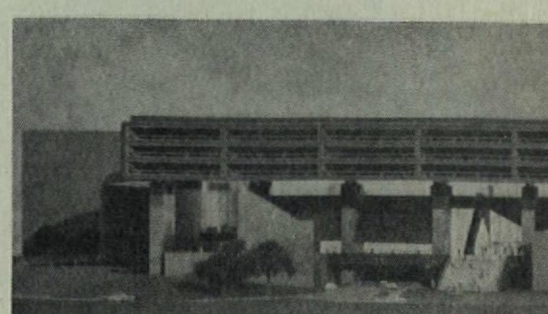

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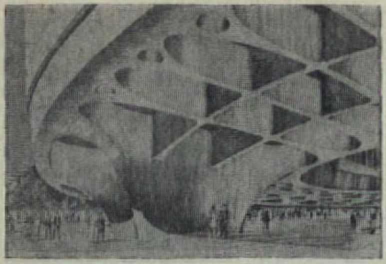

Civic design in the USA

Civic architecture, the editors of the *Architectural Record* lament,[1] has been late to benefit both from American affluence and the ministrations of those architects in whom leadership might be said to be vested. The city fathers of Victorian England were quicker to realize that buildings of individual and extraordinary style could confer prestige. Companies and corporations in the USA have certainly not been slow to realize this—Skidmore, Owings and Merrill, Mies van der Rohe and, more often, Minoru Yamasaki have been called in to lend their talents to the public relations department. But civic authorities, it seems, have been laggards. The problem, now that they have shown their concern, is to establish a fitting style. The city administrative centre now being built on Capitol Hill in New York will clearly not do this. The dull and formal bombast of the Lincoln Centre is more likely to be preferred. Gordon Bunshaft of Skidmore, Owings and Merrill has opted for a gutless and inflated formalism in designing the $15 million Joseph H. Hirshorn museum[2] as a cylindrical lump **1** with an eccentric circular court, the whole to be supported on four great piers **3**. The museum and its reflecting pond, are to be built on a cross-axis of the Mall, in Washington. The debased classicism of Washington is not alone accountable for the design, SOM's County Coliseum[3] far away in Oaklands, California, is an equally rapid and vain-glorious concept **2**.

Philip Johnson, to judge by two of his recent designs, is also grappling with formal solutions. His sewage treatment plant for New York[4] is a neat geometric platform built out over the water **4** with aeration nozzles and 200ft water jets for added effect that are likely to provide a nasty surprise for anyone in range (and anyone who has been near the *jet d'eau* in Geneva on a gusty day will know just how easy it is to get within range). Johnson's revised design for the rear extension to the Boston Public Library[5] is patently intended to be 'in keeping' with the famous McKim, Mead and White building, **5** but the scale of the proposed work belies a spirit of strong competition. The scale however, is by no means as gross and unsuitable as that of the John Hancock building[6] proposed by Henry Cobb of I. M. Pei and Partners for another site off Copley Square **6, 7**. The civic decorum postulated by McKim, Mead and White and by H. H. Richardson in his great Trinity Church is brashly shattered by this sixty-storey oblique structure, sheathed in reflecting glass, sticking its nose, so to speak, into the historic precinct. Even formalism, however dull, can in contrast be seen to yield virtues.

[1] December 1967; [2] *Progressive Architecture* 9|67, *Architectural Record* 9|67, 12|67: [3] *Architectural Record* 1|68; [4] *Architectural Record* 12|67; [5] *Architectural Record* 12|67; [6] *Architectural Record* 1|68, *Progressive Architecture* 1|68.

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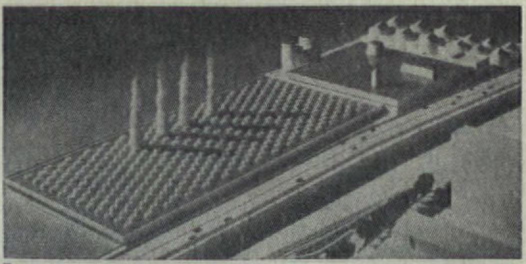

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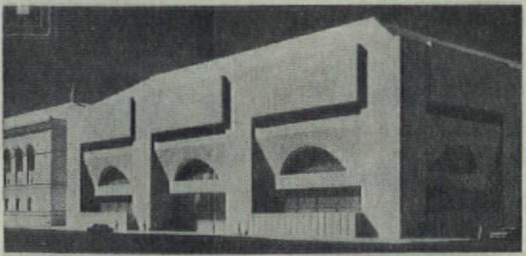

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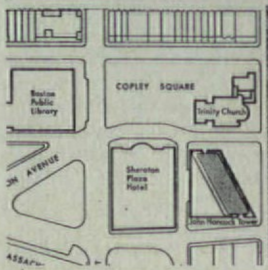

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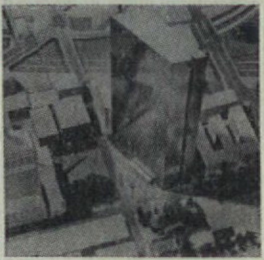

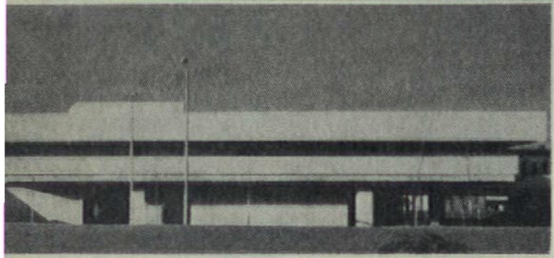

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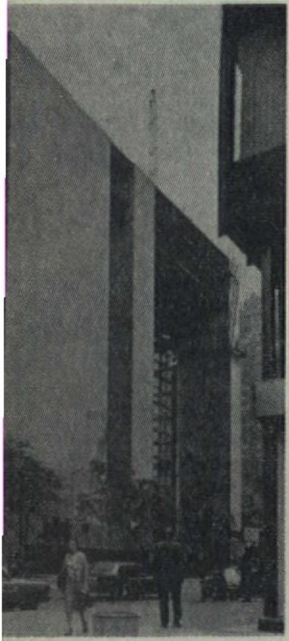

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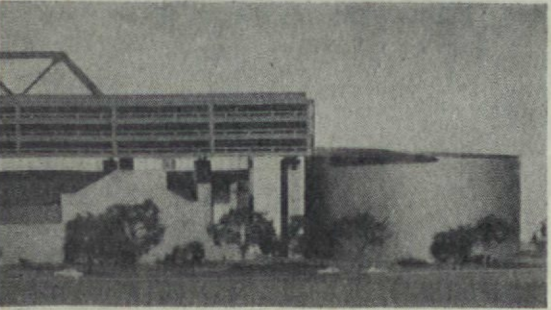

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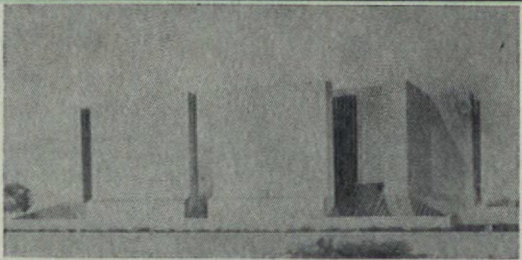
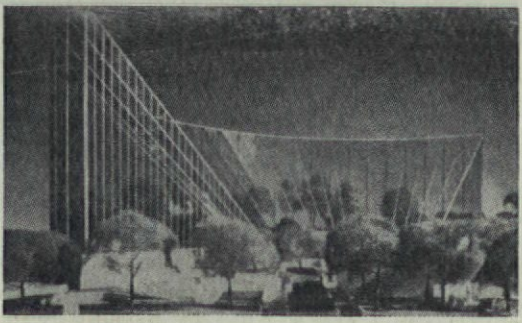


Heavyweight styling

2

The Saarinen mantle and practice passed on his death in 1961 to Kevin Roche, John Dinkeloo and Associates. Determinedly they have sought a style more consistent than that of their wayward mentor. They have opted not only for consistency, but for a heavyweight rather than a lightweight aesthetic. The forms of their recently illustrated projects or completed buildings are all strong, large and clear-cut. The human scale is irrelevant. This is less evident in their High School[1] at New Haven, Conn. **1**, than in the newly opened Ford Foundation headquarters[2] in New York **3–5**. All walls to the streets are blank, the ten-storey windows enclose a private landscaped garden—an extraordinary romantic gesture within the precinct of a grim granite-faced city building. For the $10 million National Aquarium[3] at Potomac Park they have proposed a giant geometric glass shed **7**; for the 747,000 sq. ft extension to the Aetna Insurance Co. at Hartford[4] a massive, quadrangular building with five-storey walls of reflecting glass rising sheer, between unbroken concrete walls **2**. Their Sports and Convention Hall[5] at New Haven (adjoining their Knights of Columbus tower is of a mammoth scale, with 2400 cars parked within the long-span trusses **6**.

The flimsy, brittle effects of the late Saarinen buildings have clearly been cast aside; instead, a personal style has emerged, at once bold and blatant.



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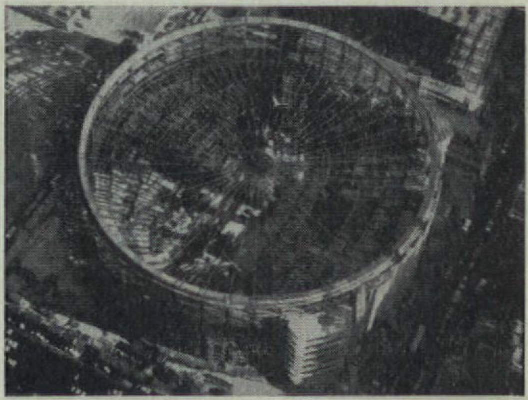
[1] *Baumeister* 2|68; [2] *Architectural Record* 9|67, 1|68, *Progressive Architecture* 1|68; [3] *Time* 11|8|67; [4] *Progressive Architecture* 12|67, *Architectural and Engineering News* 12|67; [5] *Fortune* 9|67, *Architectural Record* 10|67.

Biggest suspender

The new Madison Square Garden under construction (see *AD* 10, 66). The circular cable suspension roof (425ft diameter) is the largest in the USA, probably in the world. The suspended roof of the US pavilion at Brussels, 1958, was 290ft in diameter, the suspended section of that of the Palasport in Genoa is only 225ft.

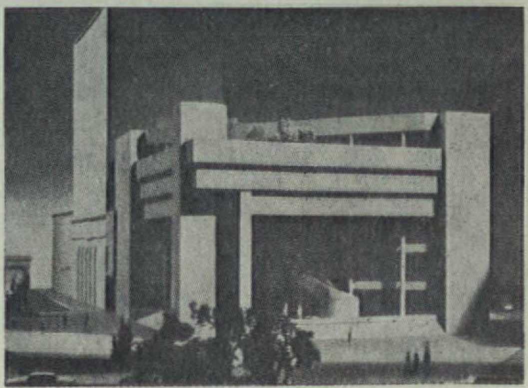
Suspended Structures published by the British Constructional Steel Association Ltd.



Common denominator

Ulrich Franzen's design for the Cooper Union in New York is half the height of the Kevin Roche, John Dinkeloo and Associates' Ford Foundation headquarters, but it has affinities of form and scale that suggest that a common style has now been formulated and accepted by one generation at least, of American architects.

***Architectural Record* 12, 1967**



Triennale di Milano

The theme of this year's Triennale, to be held from May 15th to July 14th in Milan, is *The Greater Number*. The range of designers invited to participate is wider and more diverse than usual—among them are the Archigram Group, Lynn Chadwick, Warren Chalk (for the UCLA exhibit), Charles and Ray Eames, Aldo van Eyck, Romaldo Giurgola, Hans Hollein, Arota Isozaki, George Nelson, Alison and Peter Smithson and Shad Woods.

The executive committee have advised designers that their task is *to select objects and models, in relation to their capacity to introduce new hypotheses for the shaping of the physical environment, and offer them to public debate; thus through this action of choice and criticism —in an impartial environment, free from professional constriction— stimulating the formation of other increasingly appropriate hypotheses.* Two of the designs submitted for the Triennale are illustrated here, together with excerpts from the reports accompanying them.

Transformations of the city

Alison and Peter Smithson

We were invited to participate in the International display, and we have tried to take as seriously as possible the Committee's instruction 'to avoid autobiographic or didactic details which are of no interest; only the proposal in itself interests the public, realized in terms of clear and suggestive images'.

Above all we want our exhibition to be a 'show'—enjoyable and understandable at an ordinary level of participation. But each part is also an allegory of a certain general idea. We would like people to be suddenly aware that they have already found ways of identifying with the city of the greater number—of transforming it with their own day-to-day acts and acquisitions, and that society as a whole already has the means to make the cities it lives in more opened-up and more appropriate to our present life-style.

In our exhibit we show three transformations.

Wedding in the city—the transformation of the city by an event.

This is intended to be the most easily understood transformation. It happened in the past, and on the wall close by the present-day wedding evocation, is shown a parallel historical happening to make the point—a big picture from a *wedding cassone* (in the *Galleria Dell, Academia Belle Arte in Florence*)—out of which step allegorical figures dressed by *Jan Hawarth* on the way to the wedding event. Over the wedding hangs a cluster of *wedding flags* in pink and white.

The five figures are dressed for tomorrow's wedding in the city by students of the Royal College of Art, London.

City as a decoration of the region

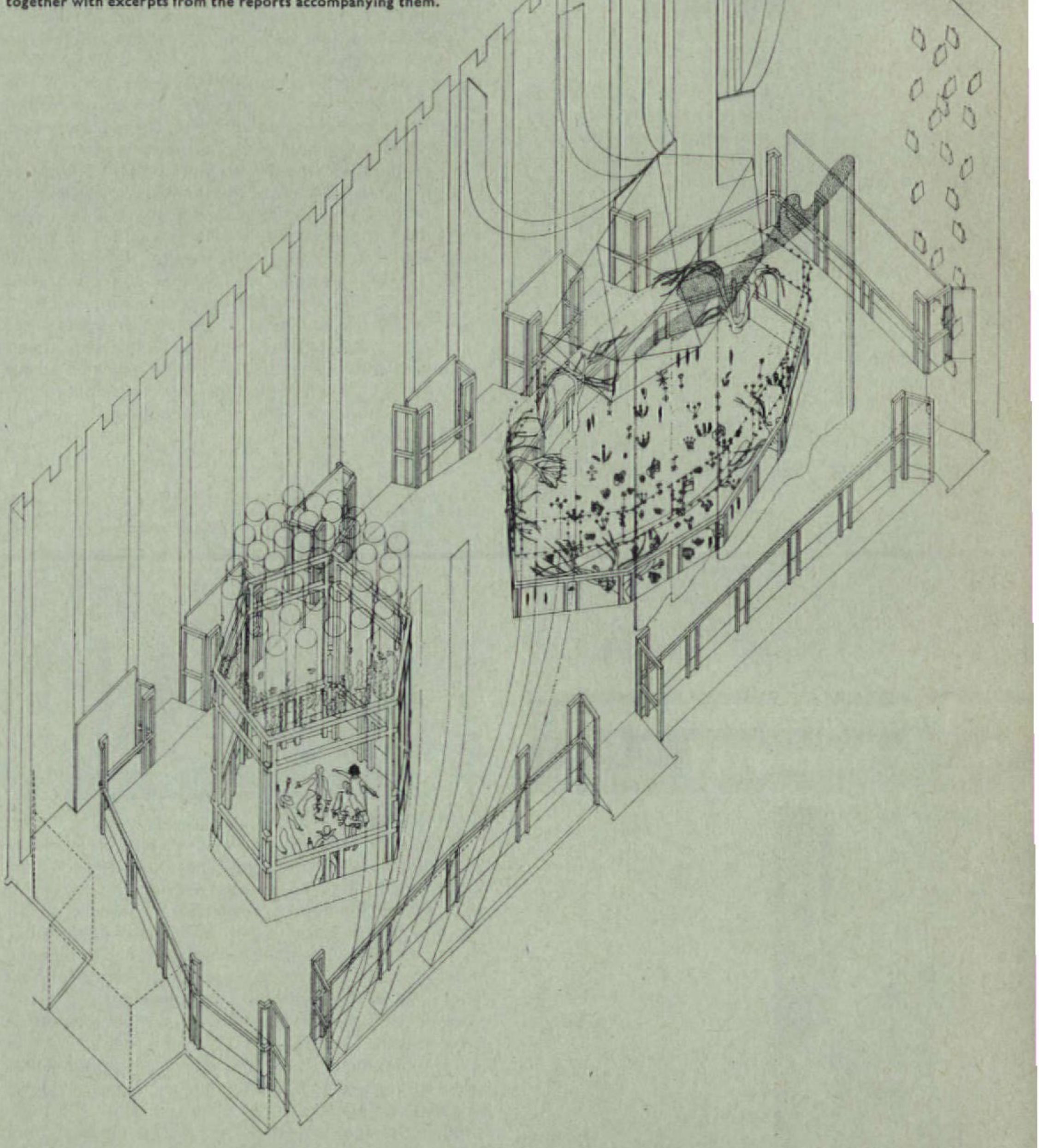
What we are trying to show here in an allegorical way is that through the invention of the urban motorway and of rapid transit systems (actual examples of which will be shown in the adjacent exhibit of Shadrack Woods) the city can be again what it was in the Renaissance—marvellous built things set down in a green land. We evoke a vision of the Arno Valley—white buildings in a green, watered, cared-for land—and contrast it with a present state of Florence—grey, dense, stifling—a mirror image air photo floating over it as a cloud. The nearby linked feature—'Your country needs you' is the only old-style exhortation device we use, to punch home the message that responsibility for the making and the keeping—the caring-for—is up to each person, through his personal and collective behaviour (in the air-space above—the carrier-bags, 'Take that rubbish home with you.')

It is in this part of the exhibition we hope to give a glimpse of a new ideal, to show how beautiful Los Angeles, Pekin, Moscow or Milan could easily be if we deployed properly the tools of urban development now commonly available to us.

Life's decoration of the urban scene

The city is being constantly transformed by its 'invisible' decoration—by tram-wires, lamp posts and change of paving pattern, by the horse-manure that Ruskin hated; by carts, cabs, cars and buses; by rains and floods; by weddings, funerals, seasons and ceremonies; by street-sellers, shop-fronts, sky-signs and posters; by people's ways of walking and dressing and by what they are carrying. All these things are the city's invisible decoration; invisible because they change so slowly, because they are so normal.

By taking an apparently never-changing place—and a well-known place—the Baptistery at Florence (for which place, because of the relationship of the English to Florence, an extremely rich vein of photographic material is available to us)—and by treating the records of the place freely (i.e. by collage, over-painting, distortion and cutting) we make obvious how these not-thought-about-things are the decoration of the city, how every generation transforms it. This is shown in the exhibit by a flat, mostly photographic, wall-show, but parts are three-dimensional. In one part we show real figures and things—'the poetry of the ordinary.' A common sight in the streets of Milan; yellow polythene pipes, translucent, fresh, beautiful; a workman with a white, clean wash hand basin. In another part 'rain' fills the air-space. All part of our everyday 'invisible' decoration.

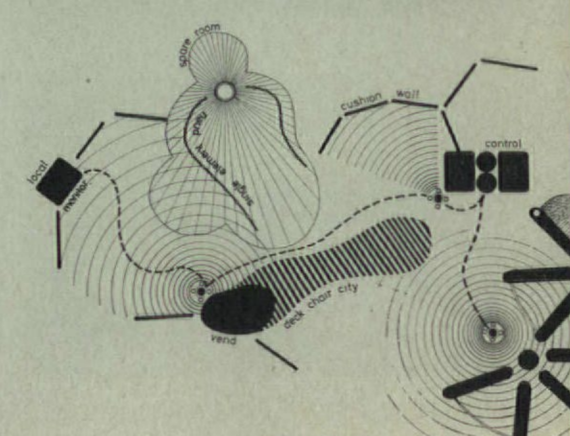


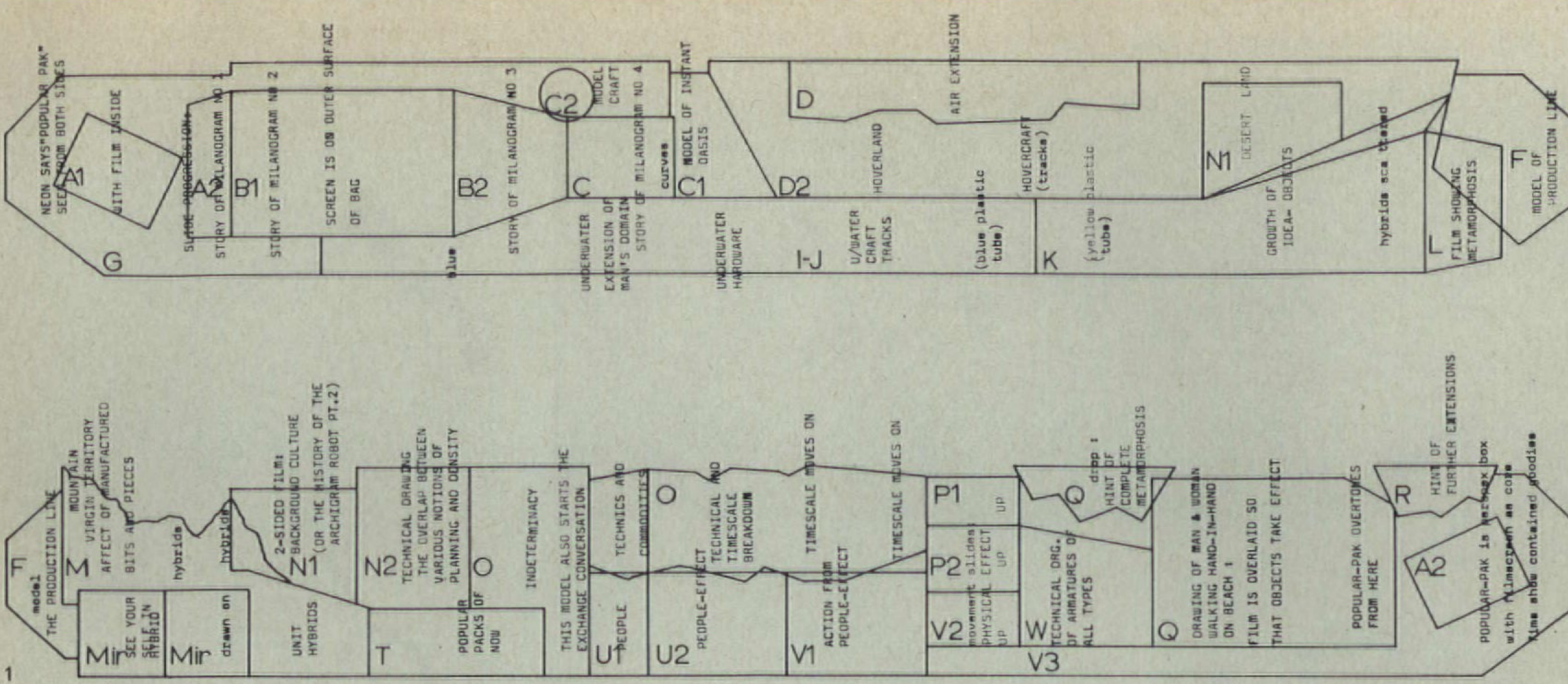
Rogue entry

A cybernomadic (cybernetic nomadic) living project with which a number of students* intend to travel to Milan to visit the Triennale. They hope to be able to set the project up in the exhibition grounds in order to allow it to interact with an unpredictable audience.

Apart from being an opportunity to realize and experience a project in reality, its purpose is to relate the current vocabulary of communication equipment, feasible pneumatic 'constructions', travel hardware, etc., to ideas and speculations presently being developed, concerning thermal, visual, and acoustic control at a service level, and software zoning of entertainment, communications, and mood at a stimulus level.

*Simon Conolly, Mike Davies, John Devas, David Harrison, David Martin.

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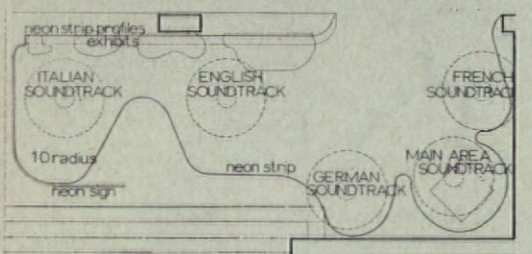

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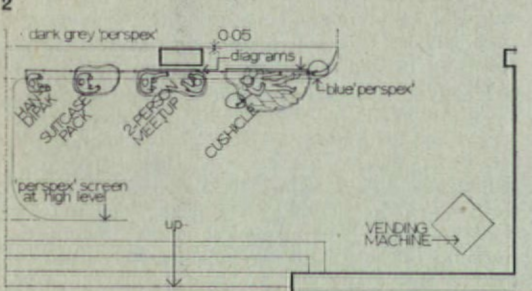

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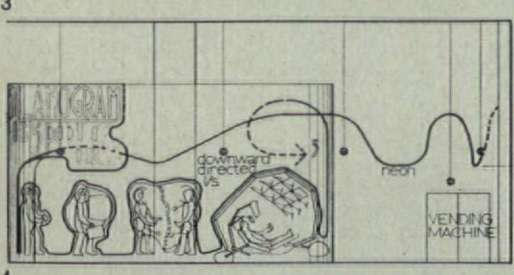

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Milanogram

Archigram Group

Archigram agrees that the problem of Greater Number is central to tolerable existence in today's world. In every sphere of our experience and its environment we are dependent upon the intelligent manipulation of quantity. Against this is the realization that all people are individuals, despite the scale of their total need.

It is this paradox of scale, quantity and repetition at the service of all as against their individual choice that confronts us, and at the same time, intrigues us.

Archigram has for some time been interested in evolving a series of operations and organizations that deal with the environment as a series of chosen commodities taken from a large range. These commodities being exchangeable and expendable and free forming.

The hypothesis, that we can choose and interchange between these parts and reach a range and excitement far beyond that of the architecture of the past, and at the same time take advantage of the rationale of many non-architectural and non-design techniques (market research, high-stress technology, consumer assembly; is supported by the continuing breakdown of technical and perceptual barriers.

Archigram is concerned about Greater Number and its implications: the problem of production, of optima as a necessary reflection of economic reality; of co-existence of the new and the re-thought, with much that is bad and must yet be tolerated; of the less attractive effects of speed, noise and boredom. Archigram has decided to make a positive rather than negative or even just contemplative response to the problem: to show how we might tackle Greater Number and turn it to advantage for the individual.

In the entrance area **2, 3, 4** are four exhibits that show at life-size, the self-contained environment—a progression from small to large—the hand-held apparatus that renders the individual able to be part of the world-village, then the extension of this so that an enclosure can form part of the equipment, then a composite created by two persons meeting, and then a 'cushicle' —a device deploying a slightly more sophisticated environment than the previous three but equally nomadic in its implications.

The principal exhibit is a large suspended 'exhibit bag' **1** consisting of a multi-technique assembly, protected by a transparent air-inflated rib structure. The bag structure is regular in geometry and profile, but the contents are scattered and wildly intermixed.

There is no one zone inside the bag that deals with any one area of interpretation. There are, however, parts of the assembly that contain a specific film or slide group that is retained in a comprehensible sequence, and occurs at a particular place.

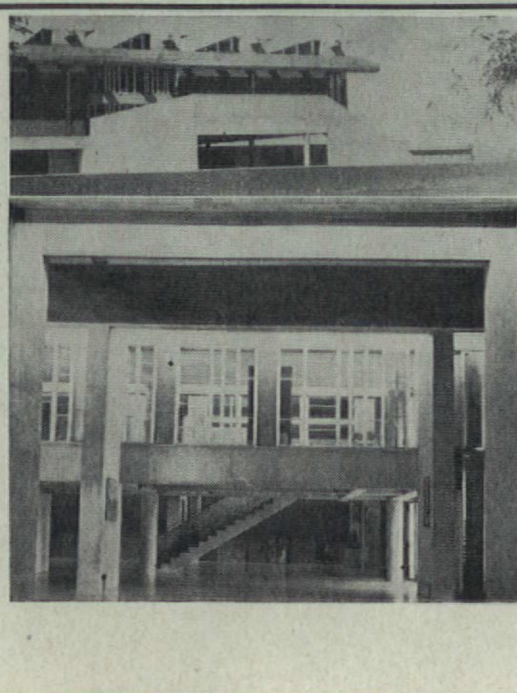
The 'exhibit-bag' assembly describes the range of assemblies and devices that can bring together quantity and personal choice. The range covers many scales and describes many kinds of location. It particularly involves hybrids—unusual mixtures of parts out of their more usual context. The contents of the bag themselves constitute a 'hybrid'. There is intentionally an overlap between a film, projected slide, model or technical drawing shown on any one surface.

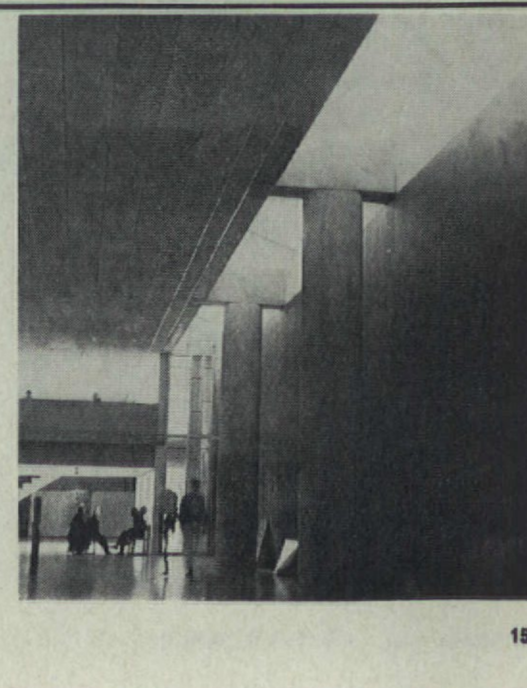
The arrangement of contents can best be traced from the drawings.

Chandigarh museum

Leisure Valley running through the middle of Chandigarh is the setting for the city's cultural buildings. Of these, the School of Art has already been built. The second building, the Museum and Art Gallery by Le Corbusier, has now been completed and opened. It is a two-storey frame structure, square in plan, with a round workshop to the north and a lecture theatre abutting the western side.

The entrance is along a colonnade through a large pivotted enamelled door. The information counter, offices, store workshop and toilets are on the ground floor. The rest of the space is for exhibiting paintings and sculptures. Access to the upper floor is by means of a wide ramp. The exterior is faced with brick, so as not to vie with the Capitol buildings a mile away.





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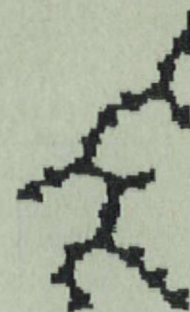

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1
Aerial view of the Märkisches Viertel development with Herbert Stranz's block in the foreground
2
Location plan, Märkisches Viertel marked MV
3 & 4
General view and block plan of Wohngebiet W3c, 636 dwellings, designed by Herbert Stranz
5 & 6
General view and block plan of Wohngebiet W1a by René Gagès (Paris) and Volker Thiesen (Berlin)
7 & 8
General view and block plan of Wohngebiet W1c, 283 dwellings, by Karl Fleig, Zurich. The walls are painted in reds, puce and blue
Bauwelt 46/47 1967.

The Märkisches Viertel, Berlin

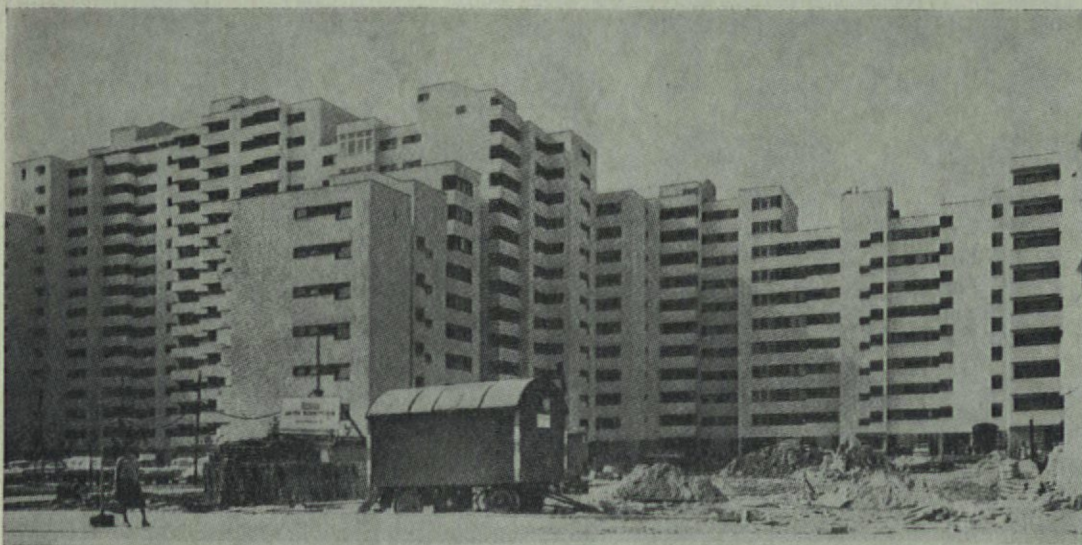
It is almost impossible to built any new settlements in West Germany these days, without referring to the example of the Weissenhofsiedlung at Stuttgart, now forty years old. This was as promising in its own day and age as the subsequent attempts to renew that promise or to fulfil it have been void, futile and fruitless.

Weissenhof started with great advantages: commissioned by the *Deutscher Werkbund*, designed and presided over by architects of a younger generation at that time little known or acclaimed in Germany, it was a genuine laboratory of modern building and living techniques, where new forms of construction, involving prefabricated steel building in the case of Gropius' house and new ideas in planning could be tried out.

In contrast the Berlin Hansaviertel of 1957 has all the same defects, and the same sort of defects, as an English post-war new town, or a new university almost anywhere—too many architects have had a 'go' at pushing their pet ideas.

Anything which happens on this scale in West Berlin nowadays, always, to a stranger, wears a desperately factitious air, of being put up, primarily to impress the east Germans with the advantages of free enterprise; and the same is to some extent true in reverse across the Berlin Wall.

The main road through the Märkisches Viertel terminates a few hundred metres beyond the last buildings in the barricades of the frontier zone, which will not fall down just because of an architectural trumpet blast. And in spite of all the lip service paid by the participating architects to ideals of natural light and community living, the quarter wears all the aspects of a barren formalistic exercise, some of it, in strident colour, designed to impress the politically unfortunate inhabitants of the other zone—be hanged to the buildings' inhabitants. *Thomas Stevens*



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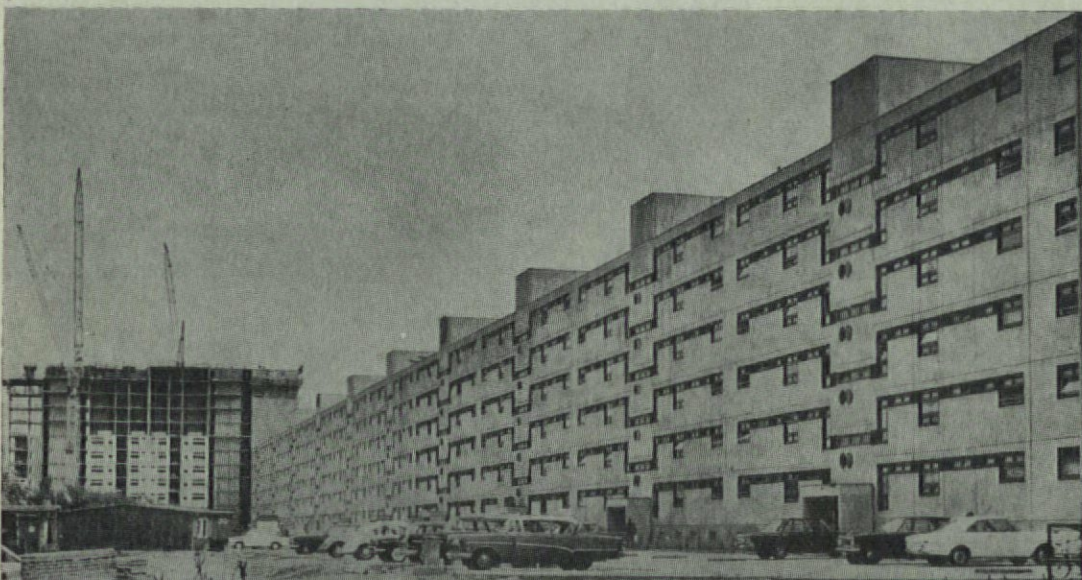

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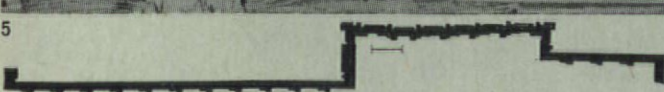

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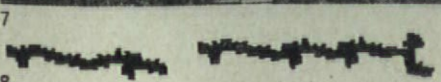

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Books

Environment for man; the next fifty years
Edited by William R. Ewald, Jr. Indiana University Press. 52s.

The American Institute of Planners, for its 50th anniversary, decided to do a little forward thinking, and this is a collection of papers, from their Portland, Oregon, conference of 1966. They are infinitely worthwhile; the theme of the next fifty years provides an opportunity for exploration, for hopeful conjecture, and a good deal of condemnation of the present. There is hardly a paper without a great deal to teach us, especially Alexander's 'city as a mechanism for sustaining human contact' (answer: change it into a hillside and crawl under) to Carr's 'city of the mind' which investigates problems of identities, and perception in relation to city form.

It would be too much, perhaps, to hope for similar intelligence from the council of the TPI. but perhaps for their centenary . . *Theo Crosby*

Twentieth-century architecture 1940–65
John Jacobus. Thames and Hudson, 1967 *215pp.* £4 10s.

'The varieties of personalities producing our contemporary architectural styles, as well as the ebb and flow of design fashions in the 1950s, have made it difficult to characterize the nature of architecture and the directions it has taken since the dispersal of the International Style architects before World War II.' And impossible if the architecture in question is, with some odd omissions, that of the whole world between 1945 and '65. Professor Jacobus's book has a decidedly musty Victorian flavour, which derives from its encyclopaedic intentions, from the preface in which he elects 'the approach of a history of style', and from the apocalyptic finish when, in 'new patterns of order', Kahn is revealed as the hero who will lead architects from the 'crisis and reorientation' of the later fifties.

The Banister Fletcher aspect is well covered in the 400 smallish illustrations, but a rigorous apparatus of comparative stylistic criticism is missing. The quick run-down 'Genealogy for Modern Architecture' is eccentric and inadequate, (Dutch and Russians omitted), having been more usefully dealt with elsewhere by Banham, Pevsner, Johnson and Hitchcock, all of whom occur in the notes, but not in the thought. These histories have a firm moral underpinning to their stylistic observations which Professor Jacobus lacks.

Instead he substitutes another Victorian (and romantic) technique: the influences game, or description by association, which takes the form of imagining oneself in the building and then thinking of all the possible historical reminders. The method, which will work for Le Corbusier, Wright, Saarinen, Kahn, and most current East Coast work, produces for example for the Villa Savoie; Swiss neolithic lake dwellings, Tiryns, Villa Rotunda and Olbrich's Darmstadt Art Centre; and for the Chandigarh Assembly building, Persepolis. This is merely unilluminating name dropping, pseudo-history; for the suggestion is never explicitly made, as Scully always makes, that the architects actually intended or could have been motivated by these associations. Because of this confusion, those who use associations deliberately as form-techniques, like the middle-generation East Coast architects, remain unidentified.

The method collapses completely with Mies, and, where comprehensible, Professor Jacobus has got him all wrong. He has chased the hares of Paestum and Parthenon in Hilbersheimer, only to appear disappointed that none of Mies' single-storey temples have columns at the corners, and must therefore be 'inescapably mannerist'. That Crown Hall, the Baccardi building project and Farnsworth house might instead celebrate the possibility of constructing cantilevers in steel is not mentioned. The examination question 'Compare and contrast the Marseilles Unité and 860 Lake Shore Drive' is raised but not answered. The Unité is offered as a possible piece of a city (860 by implication is not), but Mies and Hilbersheimer's Lafayette Park, Detroit is omitted.

The last chapter on the sixties is a desperate attempt merely to mention and illustrate every art-history-type building of the last five years, the terms Brutalist, Formalist, Futurist, Empiricist and Humanist flying unhelpfully through the text.

And as for Kahn in the role of Moses, I know from the work of my contemporaries that Professor Jacobus is already wrong. *Christopher Woodward*

New Italian architecture,
Alberto Galardi. The Architectural Press, London, 1967.
Copyright by Verlag Gerd Hatje, Stuttgart, 1967.
English translation E. Rockwell. 90s.

Mr Galardi's book is a handbook: a product of that international and anodyne kind of publishing which is guaranteed to give you a bit of the best of everything and quite a lot of the indifferent. The introductory text begins with the unfortunate words 'In Italy, too, . . .' and goes on in that unnecessarily me-tooing tone for another ten pages or so, giving you a comprehensive cliché picture of the Italian situation which bears very little relation to what actually happened. As for the rest, the photographs are adequate, the drawings not so, as might have been expected. A book which will not satisfy the architect, will irritate a critic or historian, and will provide a dubious directory for the executive. Still, let us hope it will make someone happy.
J. Rykwert

Il Mondo Sotterraneo
E. Utudjian and W. J. Armento, University of Naples.

Report of a study conference in 1966–67 on the possibilities of underground architecture, transport and general urbanization.

The greater part of the proceedings deal with underground parking, and with the Bay Area Rapid Transit system with which Armento is associated. The concept of underground living, though probably inevitable, is not approached with much relish.
Theo Crosby

Reinforced concrete detailing
John A. Barker. Oxford University Press, 1967. 84s.

This is a luxurious book. The drawings, paper and binding are all superb. It must have taken years to produce; unfortunately much of it is out of date. And to present it within a few months of the publication of the *Report on Detailing of Reinforced Concrete* by the Joint Committee of the Instititution of Structural Engineers and the Concrete Society and neither comment nor conform would appear to be an act of commercial folly. It is a pity because there is certainly a need for books on this subject.

Any book, which claims to be both a *reference* book for architects, contractors and engineers and also a *teaching* book must be judged as to whether it satisfies these two areas of need.

As a *reference* book more should be up to date. Currently in the industry it is economical to try and eliminate hooks in bars; hooks appear everywhere throughout the illustrations and even in the photograph on the dust cover. Personally we feel the elimination of kickers for columns and walls is desirable but their use is still common in the industry; to omit them on column drawings is odd. The use of high bond bars is universal but in the book, while they are described, they appear not to be illustrated. The book has many such omissions. Finally our main complaint is that most engineers' problems—ones which they would like to see how others solve—are how to detail sections of a structure which are not designed mathematically; the solutions are matters of opinion. A good reference book should give a guide to tackling such problems. This book does not.

As a *teaching* book we have fewer criticisms. The content is a compendium of how detailing problems, in many firms, have been solved. Much is out of date and rarely done that way today. Mesh reinforcement is very inadequately covered, especially as developments in this field have such potential. Mainly we regret the omission of comments on how, and in what form, a detailer gets his information from a designer and how reinforcement is actually handled by the supplier.
Edmund Happold and Percy Fayers

For specialist hospital architects, one should draw attention to the existence of a very fine library at the Hospital Centre of the King's Fund, at 24 Nutford Place, just off Edgware Road, London, W1.

Publications received

Architettura come 'mass medium'
Renato de Fusco. 193 *pp. Dedalo Libri, Bari, Italy.* 4000 *lire.*

Transformations in late eighteenth century art
Robert Rosenblum. USA: Princeton Univ. Press. London: Oxford Univ. Press. 92s.

Space time and architecture: the growth of a new tradition
Siegfried Giedion. 897 *pp. London: Oxford University Press. USA: Harvard University Press. Revised.* £6.

Directory of official architects and planners
Ed. Robert McKown & W. A. K. Faldo. Architecture and Planning Publications Ltd., London.

Hydra, a Greek island and town
Constantine E. Michaelides. The University of Chicago Press. 95s.

A thousand years of Norfolk carstone 906–1967
Claude J. W. Messent. New Churches Research Group, London. 1 *guinea.*

Inscape
Hugh Casson. The Architectural Press. 63s.

Typographica 16
Ed. Herbert Spencer. Percy Lund Humphries. 12s. 6d.

La Chiesa de S. Andrea al Quirinale
Franco Borsi. Centro Librario Italiano, Rome. 7000 *lire.*

l'emploi residentiel en region Parisienne les Bureaux, les commerces Vol. 10
Cahiers de l'I.A.U.R.P.

Barbara Hepworth
A. M. Hammacher. Thames and Hudson. 21s. *paperback,* 35s. *cloth.*

Zodiac 17. USA architecture
Edizioni di Communita, Milan.

Historic architecture of Newcastle-upon-Tyne
Bruce Allsopp. 96 *pp. Oriel Press Ltd., Newcastle.* 12s. 6d.

Kinetic art
Guy Brett. Studio Vista. 25s. *hard,* 12s. 6d. *paperback.*

Stage design
Kenneth Rowell. Studio Vista. 15s.

Thermal environment for the student of architecture
Chalkley & Cater. The Architectural Press. 42s.

Choosing your house
MoHLG. HMSO. 2s. 6d.

House Planning—a guide to user needs with a check list
MoHLG. HMSO. 8s. 6d.

Totale stadt
Fritz Haller. Walter-Verlag, Freiburg im Breisgau. 49 *Sfrs.*

Metric conversion tables
Royal Institution of Chartered Surveyors. £1.

Total building cost appraisal
J. Southwell. Royal Institution of Chartered Surveyors. £1.

Playleadership
W. D. Abernethy. National Playing Fields Association. 5s.

Playgrounds
W. D. Abernethy. National Playing Fields Association. 6s.

Organization and handling of bibliographic records by computer
Nigel S. M. Cox & Michael W. Grose. 187 *pp. Oriel Press Ltd., Newcastle.* 65s.

Directory of construction statistics
MoPBW/Research and Development. HMSO. 17s. 6d.

Controlled vehicle impacts—instrumentation and test procedure
Ministry of Transport. Road Research Laboratory. Free.

A modified formula for calculating the disability glare effect from street lighting lanterns
R. L. Watson. Road Research Laboratory. Free

Injuries to the hip joint in vehicle occupants
E. Grattan & J. A. Hobbs. Road Research Laboratory. Free.

Building Research 1966
Ministry of Technology. HMSO. 9s. 6d.

Low friction sliding surfaces: PTFE weave
M. E. Taylor. Road Research Laboratory. Free.

A method of measuring the tensions in belts
D. S. Moss. Road Research Laboratory. Free.

High strength friction grip, bolts—slip factors of protected paving surfaces
W. Black & D. S. Moss. Road Research Laboratory. Free.

50 point traffic census—results for 1966
J. B. Dunn. Road Research Laboratory. Free.

Estimated expenditure on road transport in Great Britain 1965 & 68
R. F. F. Dawson. Road Research Laboratory. Free.

Creation of an industry

Arthur Quarmby

The building industry of this country occupies a semi-stagnant backwash, off the main-stream development of other industries. It is an enormous and unwieldy craft-based industry of site construction which is incredibly under-capitalized and under-equipped: its products are too crude, too few in number and far too expensive.

It is all we have got, and therefore we are rarely able to stand back and view its performance dispassionately. Try visiting any building site and just looking at it: preferably through eyes which have first been de-conditioned, eyes attuned to twentieth century mass-production technology. Sticking bits of burned clay together with slop. Utterly intolerable in the second half of the twentieth century.

Yet the best we can do is to try to graft a few joinery techniques onto this relic of the middle ages, this monster which currently employs well over 1,000,000 men on building sites alone, and which could not manage to produce even 400,000 houses and flats in 1966. Compare this with the 400,000 motor industry workers, who produced over 2,000,000 vehicles in that year. More than five vehicles for every dwelling, with a fraction of the labour force.

A change from a *construction* building industry to a *manufacturing* building industry is grossly overdue. This change is needed in order to permit the full resources of modern technology to be made available for the production of buildings; buildings which offer something like value-for-money in normal twentieth-century terms.

It is incredible that this change-over has not already been brought about. And yet for it to occur a number of factors have to be brought together at the same time. First of all the market.

The building industry enjoys a market currently running to some £4,000,000,000 per annum. This really is very large indeed, being one eighth part of the total gross national product, and over three times the size of the market, at home and abroad, for British automobiles. And yet this marvellous market is totally fragmented into individual units of non-standard, uncertain demand in such a way as to prevent the level of capital investment which would enable us to make use of modern technology. The present building industry is based on the one-off, or at best, the few-off. This suits the present type of demand entirely, though I am uncertain which perpetuates which. Manufacturing industry, thinking particularly of the mass-production side of industry with runs of tens of thousands, hundreds of thousands, sometimes millions, can never compete on these terms.

Neither can the construction industry compete with manufacturing industry on its terms. The association of system builders recently claimed that if given guaranteed full-capacity orders of a minimum period of five years, they could reduce their costs by between 5 and 6 per cent. Derisory, and proving simply that even the supposedly-advanced end of the building industry is still the old sheep in wolf's clothing. I know of no instance where the transference of a product from hand-craftsmanship to mass-production has failed to realize an enormously increased output, a tremendous improvement in value-for-money terms, and eventually, after teething troubles, an improvement in quality.

To bring this transference about the market for buildings will have to be organized into large units of standardized, reliable demand.

How could the market for buildings be re-organized into large, reliable units? Either indirectly, or directly. By indirectly I mean by the creation of a product, for example a house, with which the market could identify itself, and around which it could cohere.

A manufactured house could have an absolutely overwhelming effect upon the market: it would be so easy to advance way beyond the packing cases of today, and create living conditions which were an absolute delight, rather than a strait-jacket.

A large advertising and marketing campaign would be required to launch the product, but there can be no doubt that with this added to the improved facilities and value-for-money which the house could offer, that it really would sell. After all, what chance would a 1905 Lanchester at £9000 have in the market against a 1968 Cortina at £600?*

However the production of this manufactured house would demand a considerable act of faith by the manufacturer, involving investment running perhaps to eight figures.

On the other hand, the direct organization of the market would mean that the largest purchasers of buildings would deliberately standardize their orders, in their mutual interest. In the knowledge that this standardization would inevitably result in a lowering of prices and an increasing of standards.

It would also result in the creation of an entirely different type of building industry.

Already the first signs of the inevitable involvement of major outside manufacturing industry in building are appearing in the USA, where Lockheed, Martin and General Electric are entering the field with the latter having formed a Community Systems Development Division aimed at the creation of complete new towns, of which the United States will need some 500 of 150,000 population each, during the next twenty-five years.

Such giant organizations, equipped with ample capital resources and the latest in modern technology, will by their evermore widespreading diversification become more and more involved in building, largely on account of the fact that the demand for buildings is incredibly large in all countries in the world, and is perhaps the only major market where real manufacturing techniques have yet to be applied. In addition this market is ever-growing; current forecasts suggest that world demand for building within the next fifteen years will equal the volume of building produced during the whole prior history of mankind. This involvement will also inevitably result in their eventual domination of the building field, so that we shall in time reach the position where we have perhaps half a dozen large organizations in this country, each producing ranges of standardized structures and components interchangeable within the product range of the organization (which may be defined as the proprietary open system).

This is the natural and utterly inevitable evolution of the building industry, which would be greatly accelerated, even short-circuited, by the organization of the market for buildings into vast orders for a restricted range of products.

In Britain we have the opportunity to commence this transformation by one agency alone.

It is not generally realized that Government (national and local) purchases, each year, almost 60 per cent of the total output of the building industry. Quite a weapon, although as yet unrecognized. With this level of involvement Government could really make its presence felt, and could transform the industry. Laurance Reed expressed this potential in his recent book *Europe in a Shrinking World*.

The Government is a continuous and big buyer, and has the power to stipulate conditions which force the seller to introduce new technology, stimulate innovation and standardization, and encourage the use of new techniques conducive to efficiency, such as budgetary control, critical path analysis, value engineering and quality control. But no European government has learnt to use this power effectively.

If this were done, if Government stated its intention to assemble its building purchasing powers, and to divide up such areas of its £2200 million total annual budget as proved feasible into a handful of orders, say six of £100 million each, what would happen?

Obviously the present construction companies could not cope. The largest British building company is more than twice the size of its nearest competitor, yet its issued share capital is a mere £32 million and there are 155 larger companies in the country. Some as much as thirty times as big.

These vast orders could only be filled by equally vast organizations, containing within themselves all the specialized products and skills (both trade and professional) at present independently, inefficiently scattered around the industry. And these organizations, which will eventually inevitably emerge, would be formed rapidly either by a wave of amalgamations from within building or by the acquisition of a suitable range of production companies by outside organizations.

Of course it would not be sufficient for Government merely to issue such attractive orders. In return it would be able to demand far more and better products for the money, and to ask for evidence as to how the new composite organization intended to tackle the organization of the rest of the building market from the start given by the bulk annual order.

The creation of buildings would thus become a manufacturing operation for the production of standardized units of considerable technical sophistication and light weight, which would be easily and quickly assembled on site, with the minimum of groundwork.

The tendency would therefore be for the majority of present building companies (which do not possess suitable industrial organizational or technological skills) to move over from building into civil engineering, to the construction of roads, dams and harbours, fields incapable of standardization and direct mass-production, and consisting of work where their traditional skills and techniques can be more readily employed.

This is, of course, if they choose either to make this move deliberately, or to have it thrust upon them by ignoring possibilities of collaboration with manufacturing industry until the chance has gone.

* This comparison is perhaps useful; Bobrowski recently pointed out that at the time of the first world war, when both homes and cars were built by hand, one could buy two homes for the price of one car. In my opinion this is the right relationship for the houses and cars we have at the moment, considering the relative complexity of the two products. Unfortunately nowadays when cars are mass-produced, houses are still built by hand. As a result it is now possible to buy eight cars for the price of one house. By the use of mass-production we have a far better product at one-sixteenth of the cost, relative to the hand-built house.

Bubbledom

AD 2/68, page 56

We omitted to give due credit to the firms and individuals connected with the PVC dome used for the film *The Touchables*. Arthur Quarmby, the consultant architect, did the preliminary design, and correlated detailed recommendations from specialists such as Birdair, Farnborough, Vent Axia and Patamac. Walter Newmart of Frankensteins gave detailed constructional advice, Patamac Special Products made the dome, Woods of Colchester supplied the fans, and Film Designs Ltd and Brighton & Co. supervised construction.

Underwater inflatable

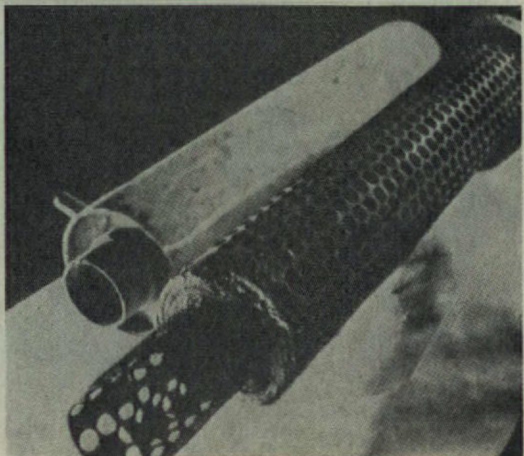
Three Russians have designed an inflatable underwater observation post—the Octopus—that can be fitted into a rucksack. The inner layer of the dome is rubberized to prevent air leakage, the three outer layers are of a dense fabric; the whole being covered with thick rope netting which is used to anchor it to the sea floor. Within is a light, dismountable timber floor with a steel hatch for entry and exit. In July 1967 the designers spent two weeks living in the dome, at a depth of 20ft off the coast of the Crimea. The experiment demonstrated the reliability of the dome, though modifications are being made.

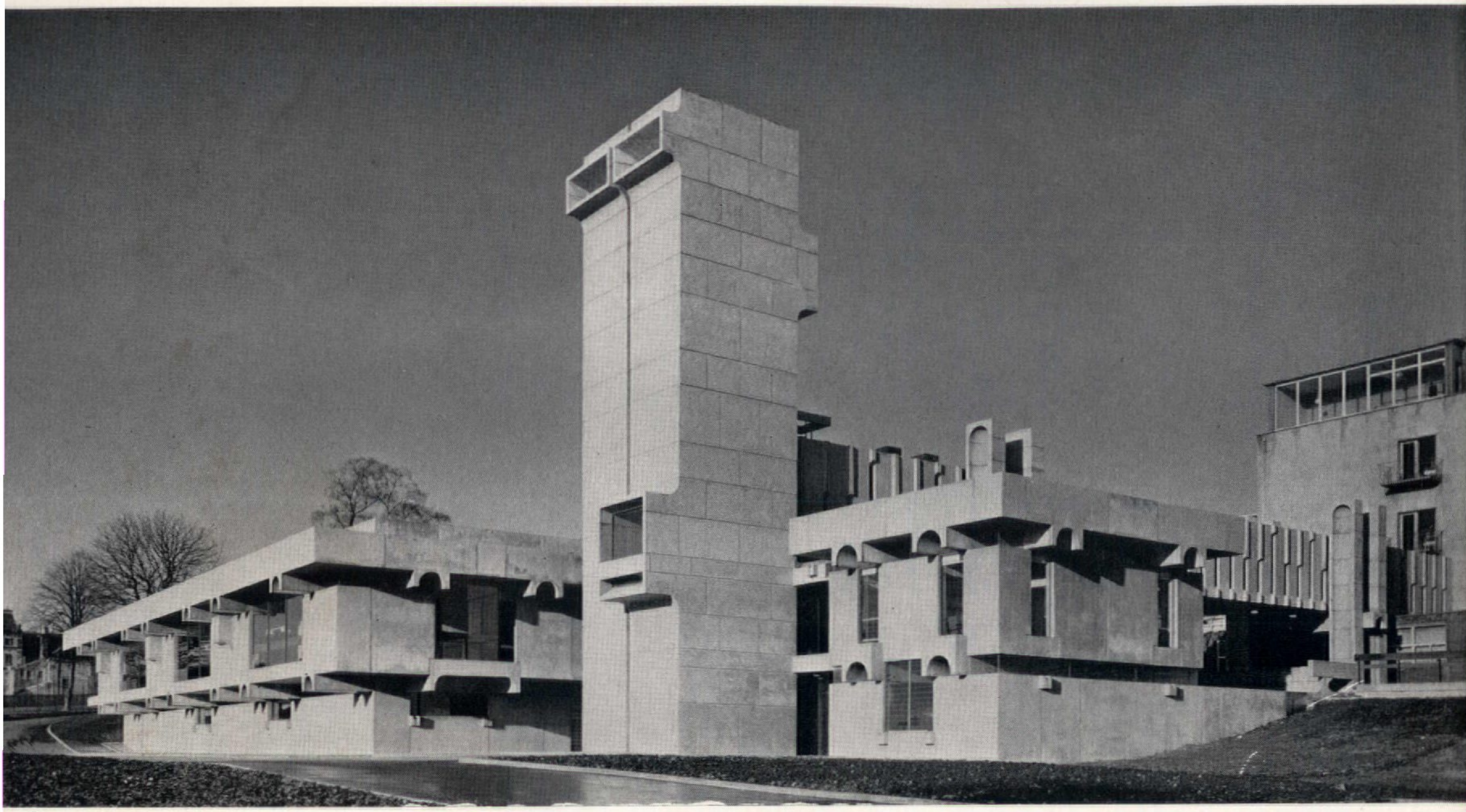
New Scientist, October 26th 1967

Palliative

Two hundred buses in Alma-Ata, capital of Kazakhstan, USSR, have been fitted with catalytic neutralizers that purify virtually all exhaust gases and, at the same time, act as silencers. The neutralizer is a meshed cylinder filled with grains of a palladium catalyst on an alumion-silicate foundation. Fitted beside the cylinder is a small compressor which feeds clean air to the exhaust gas before it enters the catalytic reactor of the neutralizer. At high exhaust temperatures this promotes combustion of 90 per cent of the carbon monoxide, nitric oxide, hydrocarbons, aldehydes and the dangerous carcinogenic substance 3,4-benzepyrene left in the exhaust as a result of incomplete fuel combustion.

Science Journal, March 1968



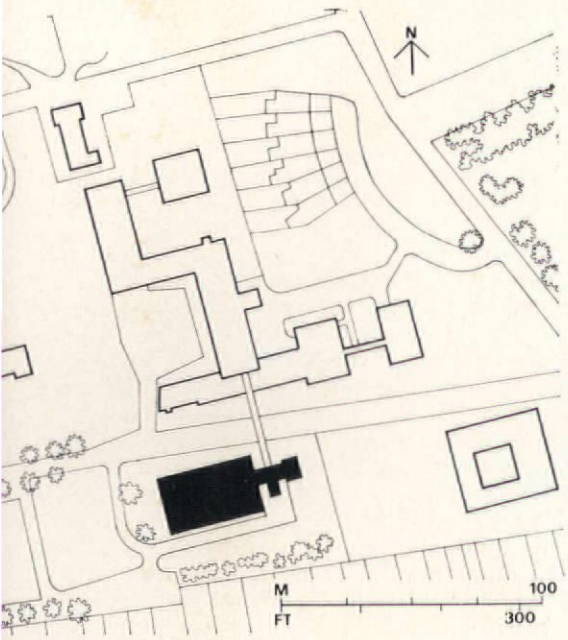


1

Nuffield transplantation surgery unit, Edinburgh

Peter Womersley
assistant: J. Blackburn

All photographs Sam Lambert except 3, below, by Edwin Johnston who also wrote the commentary



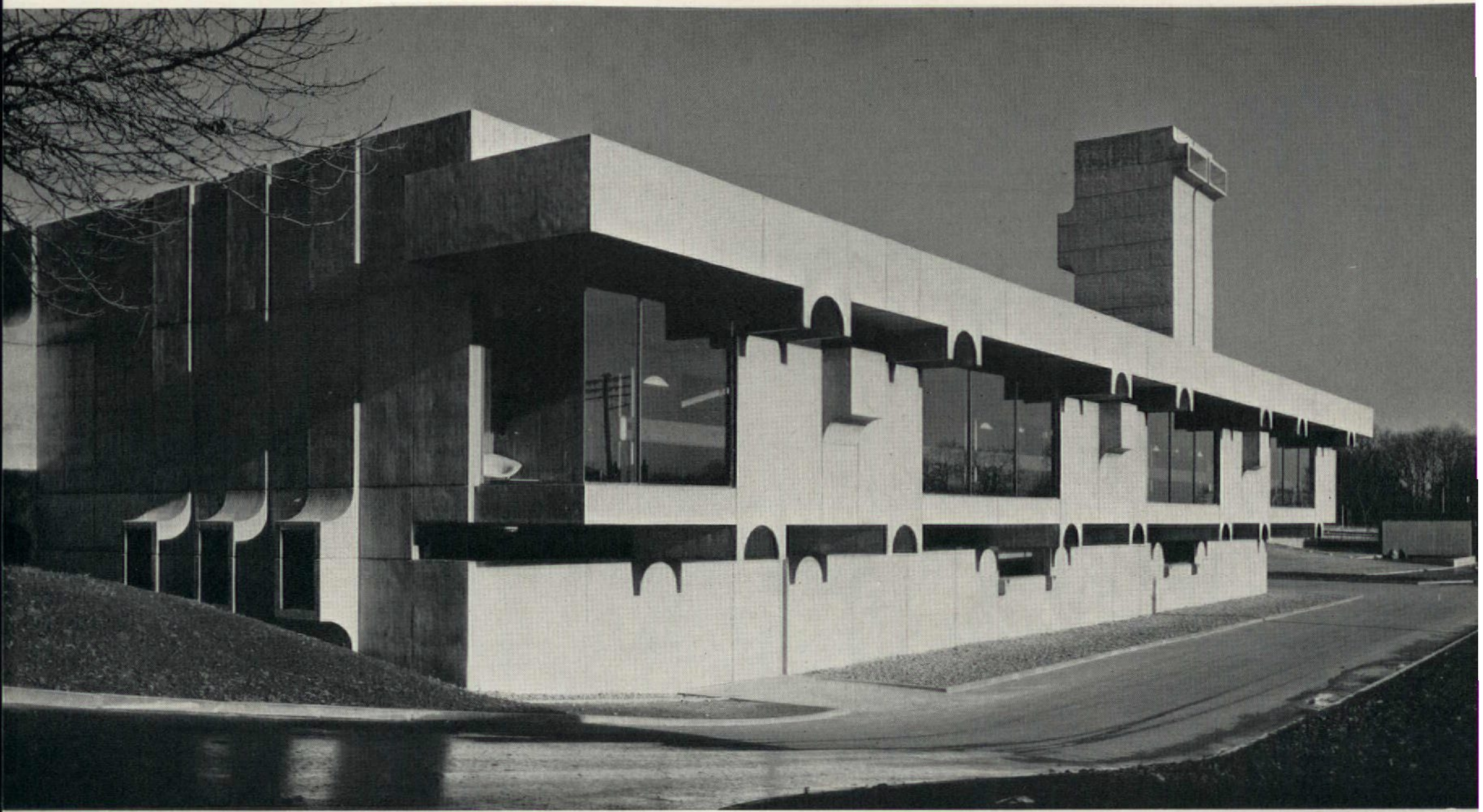
2

AD's first Grand Project Award in 1964 went to this transplantation unit at the Western General Hospital in Edinburgh. Hailed as Fort Knox by the locals—a comparison almost certainly suggested by the fortified bridge and desert sand coloured concrete—it is the most recent architectural contribution to a northern city whose origins were prompted by the fortification of the castle rock.

In the context of medical history it is in fact unique, being the first experimental building of its kind specifically designed for the transplantation of human organs, a science which has progressed astonishingly since the architect's initial brief of 1963. Many very specific and complex technical requirements—particularly those of sterilization—were demanded of the arcitects for the successful performance of the building. But apart from these, the temporary isolation of patients from the community, their emotional security, visual communication between inside and outside the building, and the psychological problems generated by relatively long periods of confinement, offer some indication of the more abstract problems with which they also had to deal. 157▷

1
View from the south-east with the radiotherapy building on the far right
2
Site plan
3
View towards Edinburgh castle

3



◁156

1

Preliminary research by the South East Regional Hospital Board architects in consultation with medical specialists led to the development of a plan for the core of the building. It was in fact part of the architect's brief, around which he was free to assemble public spaces, office accommodation, service facilities and a covered link to the existing radiotherapy building to the north of the main approach road to the hospital.

What might so easily have turned out to be yet another dull addition tentatively linked to a rapidly expanding hospital—where a number of architects appear to be going it alone—has turned out to be an uncompromisingly bold solution, tied back to John Holt's radiotherapy building by the bridge that soon evoked the local term of endearment. A double cantilever held up by a cluster of vertical barrel vaults provides a fanciful note which, one suspects, must have arisen when the architects decided to express the internal steel truss as a defensive pattern of precast concrete panels. In an outburst of sculptural invention internal spaces are logically and explicitly expressed on the external envelope. For example, on the south elevation, expansive areas of glazing reflect the patients' rooms, with bathrooms obscured by solid areas of concrete. On the east façade, the carefully manipulated profile of the tower, the horizontality of the bridge, and the delicate relationship of the building to the gently sloping site, all add up to a composition strikingly oriental.

Sandwiched between layers of services above and below, the aseptic core of the main block consists in three basic zones; staff sterilization area, operating suite, and patients' rooms. In the central corridor three superb Japanese physiological monitors set the tone of the sophisticated inter-communications systems which abound—vital since personal contact between patient and staff is reduced to a minimum. The essential need for sterilization in a building of this kind is a subject of current medical controversy, but here it has been specifically designed for, and it is therefore important that the unit will stop functioning on as few occasions as possible when maintenance work may be required to be carried out. It is for this reason that one questions the architect's selection of plaster as an adequate finish for the core area—particularly in the operating theatre.

Around the main block, the roof to the peripheral corridor is carried on a system of cantilevered barrel vaults, which *en route*, pass through a continuous horizontal clerestory light in the external wall and terminate in an apse on the innermost face of the corridor. In the administration block, and particularly in the entrance foyer—where the ceiling is made up entirely of vaulting, visual continuity of vaults from one room to another, and from internal space to external space, is consistently maintained by extensive use of the horizontal beam-deep glazing. Here, the persistent effort to dramatize the projected vaulted beams, and also the relentless effort expended on recessed details throughout, is somewhat reminiscent of Jacobsen's St Catherine's College in Oxford. This is particularly apparent where the builder has failed to live up to the designers' expectations in inserting a 16in radius semicircle of glass—without the aid of a frame—into the underside of a 16in. radius *in situ* concrete vault (no mean expectation when one considers the fractional variables in vault sizes which must inevitably occur when concrete is formed by a fibreglass mould). Regrettably, the marble sheen-like finish of the concrete envisaged by the architect is not of the highest standards. And, on the occasions where it has fallen short of the mark, therefore appears more emphatically unsatisfactory because of the very precise nature of the detailing.

Aesthetically the building is full of surprises. Restricted isolated areas of intense colour effectively applied invade quiet restful spaces where the consistent muted browns of the internal concrete predominate. Artificial lighting is excellent and the exploration of its potential visual effects is typical of the immense care and thought applied elsewhere in the design. For example, in the stair tower, an ingenious strip light built into the balustrade throws light in the most appropriate place—also lending a subtle visual emphasis to the half cantilevered precast concrete treads. Lighting troughs frequently erupt out of the concrete, carefully disguised at sill level behind the clerestory windows—once again further dramatizing the structure. From the solid limba door handle to the gigantic mouthpieces on the tower, the curve—originating in the architect's adoption of the vaulted beam—is exploited in concrete, plaster, and glass—sometimes beyond its logical limit.

But the crystalline transparency of the interior spaces is superb. From the central corridor monitor bays, through the patients' rooms to the observation bays off the peripheral corridor, each interpenetrating space is clearly defined with no loss of the essential geometry. Here, the technical demands of medical care have been satisfied, the feeling of a patient shut up in a ward utterly eliminated, while at the same time the architect has successfully avoided any conflict of materials and colour likely to occur from repetitive use of floor to ceiling glazing. A total break in fact has been made from the architectural qualities associated with medical buildings—a design priority which led to the

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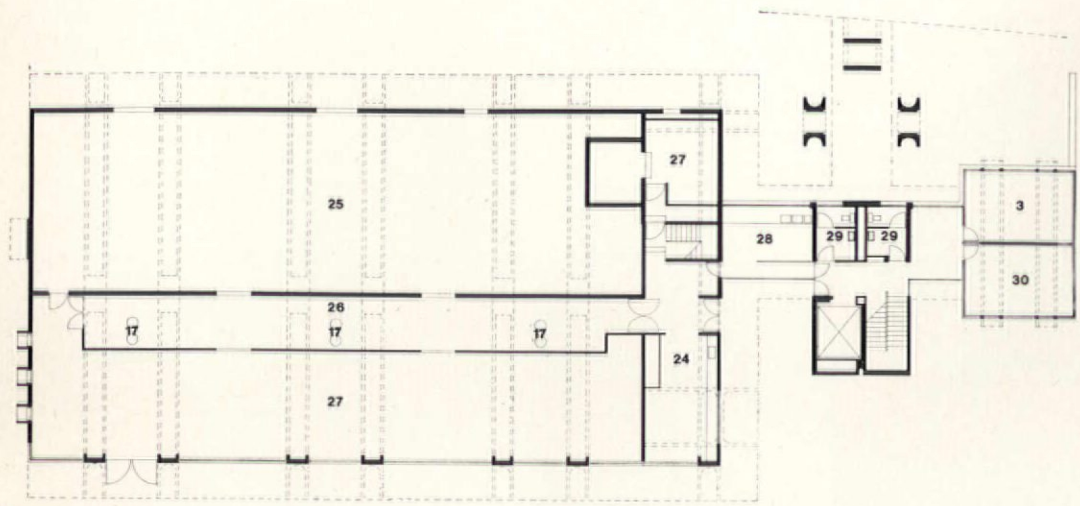

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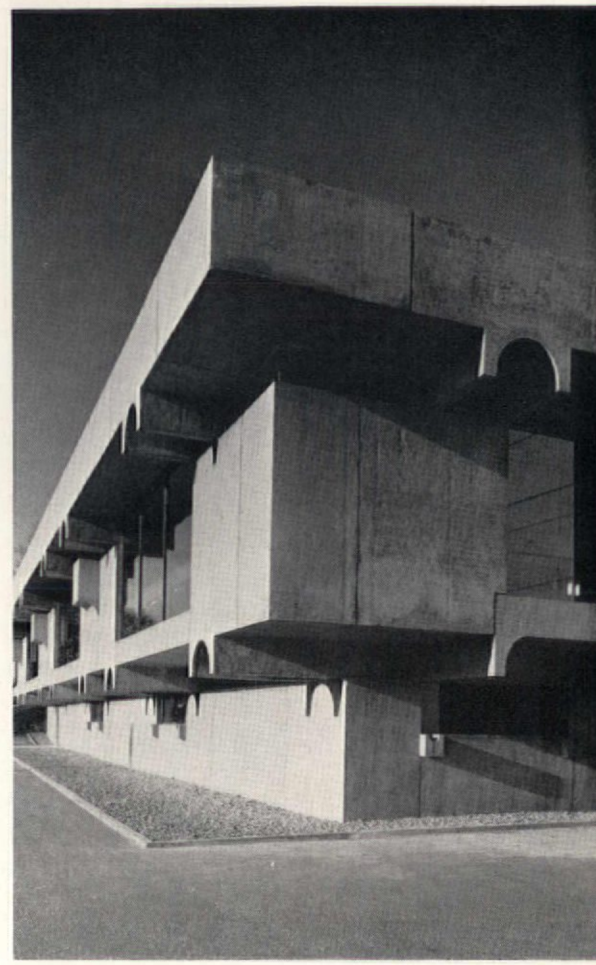

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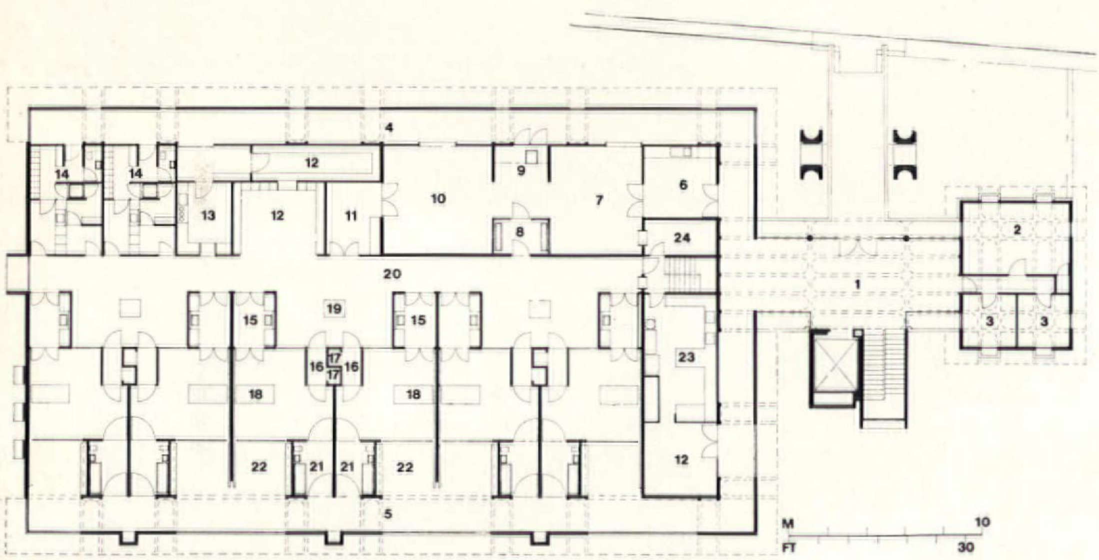

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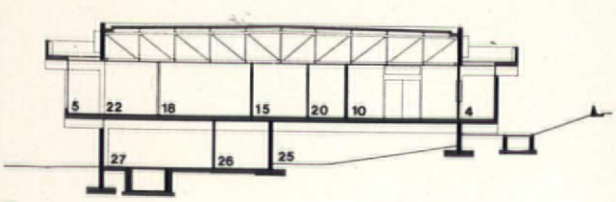
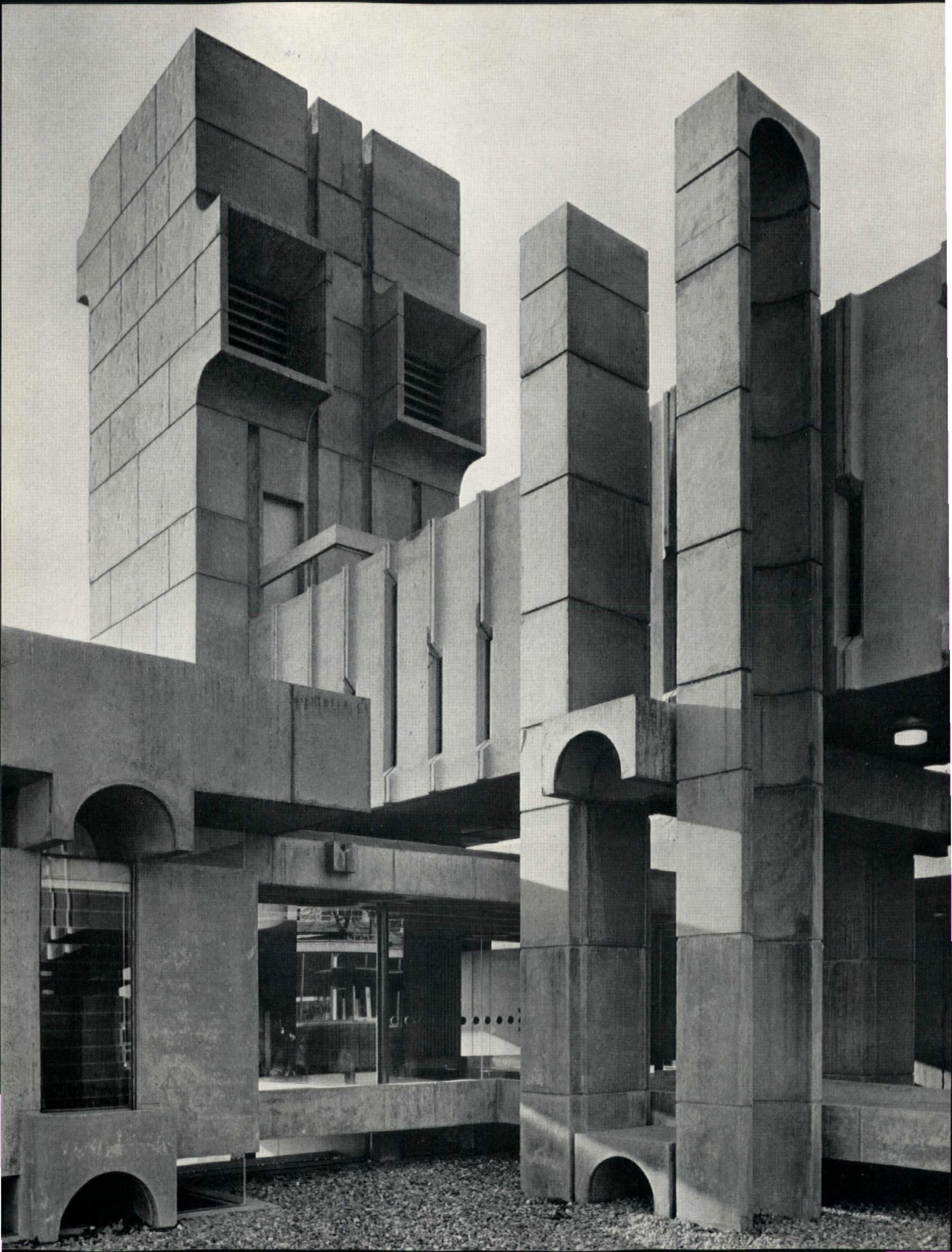


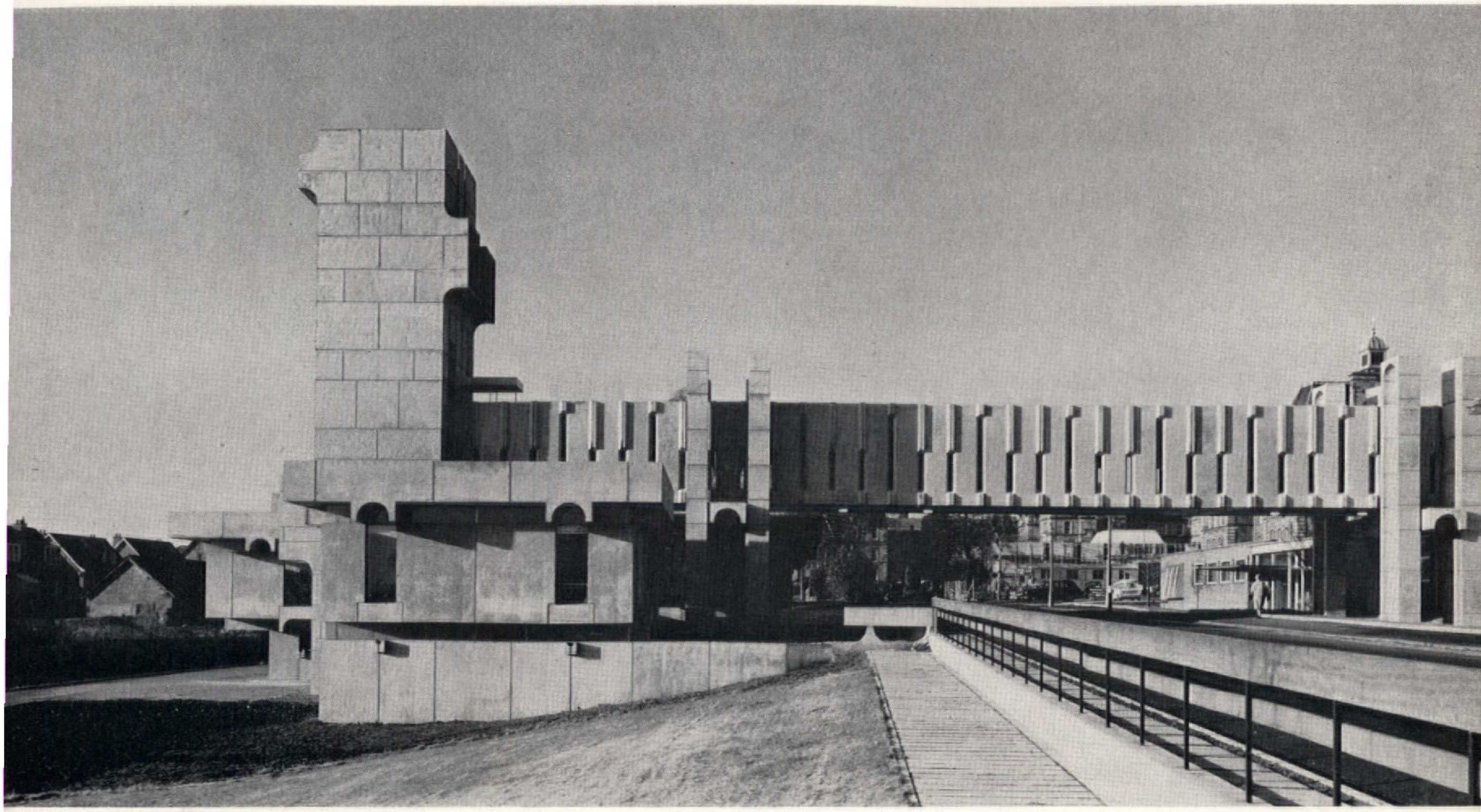
5

1
View from the south-west
2 & 3
Basement main and level plans
4
Broken longitudinal section
5
Cross-section
6
Detail of the south-east corner

Key

1 entrance hall
2 conference
3 office
4 private corridor
5 visitors corridor
6 decontamination
7 donor theatre
8 scrub-up
9 sterilization
10 recipient theatre
11 anaesthetic
12 store
13 kitchen
14 changing
15 entry airlock
16 exit airlock
17 disposal chutes
18 patient
19 physiological monitor
20 aseptic corridor
21 bathroom
22 observation area
23 laboratory
24 disposal
25 solum access to services
26 disposal corridor
27 plant
28 sluice
29 wc
30 staff
31 bridge





1

2

◁157

architect's decision to aim for an hotel atmosphere. Throughout, this ambition has been realized. In the corridors, a uniform level of illumination has been rejected in favour of localized lighting, but nowhere is it more in evidence than in the entrance foyer. Approached across a ceremonial moat the twin post and beam construction of the bridge above registers first. The curved upstand of the floor, the singular horizontal line of big red dots on the recessed entrance screen, and the sophisticated vaulted coffer slab dramatically lit from the floor all add up to a space decidedly eastern. Until, that is, the illusion is shattered by a glimpse of Edinburgh castle to the south. Through this space staff will wheel patients, supplies, and corpses, and it is here that the exciting visual qualities found elsewhere in the building reach their dramatic climax.

Edwin Johnston

Opposite
Tower, upper bridge and entrance from the north-east

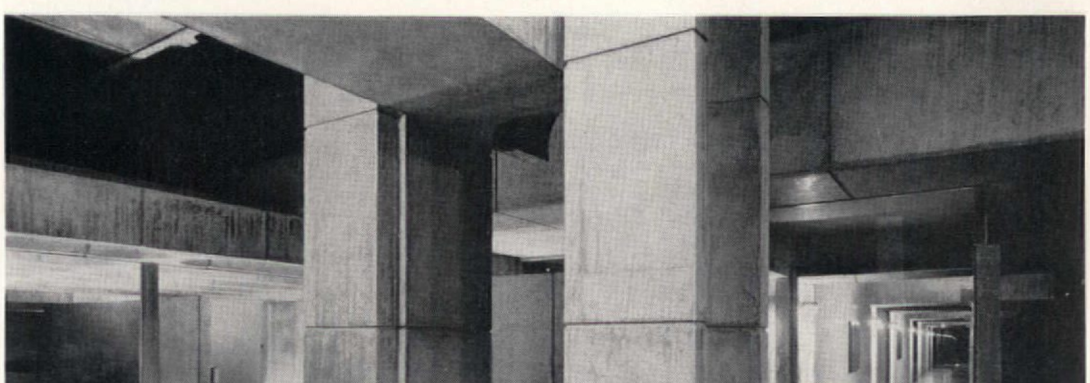
1
The bridge and east elevation

2
Interior of bridge

3
Detail of the entrance and bridge supports from the north-west

4
The entrance hall and staff corridor seen from the approachway

3



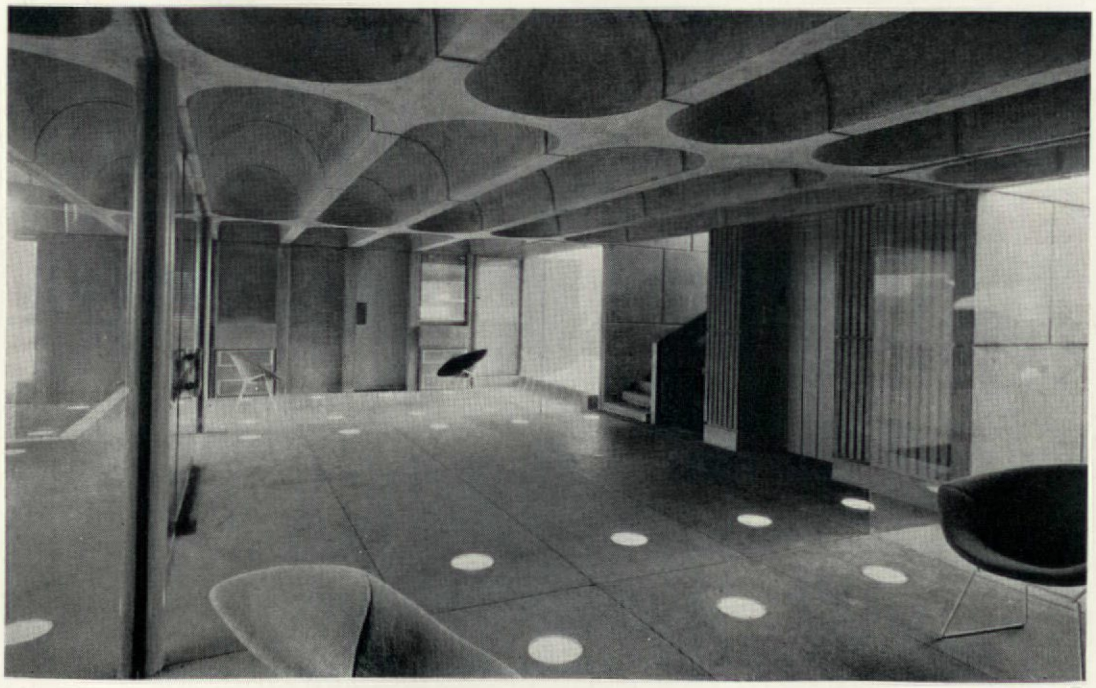
4

1

1
The entrance hall by night

2
The entrance hall with the lift on the right

3
West end of the visitors' corridor



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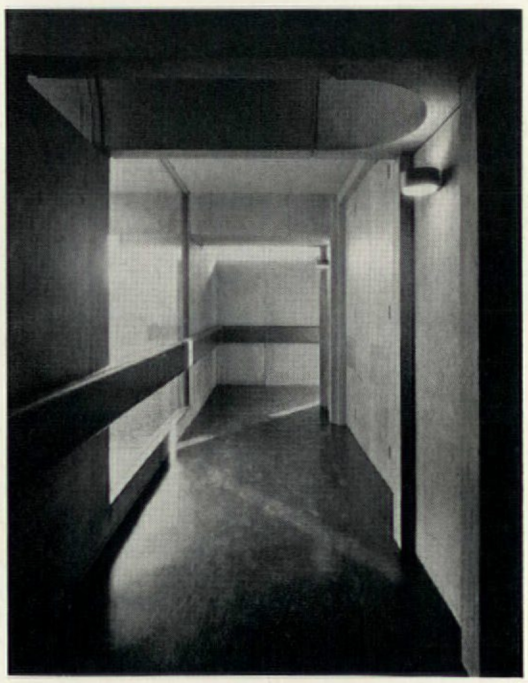

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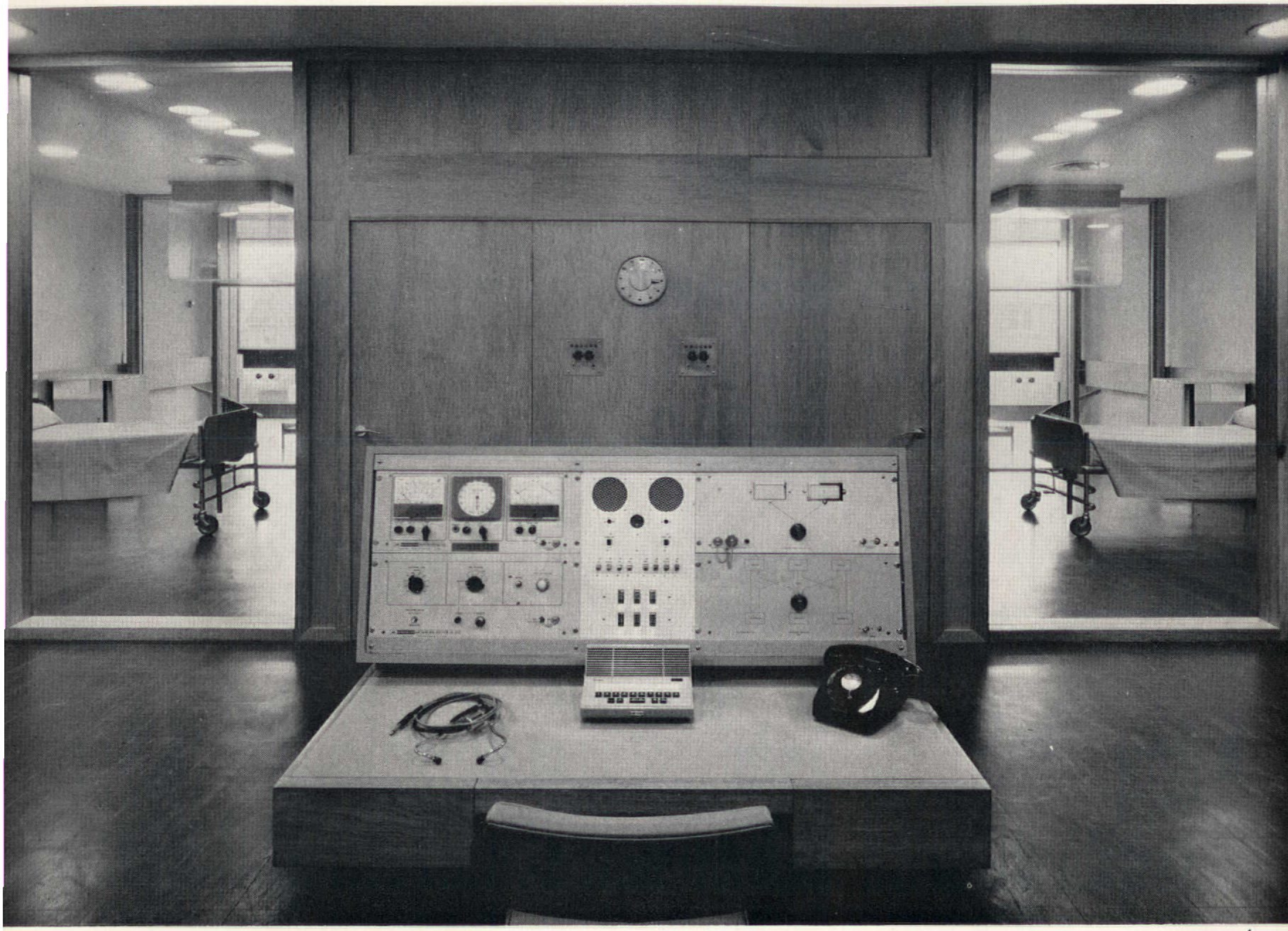

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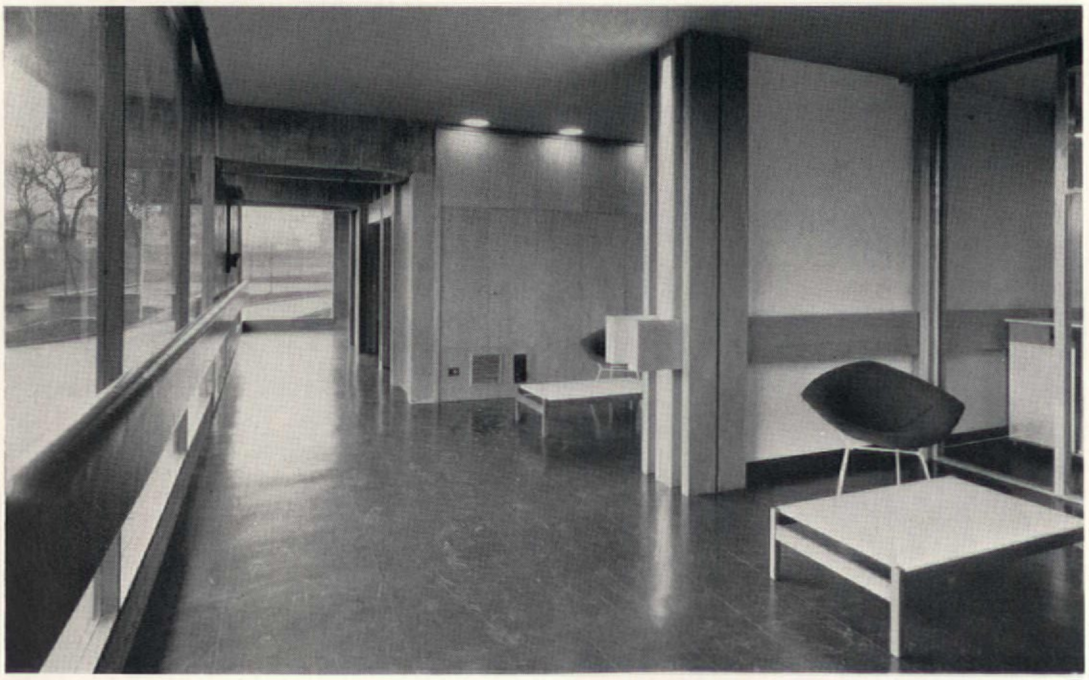
4
Physiological monitor with a view of two bedrooms

5
The visitors' passage and two visitors' bays

6
A patient's room with the visitors' bay beyond



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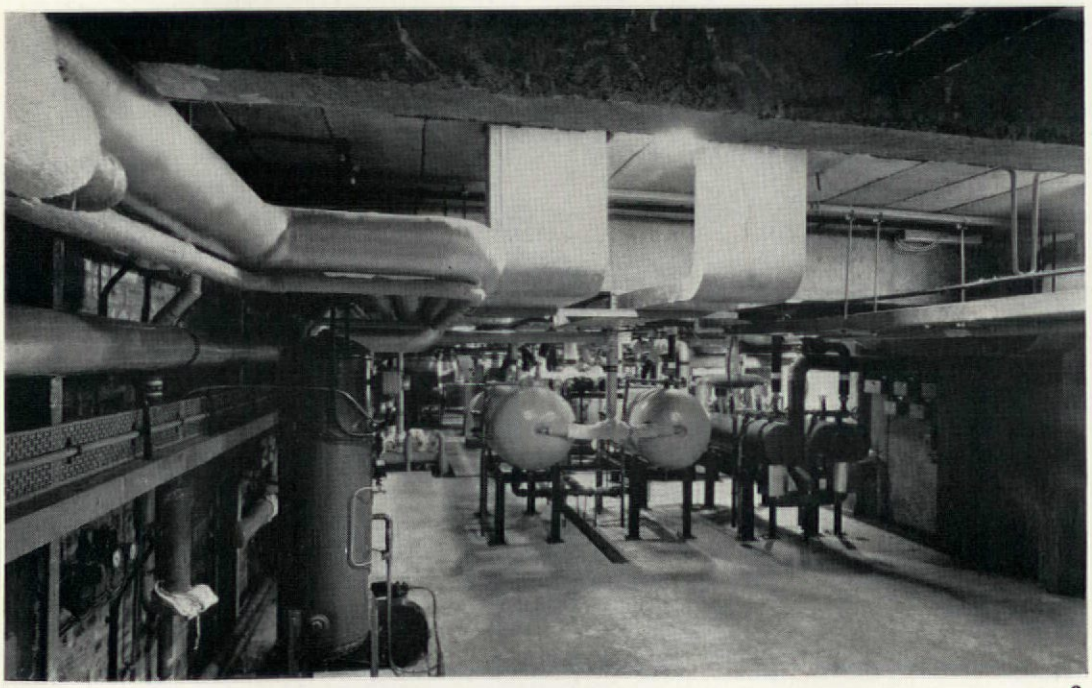


2

3

1
The donor and recipient operating theatre

2
Basement plant room

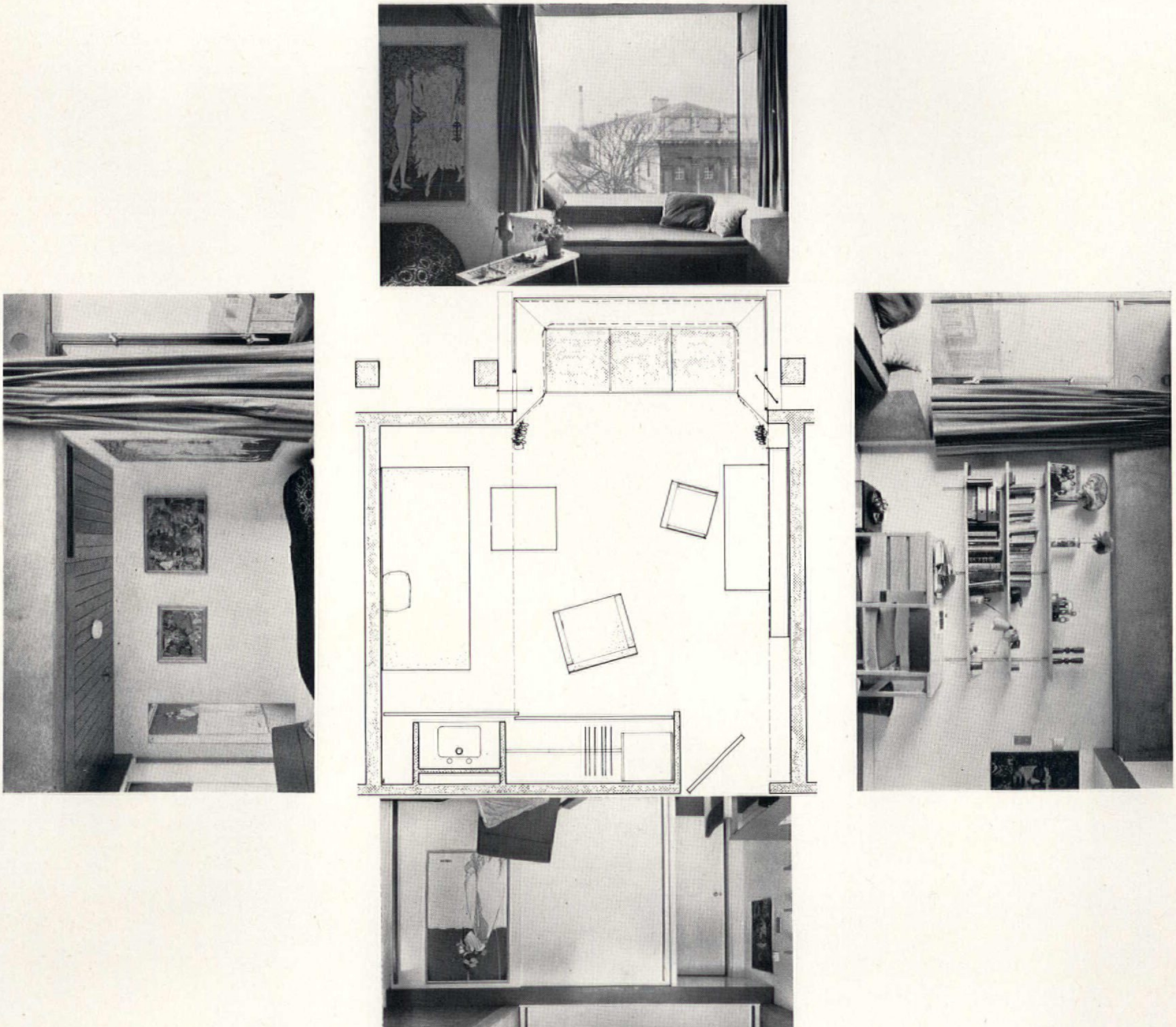
3
Disposal chutes in the basement

A room of one's own

The multiple function of a student bed-sitting room is a problem in opposites—a place of work and sleep, a retreat and a place to entertain, a place of privacy yet identifiably part of a larger community. How to reconcile these, and create at once somewhere with a sense of generosity and place, is discussed here by Philip Dowson of Arup Associates.

The new Wolfson Building at Somerville College, in Oxford, is the most recently completed of a series of graduate and undergraduate college buildings which Arup Associates have designed during the past decade, and falls within a line of development which started with the designs for Somerville's first graduate house in 1958, includes Corpus (Leckhampton) 1964 in Cambridge, Somerville II (Vaughan) 1966, and Trinity Hall (Wychfield) again in Cambridge, due to be completed this summer.

The building committees for Leckhampton and Wychfield included students, and in the case of the Wolfson Building the designs were discussed with them. It was notable how variety, allowance for self-expression, and the need to plan against loneliness were stressed.



The room for the new Wolfson Building shown in plan and elevation above was evolved from earlier experience of Arup Associates. It is composed of four main elements—a work wall, a bed/sofa alcove, a large window seat, and a storage wall. There is a transition from internal to external space, from the alcove to the window seat, which projects through the structure beyond the face of the building. Here the external relationship to the building itself and the quadrangle becomes predominant. There is the social purpose of identifying the part with the whole, and so creating a sense of 'belonging', and it was intended that that which translates the idea of the room itself, into its physical form—the 'constructed' space—should occur naturally within a total building anatomy, revealing a consistency between the idea and its execution.

Following on from this there is an emphasis on the distinction between the main elements of window seat, bed alcove, work wall, storage cupboard, structure, and so on. This reaches towards a conjunction of the individual parts which are irreducible and in a simple relationship to each other.

The site for the new Wolfson Building, adjacent to Walton Street in Oxford, joins two existing buildings, and completes the enclosure of Somerville's quadrangle. The existing buildings had different heights, axes, sections, and character, which presented difficulties; and an entry for fire engines and ambulances on an already restricted site was an additional limitation.

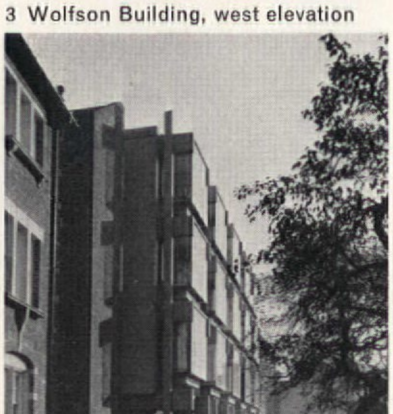
The building was designed, on the one hand, to be absorbed into the existing street scale on the frontage to Walton Street, and on the other

1 Arup Associates' recently completed Wolfson Building at Somerville College, Oxford, seen from Walton Street

to form part of the ribbon of differing buildings that make up the perimeter of Somerville's large and informal quadrangle. The view from the street is an oblique one, but from the College it is seen normally in full elevation. The reflections on the projecting windows of this elevation play an important part in the design, bearing in mind that this façade is often in shadow. This particular quality will be assisted by a tree, which it is intended to plant close to the east façade; one exists already on the west.

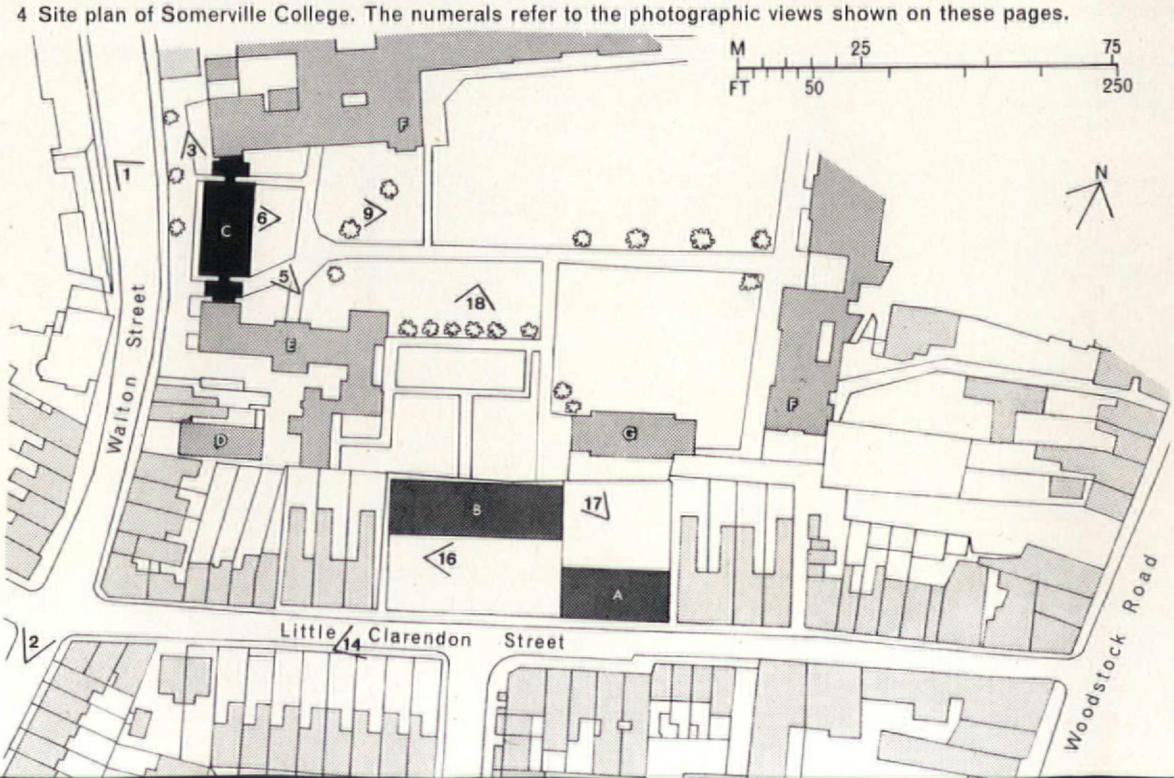
The final brief was for twenty undergraduate study-bedrooms (a minimum

2 View of Wolfson Building from further south down Walton Street



3 Wolfson Building, west elevation

4 Site plan of Somerville College. The numerals refer to the photographic views shown on these pages.



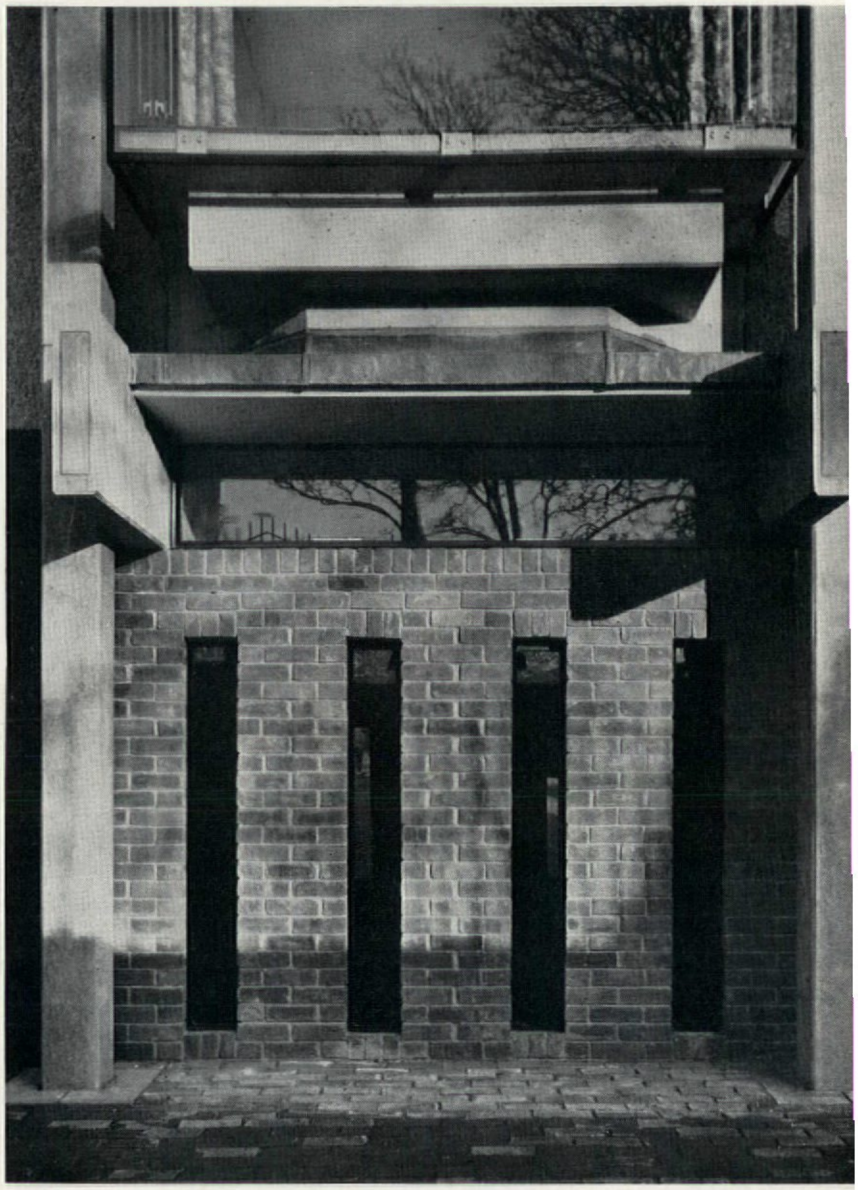
Key to plan
A Margery Fry
B Vaughan
C Wolfson
D Hall
E Penrose
F Somerville
G Chapel

area of 145 sq ft), two tutor's studies, three Fellows' flats, all for possible use by undergraduates, and a multi-purpose hall at ground level to be equipped for lecturing, teaching and general social functions, including music and simple theatre. Artificial as well as natural ventilation was to be provided to all rooms facing on to noisy Walton Street. There was a fixed budget from a grant from the Wolfson Foundation.

Staircase access from each end is planned within brick service towers, which also act as links between the old and the new. The service rooms are approached from the half landings as at Leckhampton (See *AD* 12, 1966, p. 596). The lobby access to each group of rooms is short and lit from the

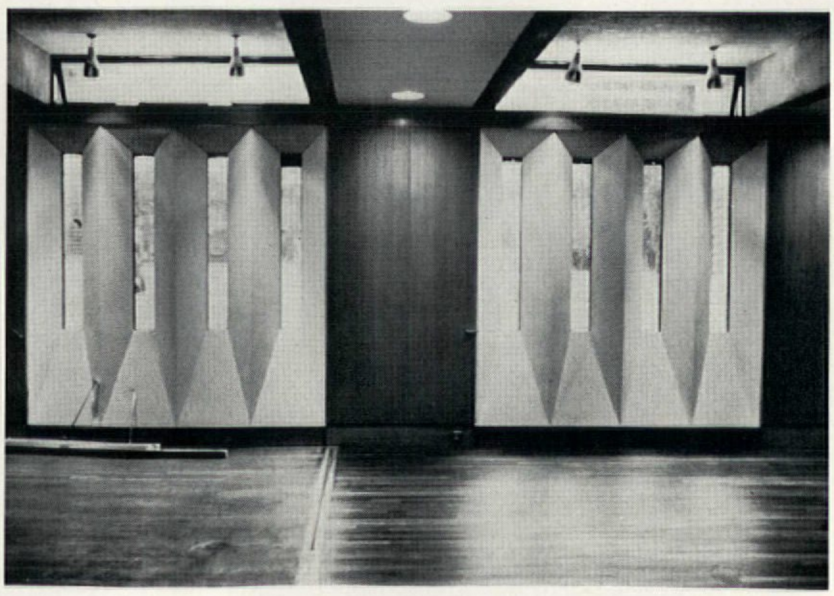
5 Reflections in the east façade of the Wolfson Building

6 Typical detail of a ground floor bay of the Wolfson Building



7 Typical room

8 Multi-purpose hall

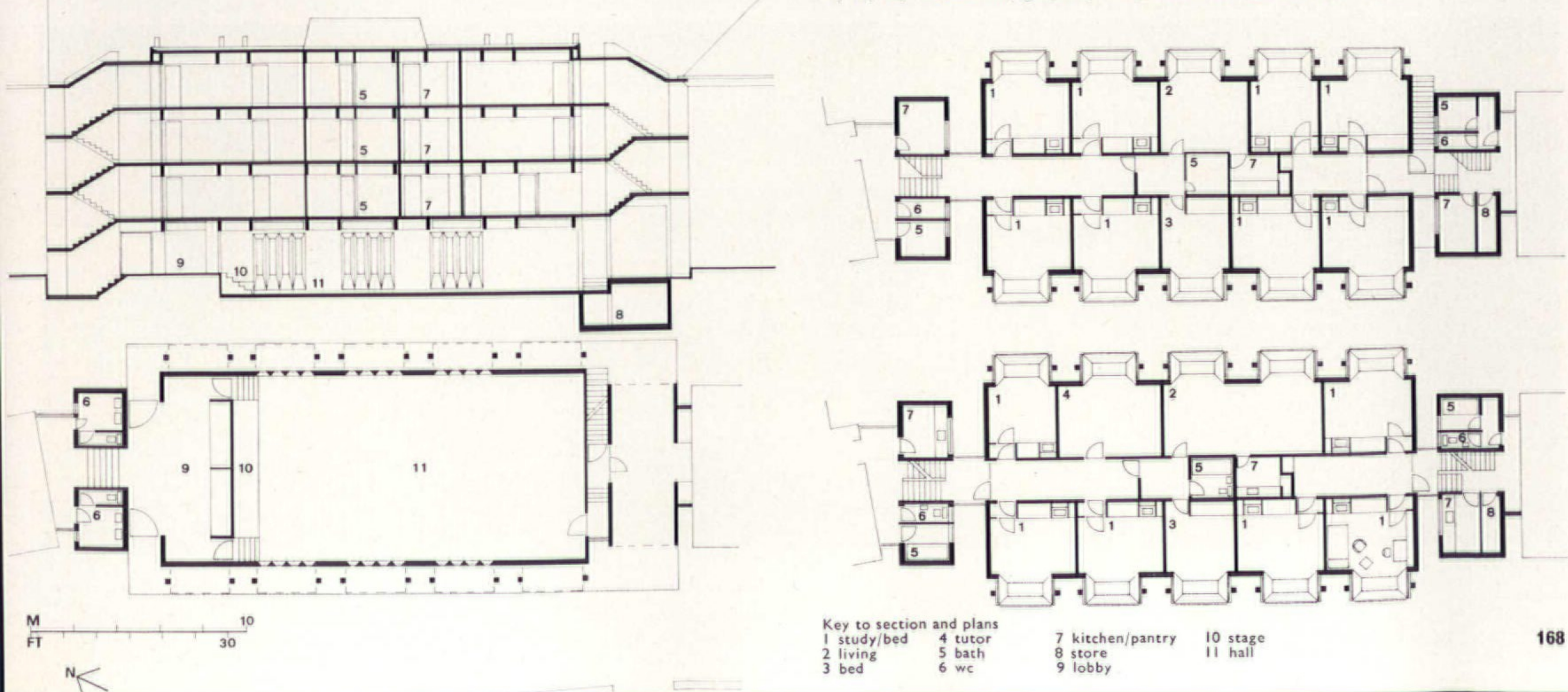


end, which produces a light, but enclosed space, separated from staircase noise. Access to the south stair is directly from the quadrangle, and to the north stair from the existing adjacent building; this was to allow for entry to the main hall either from the quadrangle or from Walton Street, which as a requirement, had to be isolated from the access to the rooms above. 'Control' determined the design of the circulation of this area.

There was a more complex planning problem associated with Somerville's first new development, which had to include on a restricted site, shops with their separate access for stores behind, underground garages, as well as a main entrance to the college to be related to the existing chapel and

9 View of the Wolfson Building from the interior court of Somerville

10, 11, 12, 13 Section, ground, first, second and third floor plans



Key to section and plans
1 study/bed
2 living
3 bed
4 tutor
5 bath
6 wc
7 kitchen/pantry
8 store
9 lobby
10 stage
11 hall

circulation system. Two raised courts, one grassed and one paved, one 4ft 6in above the other, separate in 'section' the street activities from the collegiate ones. Planting and landscaping in the brick paved upper court is an essential part of the design and has still to be undertaken.
Interestingly, the new shops have attracted others, with an effect on the use and entire character of Little Clarendon Street. This was once a rarely used backwater, but it has now become a street known in Oxford for its colourful and individual shops.

Somerville's Vaughan Building was completed at the end of 1966, although, with the Fry graduate building, it was designed ten years ago. However, the

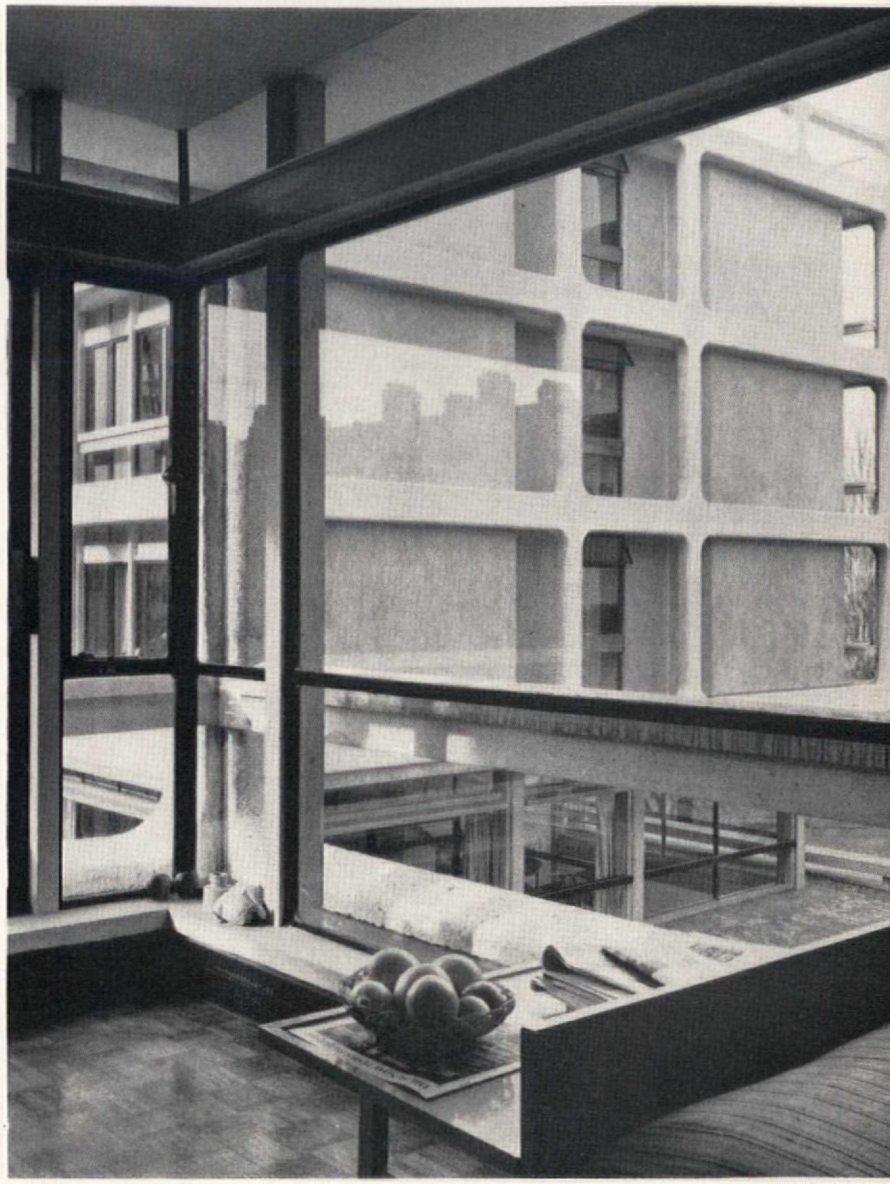
14 Margery Fry and Elizabeth Nuffield House and the Vaughan Building glimpsed above the new shops in Little Clarendon Street

15 The tunnelled entrance to Somerville College, from between the shops (shown above) in Little Clarendon Street

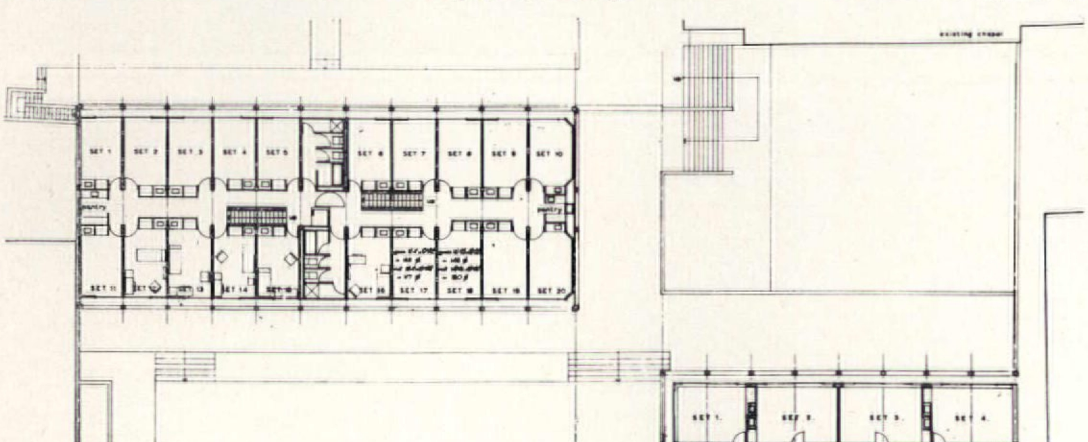
relationship between these two buildings, and the design of the rooms themselves, were based on the same broad intentions as have already been described. The rooms at Leckhampton and in the Fry building are generally larger than those in Wolfson, and permit a wider range of possible furniture layouts. Generous window areas in both allow for a close visual link with the garden and other buildings, and the sense of enclosure and possible withdrawal was in this case emphasized with a 2ft setback. The clerestorey, with the deep transom from which the curtain hangs and indirect lighting is provided, allows the ceiling plane to be visually extended beyond the limits of the room by day and night, while the overhang provides privacy.

16, 17 & 18 Views of the Fry and Vaughan buildings, indicated on the site plan

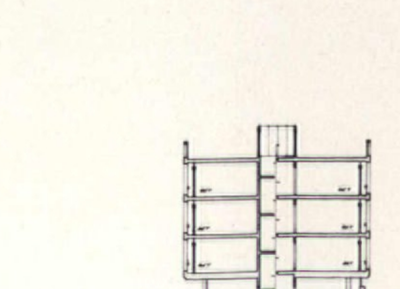
19 The Vaughan Building seen from inside the Margery Fry building

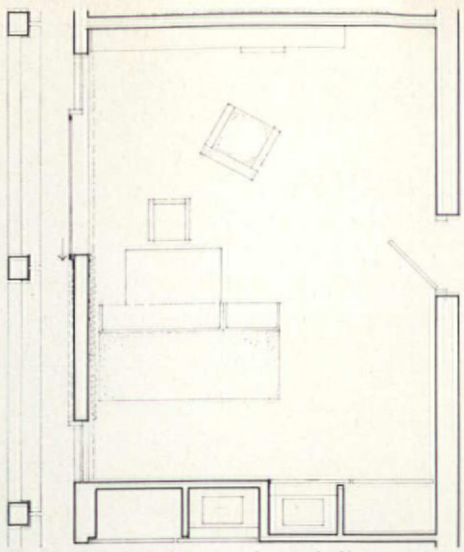


20 Typical floor plans of the Vaughan and Margery Fry buildings

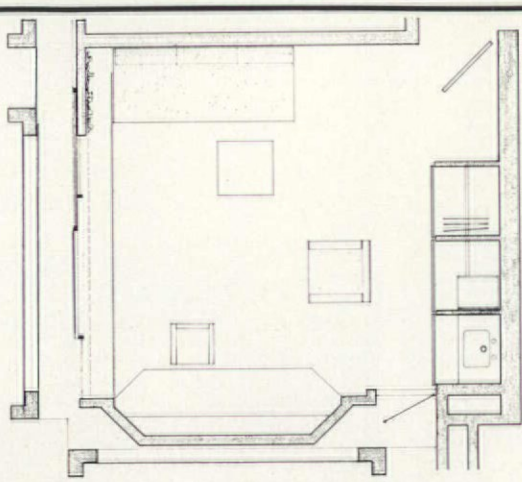


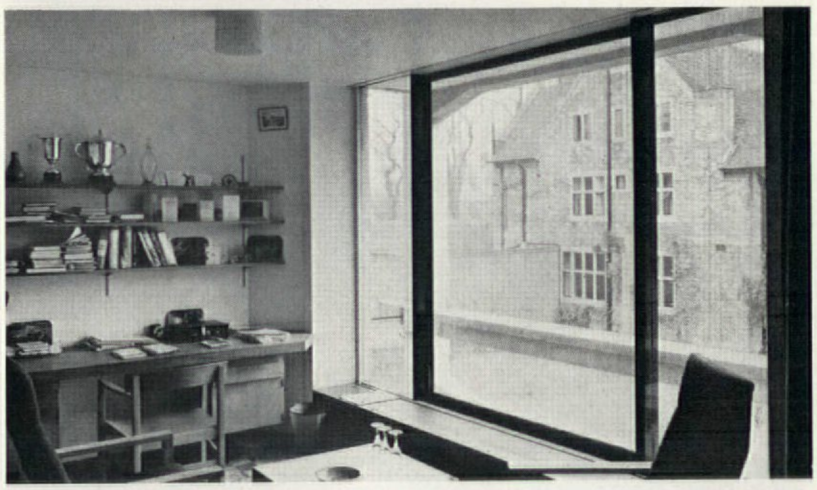
21 Section through Margery Fry building



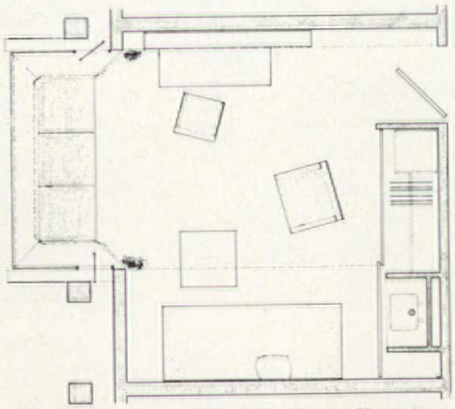


Somerville College, Oxford, stages I and II

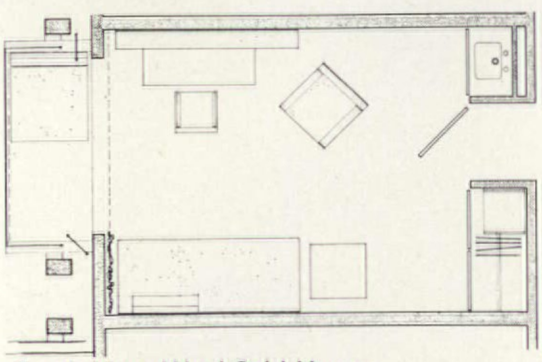




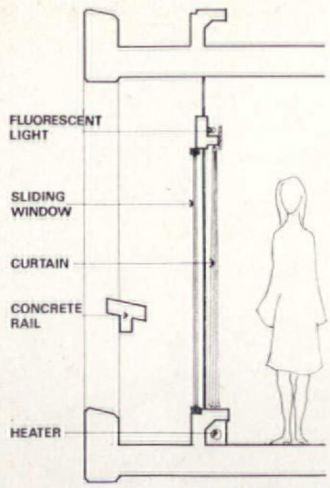
Corpus Christi, Cambridge, Leckhampton House

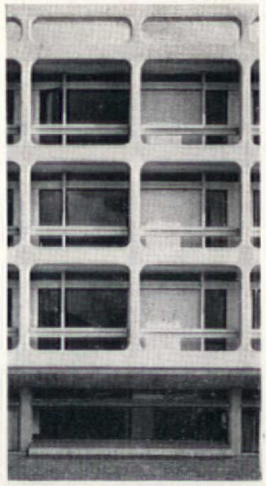


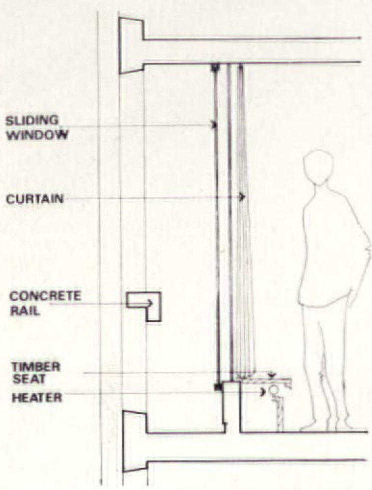
Somerville College, Oxford, stage III, Wolfson Building

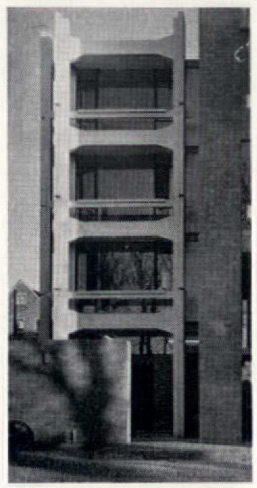


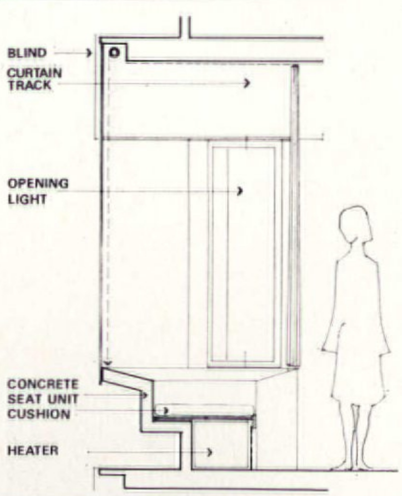
Trinity Hall, Cambridge, Wychfield House

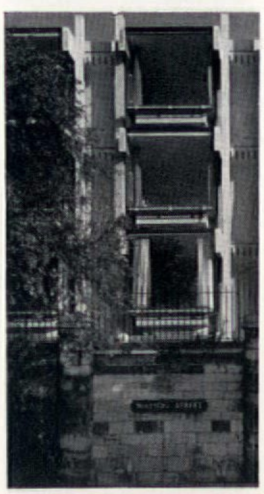


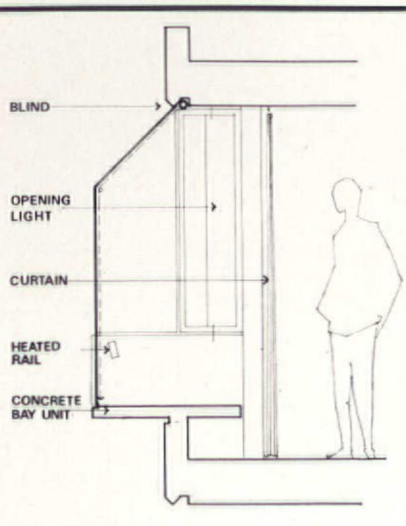












The large sliding windows, when opened, make the whole room a balcony. It is to be remembered that these are graduate rooms, and occupied for most of the year. This solution, however, became perhaps less applicable to Somerville's Vaughan Building, when the number of rooms was increased from forty-eight to sixty to conform to UGC standards, when a grant was made available and the area of each reduced. The Wolfson rooms were also to be smaller, and when a design for this building was considered a more compact and closely knit solution was sought which would nevertheless resolve the same problems already outlined.

The design for Wychfield is a development of Wolfson, without the problem of a large hall at ground level, and the beam and column structure which was adopted as a consequence. The room is similar in plan but has a ceiling height of 7ft 6in with a simplified window seat, in this case considered more as a raised extension of the room itself, which projects through the frame.

This raised extension is independently heated, and ventilation as with Wolfson is from the sides and thus free of, and behind, the roller sun blinds, which are provided in addition to the curtains in both buildings.

Technically the most difficult problems have been associated with sound and services, both easily underestimated, and the more recent plans have been particularly influenced by both aspects. Certainly the mezzanine arrangement at Leckhampton and Wolfson works well, and whilst separating staircase noise, also provides an activity on each half-landing. This reduces a sense of horizontal stratification in the building, and at once increases the choice open to a user, and helps towards an intermingling of students. This has been noted and commented upon by those living in Leckhampton.

The other consideration which has increasingly influenced these designs, has been the organization and speed of the construction process so as to reduce the effects of noise and nuisance to College life as far as possible. The main structure of Wolfson was erected in six weeks, and the contract completed in just over a year. All three buildings have a frame construction, for the flexibility it provides, and in every case there is provision for either common rooms or halls at ground level.

Summary of information

	Somerville Stage I *Margery Fry and Elizabeth Nuffield House* **Somerville Stage II** *Vaughan Building*	**Corpus Christi** *Leckhampton House*	**Somerville Stage III** *Wolfson Building*	**Trinity Hall** *Wychfield House*
Date of design	1958	1962	1965	1966
Date of completion	Fry 1962 Vaughan 1966	1964	1967	Summer 1968
Structure	Precast concrete external cols. and beams; *in situ* concrete floor slabs	Precast concrete H frames externally; *in situ* concrete floor slabs	Precast concrete beams, columns and slabs. Post tensioned beams	Precast concrete H frames externally; *in situ* concrete floor slabs
Heating	Oil fired boiler. Hot water distributing through gill tube skirting heater. Supplementary electric fires	Modified gill tube heater under window bench. Supplementary fan assisted convection, individually thermostatically controlled	Prefabricated, fan assisted convector unit water heated. Thermostatically controlled, with over-riding fan boost controlled by separate thermostat.	As Somerville Stage III but situated on internal wall. Supplementary heated rail in window to prevent down draughts.
Contractors	Norman Collisson	Wm. Sindall	Norman Collisson	Wm. Sindall

All photographs are by John Donat, with the exception of those numbered 1 and 6 which are by D. Honeyman.

A Tent for a London building site

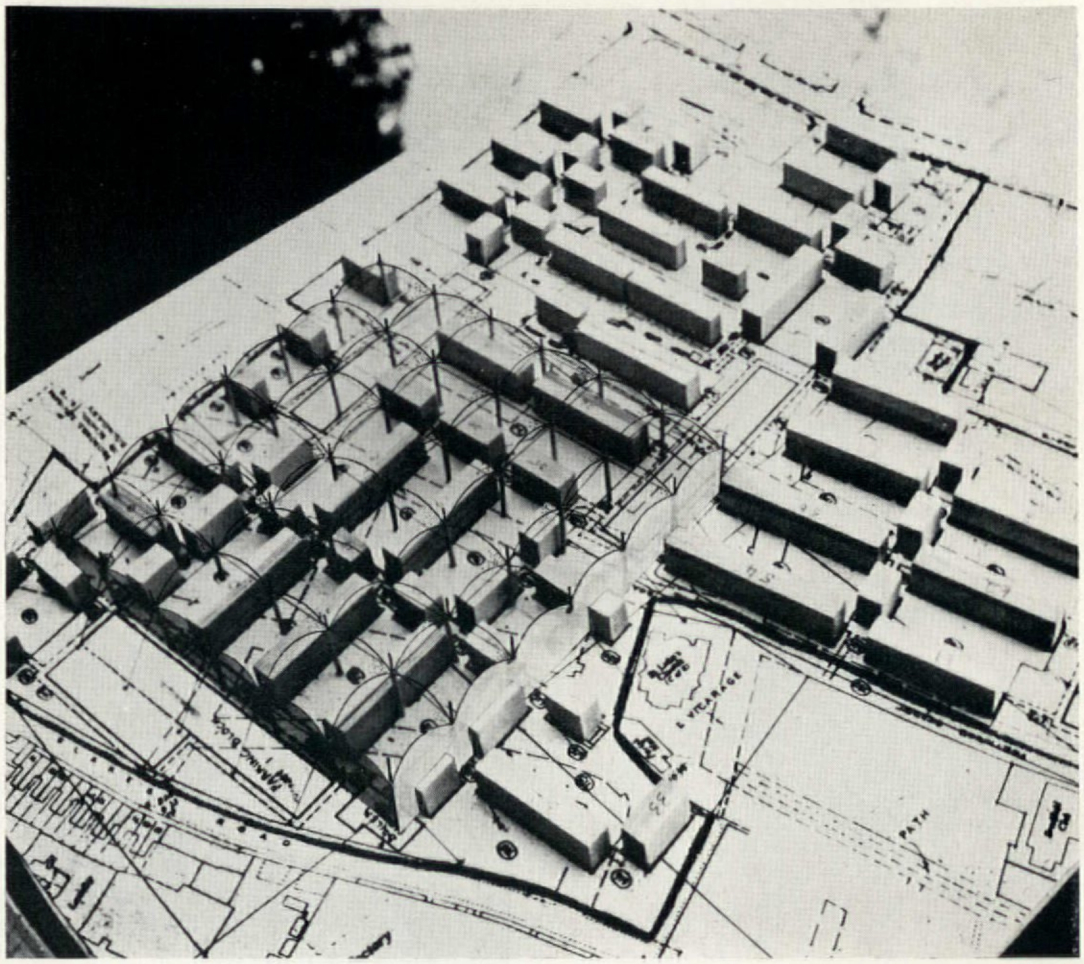
Frei Otto in association with
Bernd-Friedrich Romberg

If it rains or snows building work is still paid for in England, and yet no work is done out of doors. Continual bad weather can upset or even ruin building programmes, upsetting cost control. So all-the-year-round weather protection is worth considering as a way of ensuring that deadlines and contract prices in building programmes are met.

Experience of winter protection is already widespread in the northern parts of America, Europe and Asia. Among various measures adopted, a tent-like enclosure gives the most extensive protection by turning the building site into an interior. But although it has been intensively studied and frequently advocated for 15 years [1] it has been the least used.

Multi-storey housing has been built inside tents, enclosed scaffolding and pneumatically supported membranes.[2] Although these experiments frequently suffered from inadequate preparation and mostly ignored recent structural experience, they were nonetheless notably successful.

The Building Manager of the London Borough of Southwark, Mr. Rapier, asked Frei Otto to design a roof for a particular building site in North Peckham (see *AD* 9/67, p. 426). Four- to six-storey dwellings on a 40-acre site were to be built in a giant workshop heated in winter and illuminated at night. Building was not to begin everywhere at once; it was to start at one end of the site and move across, so that the 36,000 square metre workshop could be moved as work



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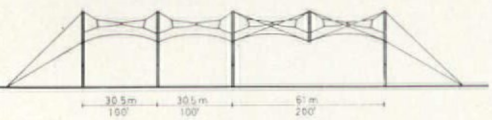

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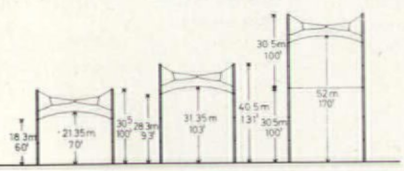

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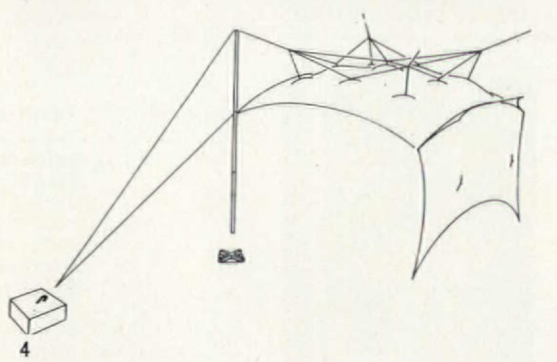

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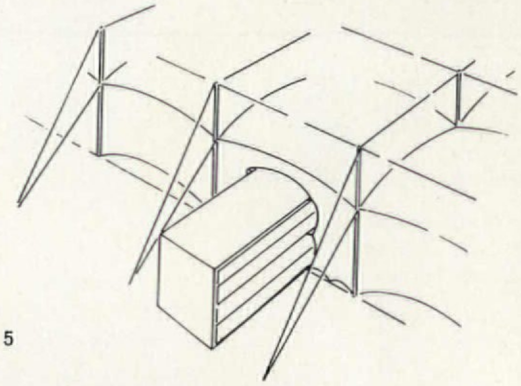

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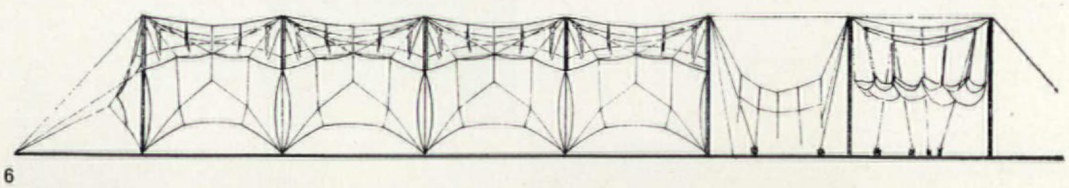

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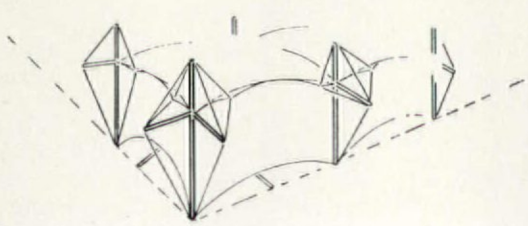

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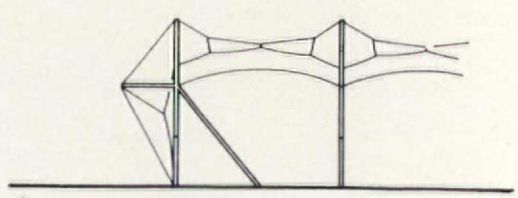

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1
Model of the North Peckham site with the first position of the tented structure sketched in

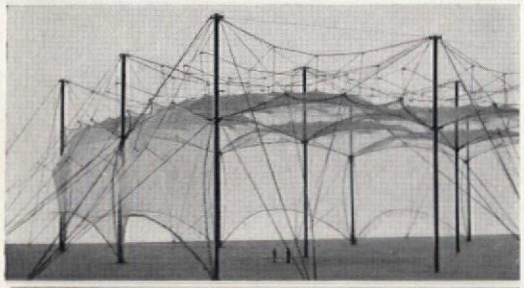
2 & 3
Variations possible in the provision for large spans and the raising of the roof height

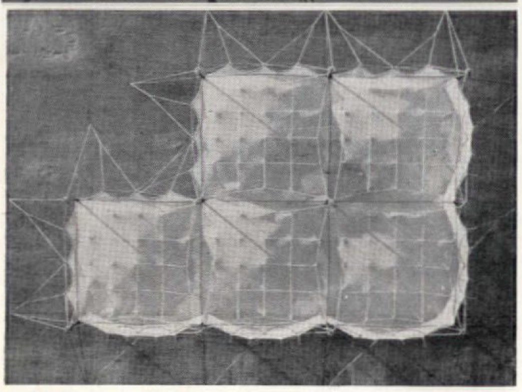
4
The tented structure is made up of the basic components shown here: anchor points, ties, masts with transportable footings, roof membranes with fixing points and perimeter supports, and wall membranes

5
The tent is open in summer, but in winter it is closed in and the interior is slightly pressurized, pneumatically stressing the wall membranes and causing them to billow out. If a building is in the line of the wall membrane the curtain can be cut to shape around it as indicated in the drawing

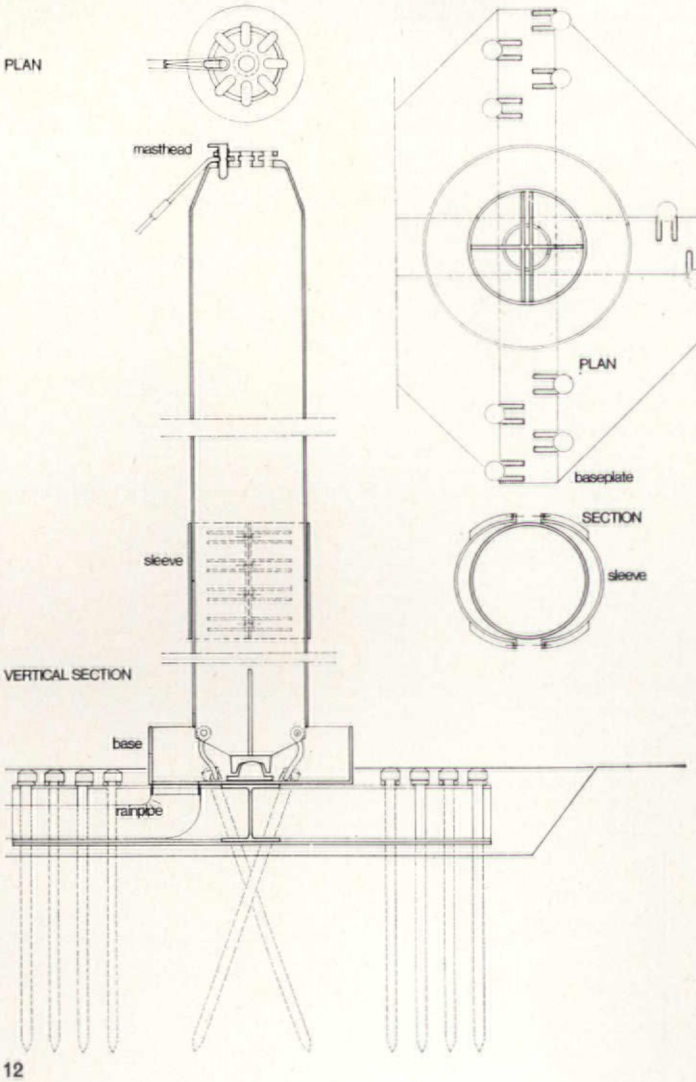
6
Long section through the tent, showing two bays in the process of erection

7 & 8
Variations on the fixing of the corner mast, with props and braces instead of guy ropes





9, 10, 11



12

progressed. It was thus demountable and extendable.

The building procedure suggested for London was not entirely new, it relied on conventional tent building and on experience with stressed curved membranes gained over a period of 12 years.[3]

Manufacturing costs of tent structures have remained almost constant during this period, indeed rationalization and refinement have reduced them slightly, whereas the expense of bad weather has grown considerably, and today people are ready to spend significantly more money on protective measures. The major factors of the financial equation are the total anticipated loss through bad weather (loss of time, delays and consequent expenses) and the cost of providing and maintaining the weather protection (construction, maintenance, heating, further extension). The density of the development is also important; a large envelope is only worthwhile for dense urban development, elsewhere individual sheds around each house are more suitable.

Apart from a few minor exceptions, no large scale project of this nature has previously been worked out. The structural possibilities were not previously known. In addition, such a solution was usually called for only when plans had already been completed and the builders were in search of ways of reducing the expense due to bad weather. It would have been pointless to develop a structure tailor-made for one project; the designers therefore sought an all-purpose solution which could be straightforwardly made and erected but suited to a great variety of tasks. The roof needed to be raised or mounted differently for exhibitions and sporting events, so that it could be used profitably—rented when no building was in progress.

The knowledge acquired from the Bremen Harbour Roof project (architects Budde, Heinrich, Otto, Schröck)[3] and the Stromeyer Hall exercise were useful in the London project, and the experience of winter building problems with the German pavilion in Montreal (architects Gutbrod, Otto, Kiess, Kendel, Medlin, Tornowski, Eber; engineers Leonhardt, Egger, Manniche) were invaluable*.[4] (see page 179).

The London project is four times the size of the German pavilion; the comparable building costs are lower—about £9 per square yard of roofed area.

The system consists essentially of four components: masts, suspension net, roof membrane and wall membrane. The supports are positioned on a 100ft square grid, the top and bottom of the masts defining the cubic unit 100ft long which can be added in any way required. The average height is 65ft. The tubular steel masts are in three sections; they can be lengthened by adding further sections, or one mast can stand on top of another giving a height of 160ft. The masts also serve as rainwater pipes. A cable net hangs between the masts of each unit which holds the roof of coated polyester fabric aloft at nine (or alternatively 25) points and which takes the snow loads. The 25-point net is used where the shed is unheated or in case of extremely high snow load. The roof may be opened at the side or completely closed by using part of the wall, which is similar to the roof, anchored at the base. The wall section leaves a large opening which can be closed in cold weather by lowering a curtain. Even if a completed house stands where a wall should go when the shed is being rebuilt, it can be avoided easily by sealing off the adjacent spaces.

When there is no room for roof ties at the boundaries slanting props could be used.

The structural grid of 100ft is large and convenient, but if a mast does stand in the middle of a house under construction there is no great problem—holes are left in the floors and the mast is lifted out by crane when the roof is taken down. Though masts can be omitted in favour of props as indicated. This is especially useful when the system is set up as a large-span sports or convention hall. The clear span is then 200ft. Naturally, all the neighbouring masts and their ties must then be more highly stressed and secured.

[1]Frei Otto, *Das hängende Dach* Bauwelt-Verlag, Berlin 1954

[2]Frei Otto, *Zugbeanspruchte Konstruktionen*, Band I, Verlag Ullstein 1962—translated as *Tensile structures* Vol. I, MIT Press, 1967

[3]Conrad Roland, *Frei Otto—Spannweiten*, Ullstein 1965

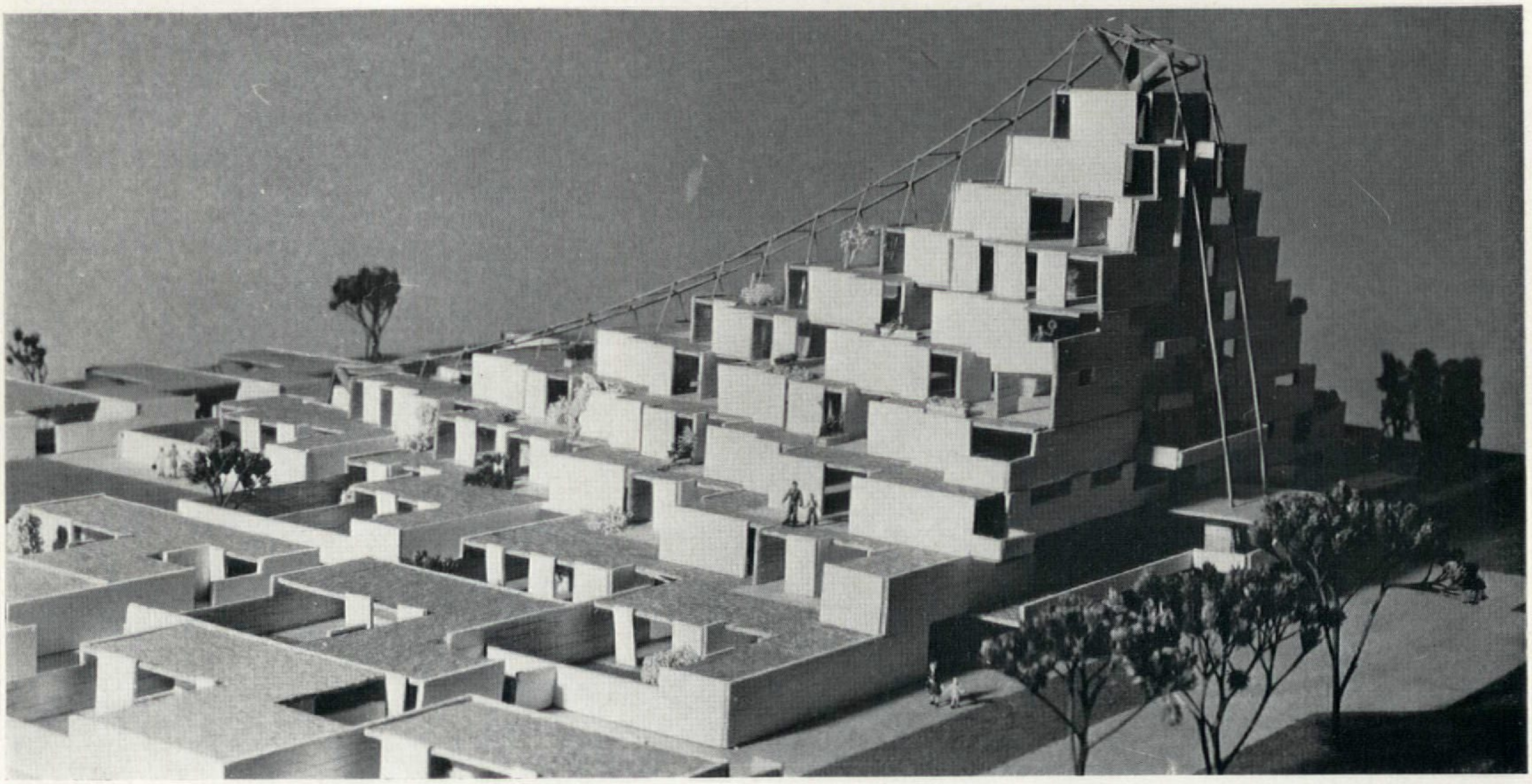
[4]*Deutsche Bauzeitung*, Stuttgart 7/1967

* Last winter was hard by Canadian standards; northern America was buried in snow for some time and the Expo '67 site was greatly hindered. On 20th January many buildings, including the US and Russian pavilions were still unenclosed, as cold inside as out. In the German tent the temperature was 16 to 18° (65°F) with no condensation while it was −25°C (13 degrees of frost) outside. In fact the tent was at the time the largest ever winter protective envelope for a very busy building site. Despite the extreme temperature outside, wood flooring and carpet was being laid under the tent all over the 8000 square metre exhibition area. The heating ensured that the snow melted so quickly that the anticipated snow load never settled.

9
Model of a building site with five bays of tenting

10 & 11
General view and bird's eye view of five bays of tenting with twenty-one support points in each bay

12
Detail plans, vertical and horizontal section of a typical mast made up in sections and joined together with sleeves



1

Hanging flats

Gernot Minke

This suspended, prefabricated structure is designed to be nine storeys high, with 52 flats for 170–180 people, providing a density of 370/ha (150 p.p.a.).

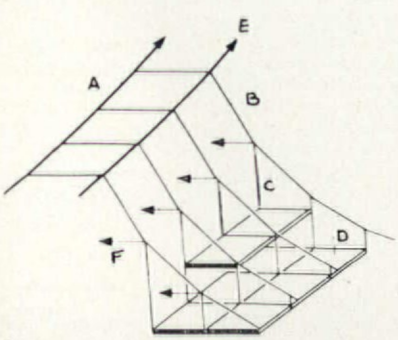
The building is planned so that each flat has a private terrace of 17–27sq m (170–270sq ft) with an unobstructed view over a green terraced landscape of grass-covered roofs. All flats are intended to face south and have at least six hours sunlight at the winter solstice. There are ten basic flat types with areas of 23–130sq m (approx. 250–1400sq ft), for bachelors, old people and families up to six children.

The interior space left by the pyramidal arrangement of flats contains 68 covered parking spaces, community facilities such as sports rooms as well as offices and possibly shops.

From first-floor up the flats are hung from a pre-tensioned space net. Dead and live loads are carried by hanger-cables suspended from the secondary suspension cables which in turn are hung from the main cables attached to the mast and anchored to foundations. The main mast is 35m (117ft) high and the small V-shaped mast is 7m (23ft) high. The space net is pre-tensioned by horizontal cables which provide stability against lateral loads.

The super-structure is all prefabricated. The main mast and pre-attached main cables are erected first; the space net is then hoisted and tensioned, the floor slabs are slung in position by crane, and finally the wall slabs are assembled on the floors.

The advantages of the structural system are: short erection time, reduction of dead loads to about one-sixth that of comparable concrete frames, savings in materials due to the large number of members in tension (no spare material needed to combat buckling) and a saving of area not wasted on structure.



2

1
Model from the north-east

2
Diagram showing the tensile members and the distribution of stresses
A main cables
B secondary cables
C hanger-cables
D floor slabs
E to the mast
F pre-tensioning cable

3–8
Flat plans types E, F, G, H, K & N with areas from 23–130sq m (250–1400 sq ft)

9
East–west section, with communal facilities shaded

10 & 11
Upper level plans. The shaded areas are grassed outdoor terraces

12
Ground level plan with car park at the centre of the building

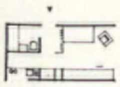
13
Axonometric showing the penetration of sun to a flat on the west side of the building in the morning during the winter solstice

14
Structural model

15 & 16
Typical sections

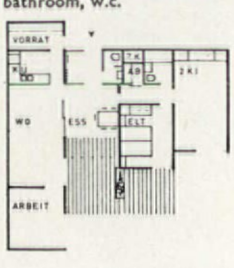
17 & 18
Diagrams showing part of the construction sequence; the masts being erected and the floor slabs being slung from the hanger-cables

3
Type E
23sq m
bachelor flat



4
Type F
45sq m
(excluding terrace)
bachelor flat with terrace

5
Type G
98sq m (excluding terrace)
5 living rooms, kitchen and bathroom, w.c.



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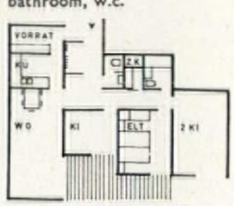
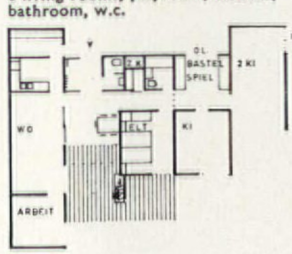
Type H
89sq m (excluding terrace)
4 living rooms, kitchen and bathroom, w.c.



7
Type K
116sq m (excluding terrace)
6 living rooms, playroom, kitchen, bathroom, w.c.



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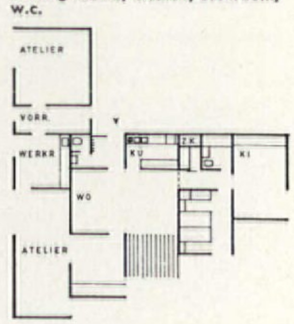
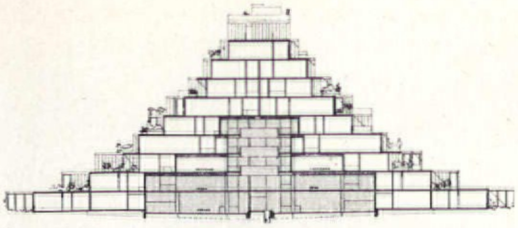
Type N
126sq m (excluding terrace)
7 living rooms, kitchen, bathroom, w.c.

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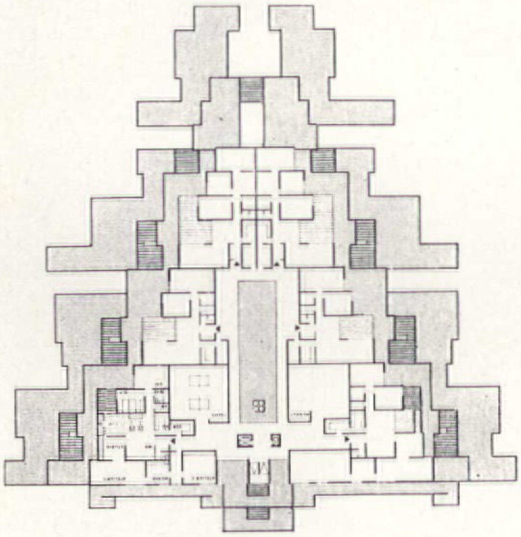
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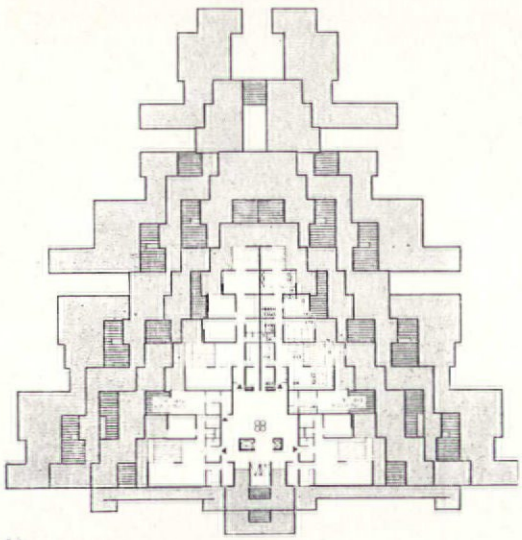
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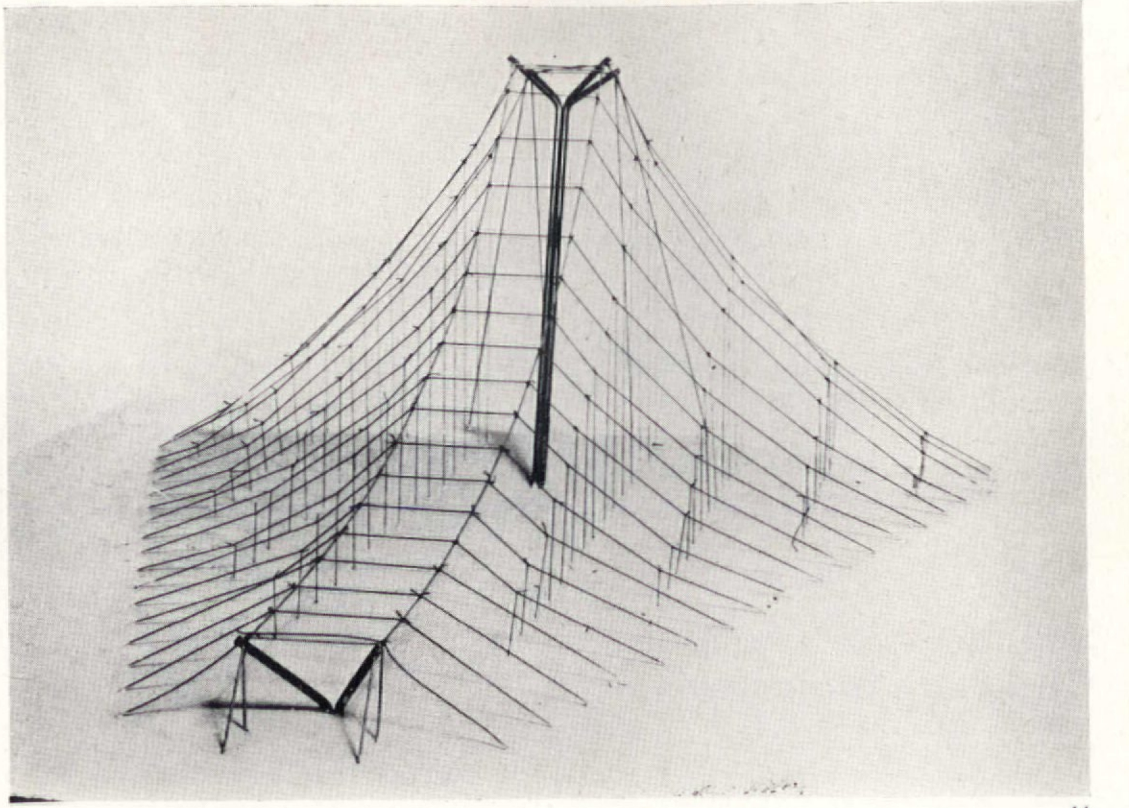
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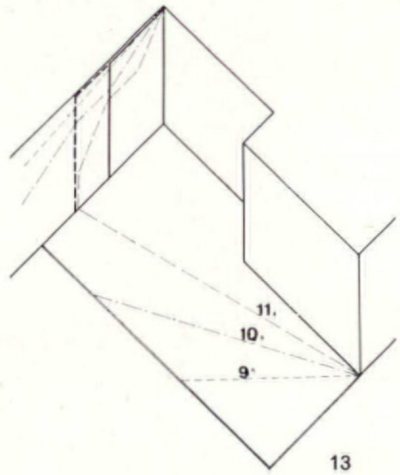

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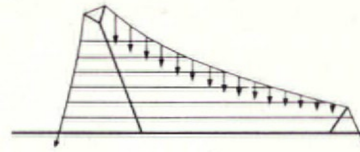
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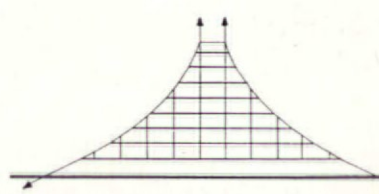
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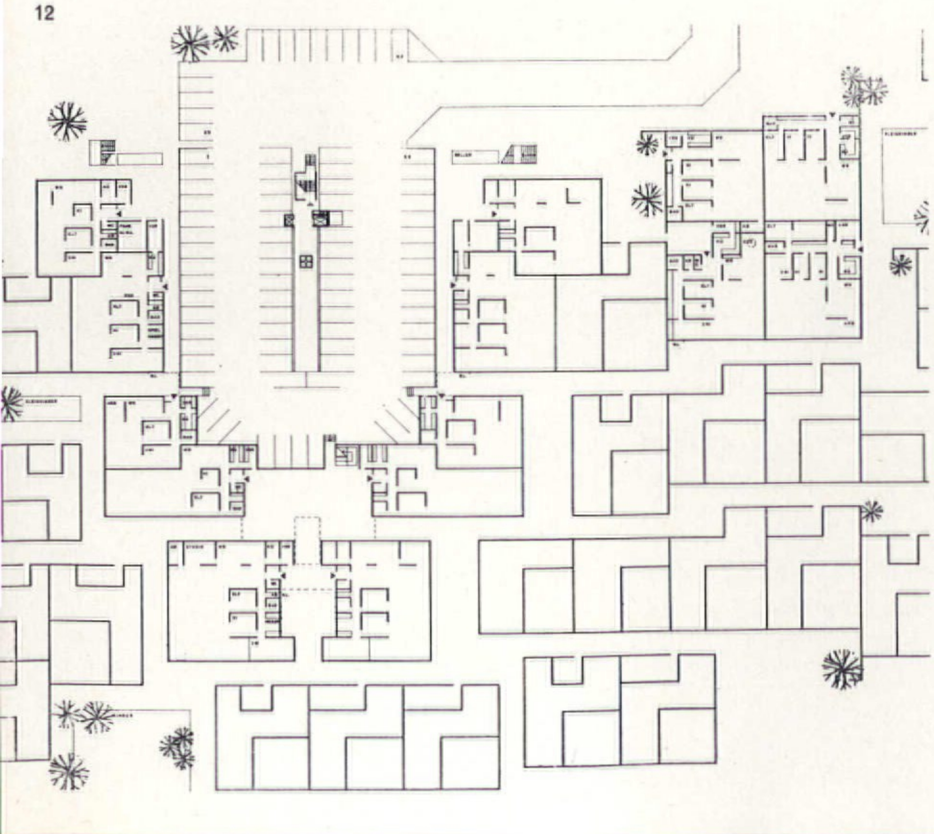

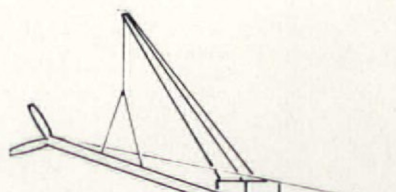
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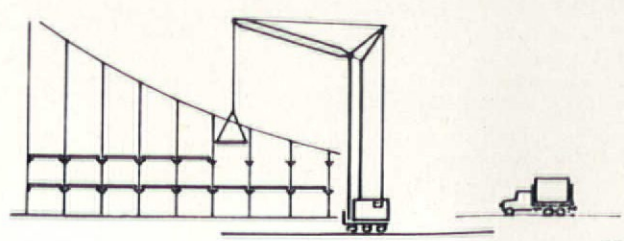
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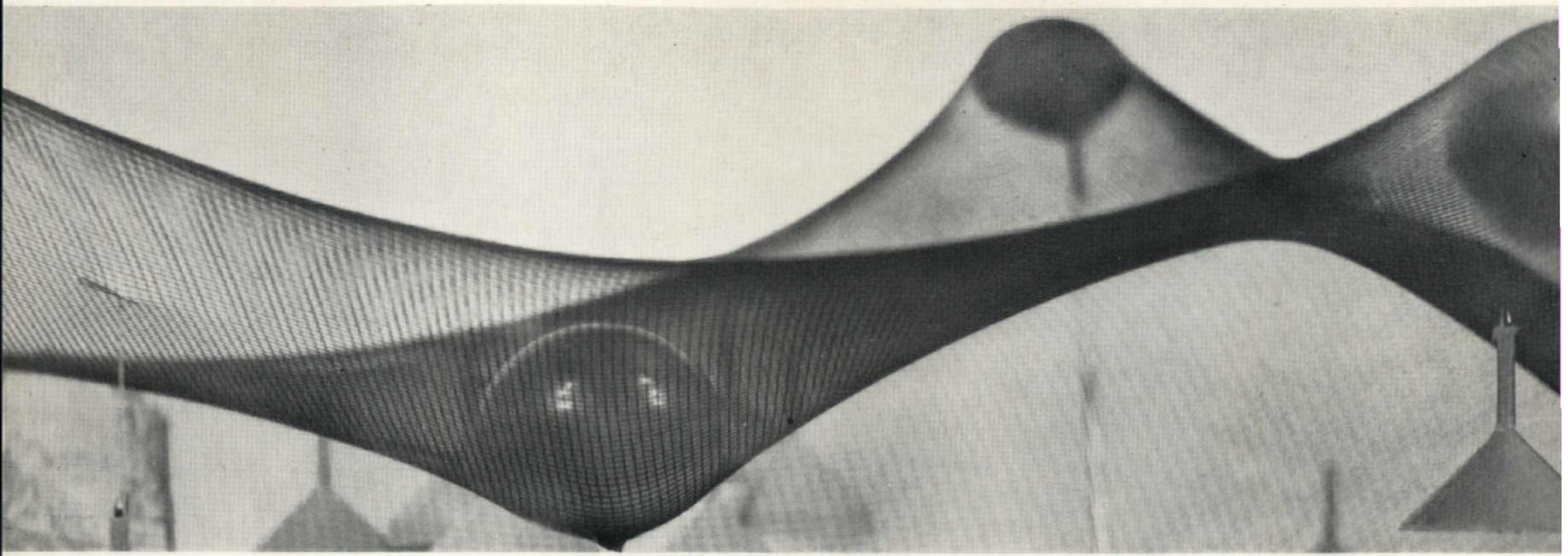


1

Bird cage projects

These projects were designed by students in the department of architecture at the Technische Hochschule Hannover, West Germany, during a seminar on suspension structures. The seminar was conducted by Gernot Minke, visiting lecturer in structures at the Hochschule für Gestaltung, Ulm, collaborator of Frei Otto.

The design requirements were:

a cage enclosure of a 40m × 80m area for a variety of birds, with a rain shield over one-fifth of the area.

wind protection, places for rests, breeding niches, and drinking and bathing pools for birds

central zone for feeding and grooming

interior and exterior observation areas for a maximum of 1000 visitors

relation of the cage to the Hanover zoo.

A basic problem posed was the relationship of people to animals in the zoo. Students were challenged to develop spaces which allowed the birds an optimum of movement and provided visitors with a variety of observation posts.

The need to enclose a space with a minimum of members and at a minimal cost suggested that a prestressed membrane construction be adopted. All students decided to use a narrow mesh steel net as a primary structure or as a secondary element between a large mesh cable net.

The structural forms were evolved by means of working models.

Determinates of the form were:

saddle curves at all points of the net surface

a relationship between the net and the horizontal to ensure surface curvature and to avoid flat areas

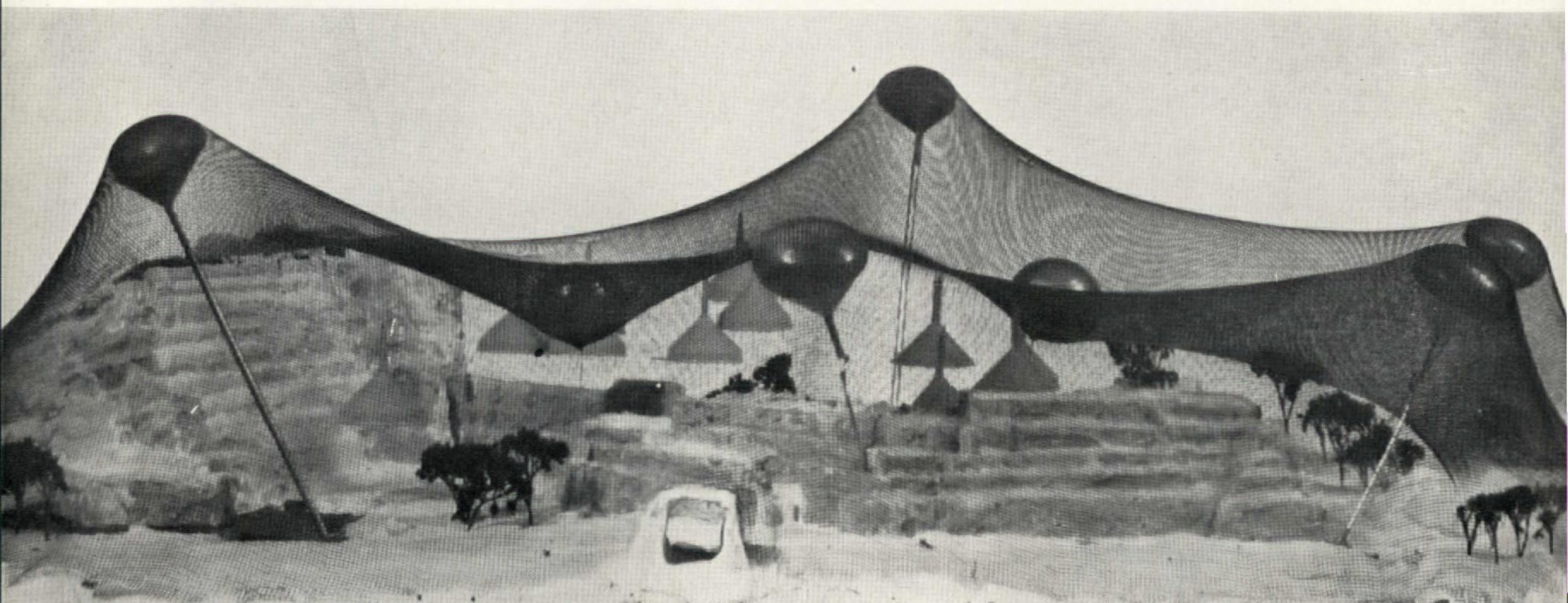
division of meshes within the limits of the net material

the net clamps must be on continuous curves in both directions so that tension distribution is harmonious

net tension should be as nearly equal as possible in all areas.

The problem of stability against deformation by wind, snow and ice was solved in various ways. In the project of D. Althaus **3**, adequate saddle curvature to counteract pre-tension of the cables was achieved by spanning the net over compression arches. In the design of H. Pommeresche **7, 8**, similar surface curvature was obtained by introducing ridge cables that directed the net stress into the mast tops and anchorages. H. Noetzig's proposal **5, 6** demonstrates an interesting combination of linear tension and compression support elements. Support and restrained points were used by A. Pook **4** and Th. Klumpp **1, 2** to form saddle curved surfaces. To avoid puncture of the membrane these points were enlarged to synclastic plains. In Pook's study circular tensile and compression stressed elements and rosette shaped tension cable loops were used. In Klumpp's solution the surface is deformed by elastic pneumatic balloons. They reduce stress concentrations by proportional enlargement of the support area.

1 & 2
Design for a birdcage by Th. Klumpp
3
Design by D. Althus
4
Design by A. Pook
5 & 6
Design by H. Noetzig
7 & 8
Design by H. Pommeresche



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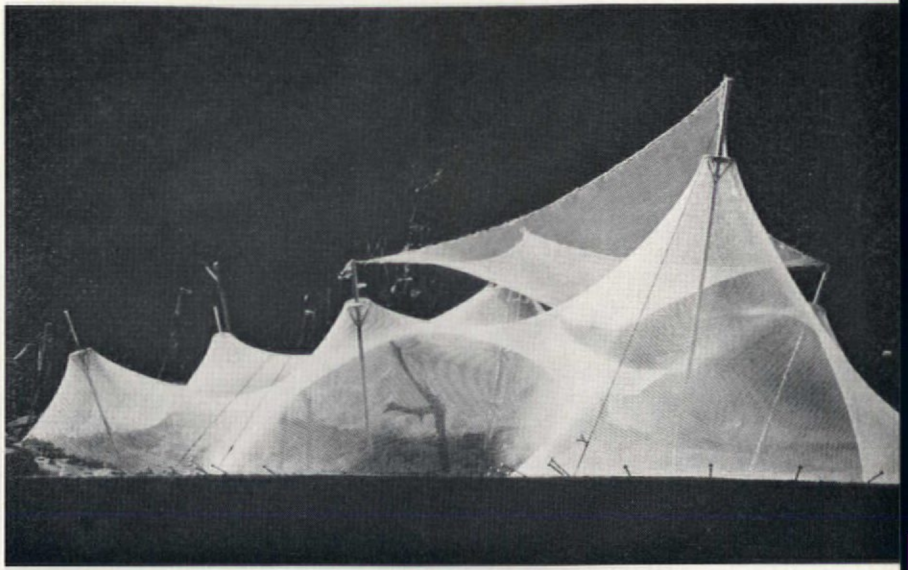
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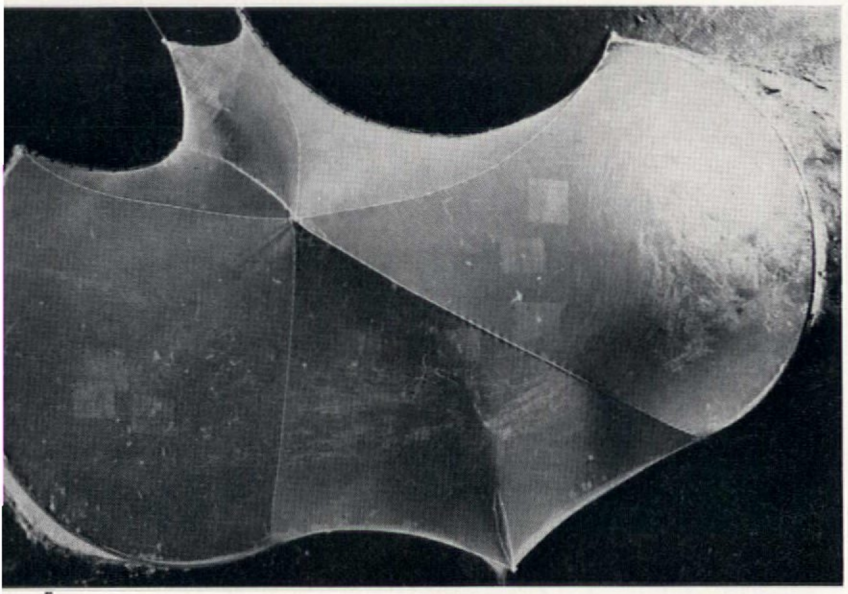
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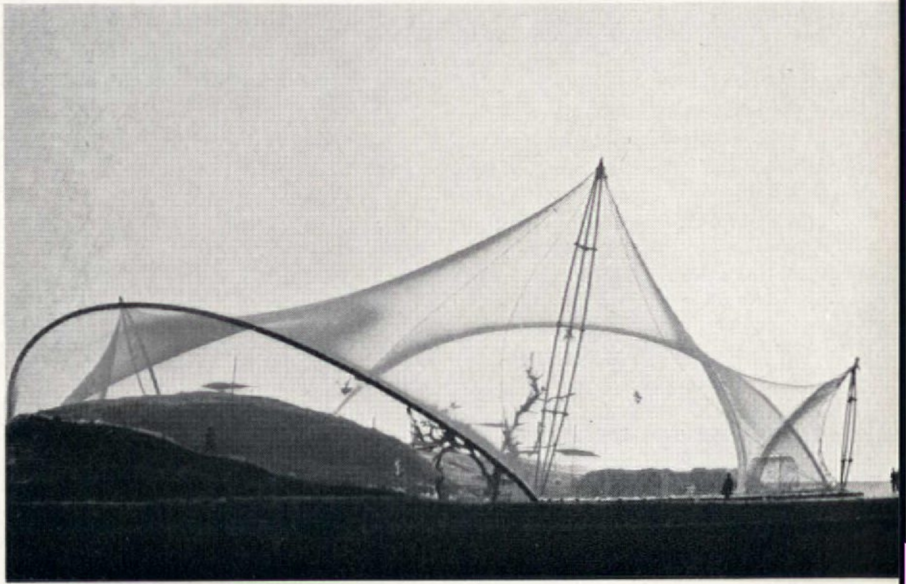
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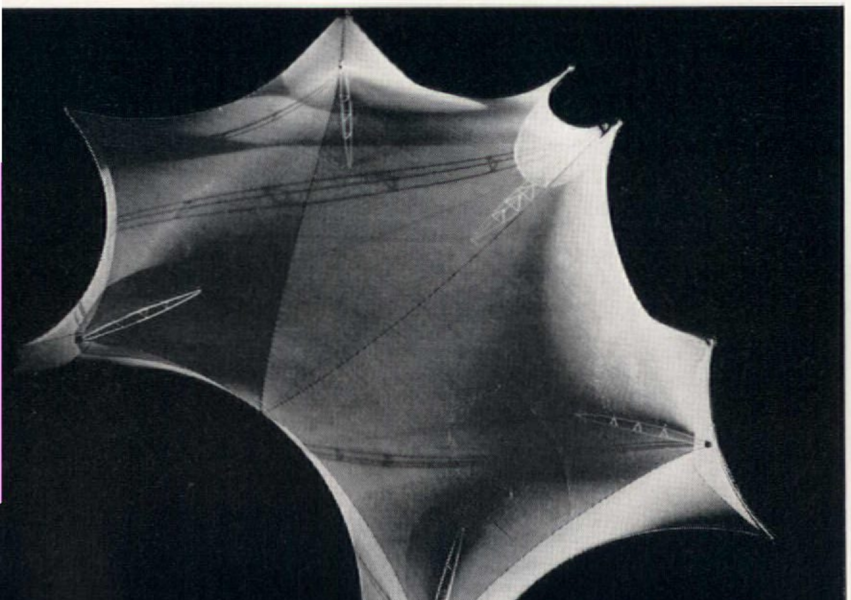
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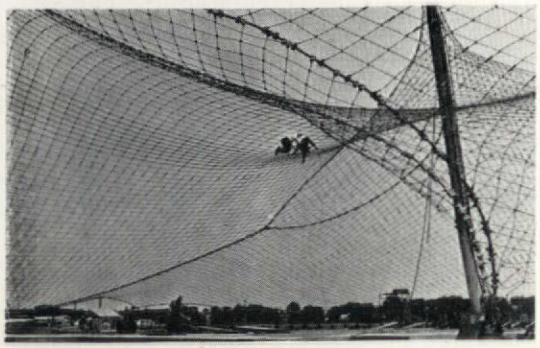
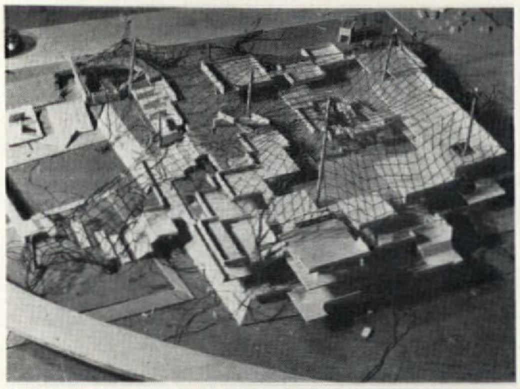
8

Tensile structures

Gernot Minke



Variations on tensile forms are apparently infinite, but one phenomenon is constant: as soon as a particular structural system is chosen, the range of possible forms is severely limited. The form derives from inherent characteristics. The design of stressed structures must respect these characteristics. This has led to unusual methods of discovering and determining form, most of which are as yet little publicized. These are outlined here with special reference to the German pavilion at Expo '67, in Montreal, which was designed by Frei Otto and Rolf Gutbrod with the assistance of Larry Medlin and Hermann Kendel (see *AD* July 1967, p. 340). The silk skin experiments were conducted under Frei Otto and Bernd Friedrich Romberg in the Entwicklungsstätte für den Leichtbau in Berlin. The final development and measurement of the scale model was carried out as a development project at the Institut für leichte Flachentragwerke der Technischen Hochschule, Stuttgart by Frei Otto with the help of Eberhardt Haug, Larry Medlin, Berthold Burkhardt, Jochen Schilling and the author.



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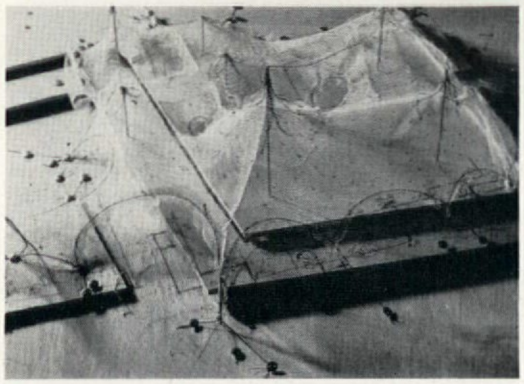

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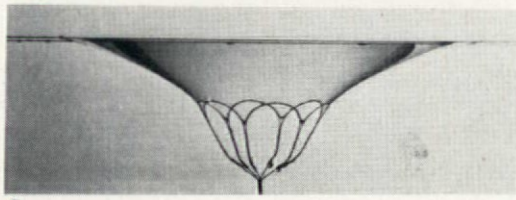

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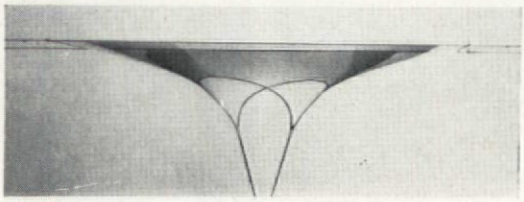

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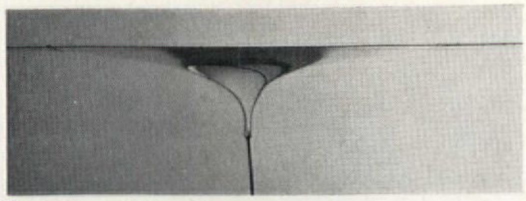

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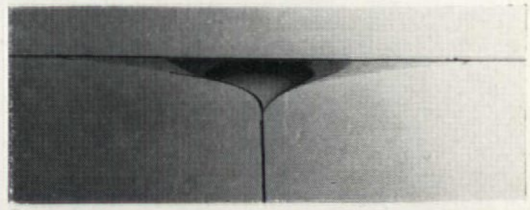

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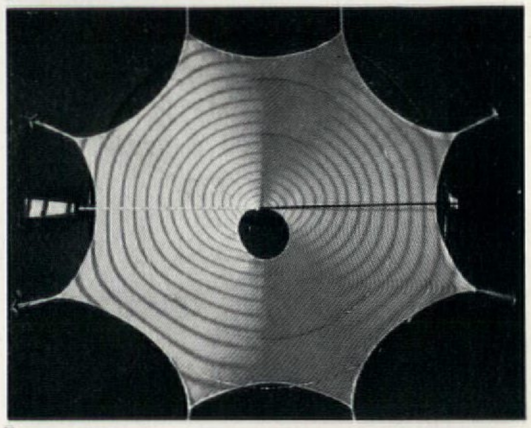

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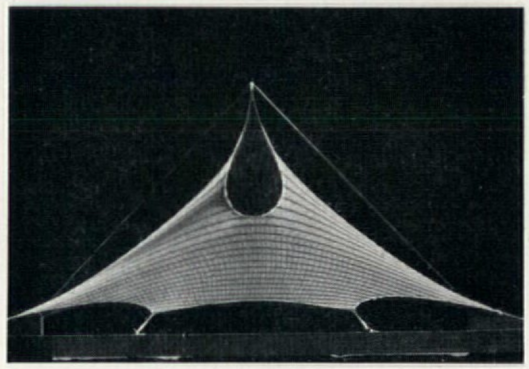

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The tent consisted of a pre-stressed cable net hung from eight masts and held by 30 edge cables which transferred the stresses of the net to pre-stressed anchor points. The net was composed of 12mm thick steel cables on a 40cm rhomboid grid. The cable-loops at the peaks and depressions transferred the planar stresses to the points of restraint. About 50cm below this primary structure was suspended a secondary stressed membrane of PVC-coated polyester fabric which defined the internal space. It was attached to the cables every three to five square metres by a cloverleaf clip which gave the membrane additional stability and transferred wind and snow loads to the cables.

Methods of determining the form

The outline of the pavilion was more or less established by the site, the height required by the route through the exhibition, and the position of the auditorium. It was early accepted that a stressed cable net was the most acceptable way of spanning so large an area. The first problem in finding a suitable form was to achieve an adequate two-way curvature in all parts of the net, bringing the edges as low as possible, to achieve an almost completely enclosed space. The exact shape of the structure could only be found empirically with the aid of models. This was impossible to calculate, as the shape of a structure must be known before calculations can be made. The form-finding process went through various stages involving seven complete models; the first problem was to find a form which suited the selected edge conditions, the second was to suit the form to its loading.

The following structural requirements influenced the development of the form:

Every peak of the net had to lie on a double-curved (i.e. saddle-shaped) plane. (In other words simultaneously on a positive and a negative curve so that it was restrained in four directions.)

The net had to be laid so that the separate cables were as tightly bent as possible.

The curvature of the net had to be as near as possible constant over the whole surface. Level areas had to be avoided as they undergo considerable deformation under snow load.

The direction of the cables had to be ordered so that the net, which was square on plan, was twisted into the tightest possible rhomboid shape by the double-curvature.

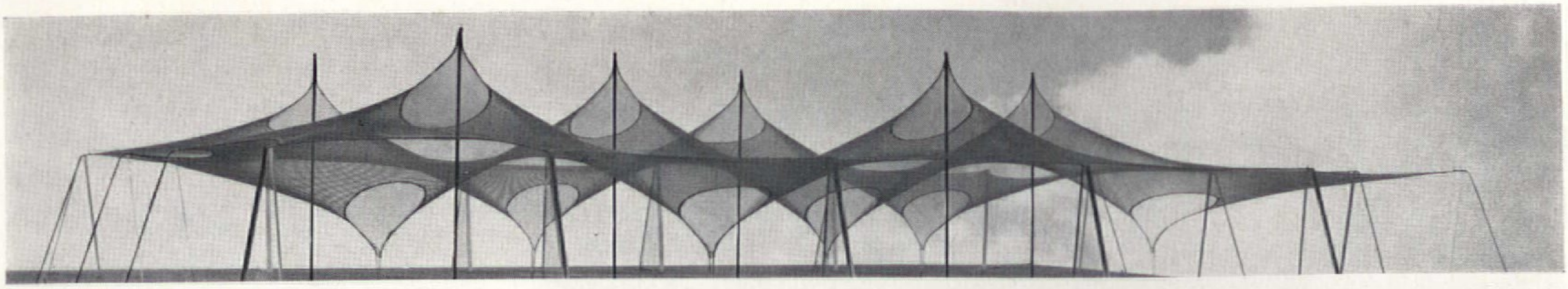
The cable junctions had to lie on similar curves in both directions to maintain an even distribution of stress.

The tension had to be as equal as possible in all parts.

This last condition of equal tension throughout means that in a true membrane (i.e. a stressed skin) the minimum surface area is found. Obtaining a minimal surface area was the starting point of the investigations.

The first study model was a very crude shape made of fishing net **1**. Eight masts were planned from the start. The height and siting was a balance between the net and the layout of the exhibition below. In the second and third models made of fine tulle the shape could be worked out much more accurately. Various parts were cut out and corrected over and over again **2**. Establishing the curves of the edge cables and the 'loops' at the peaks and valleys was especially difficult. Gathering cables (i.e. the loops) to stabilize and stress the net were used for the first time in this project, and its adoption required a whole series of preliminary tests.

Supporting a cable net at a number of points is structurally difficult because very high stresses are developed where two or more cables meet and these must be restrained in the line of their resultant force. If a cable is introduced which gathers up the stresses over a large area of the net and transfers them to one point, the stress in the surface is fairly even. This gathering cable, which returns to its point of origin, is called a loop (or eye-cable). The idea of shaping and supporting stressed skins with loops originated in Frei Otto's development workshop for stressed structures in Berlin in 1963 during a series of tests of silk membranes. Various structural possibilities were considered in which several gathering cables were arranged like a rosette and then the number of cables was reduced **3, 4, 5, 6**. These loops have a constant curvature, but it is not as yet mathematically calculable. In a cable net this curve undergoes a deformation if the grid of cables is rhomboid rather than square—the



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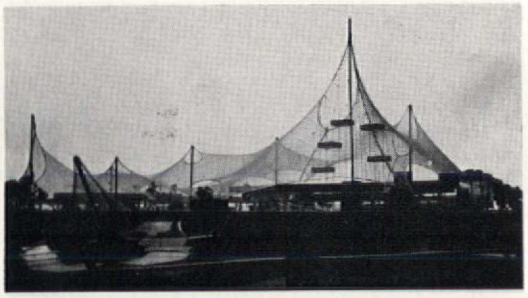

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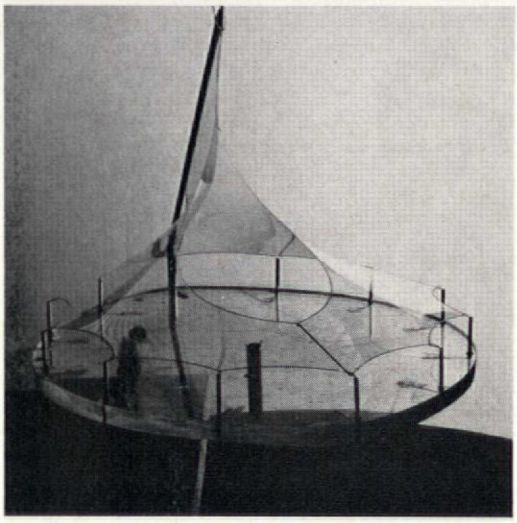

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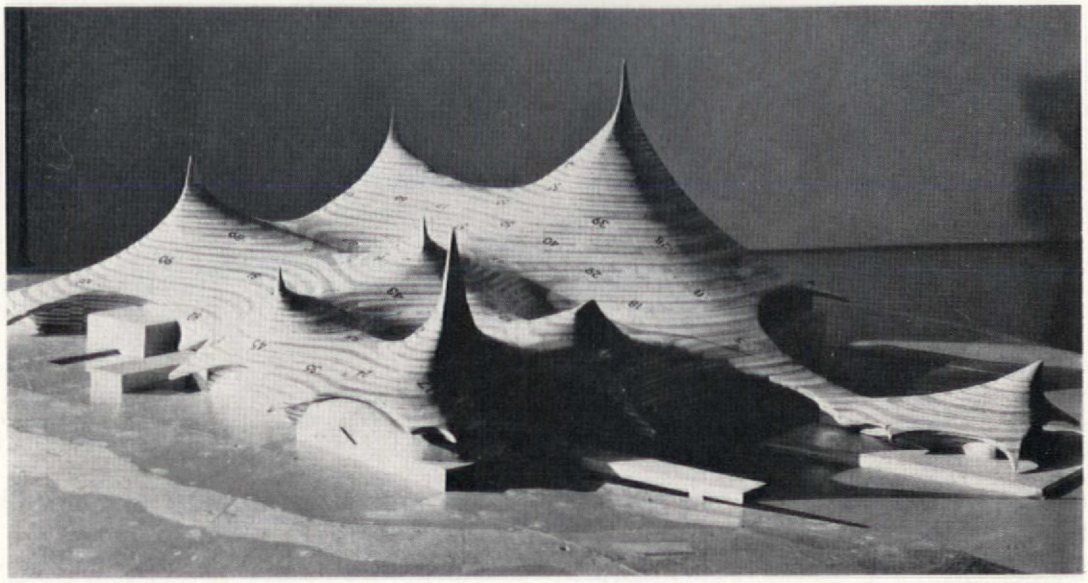

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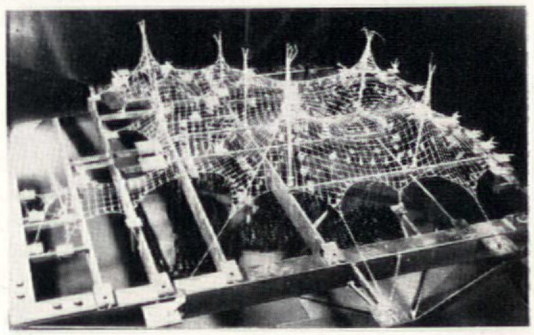

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planar stresses in a curved cable net are unequal, unlike those in a stressed silk membrane. In 1964 R. L. Medlin undertook a series of model tests at the workshop for stressed structures in Berlin to investigate the form of nets stressed by loop cables **7, 8, 9**; this structural concept was used for the first time in the Montreal project.

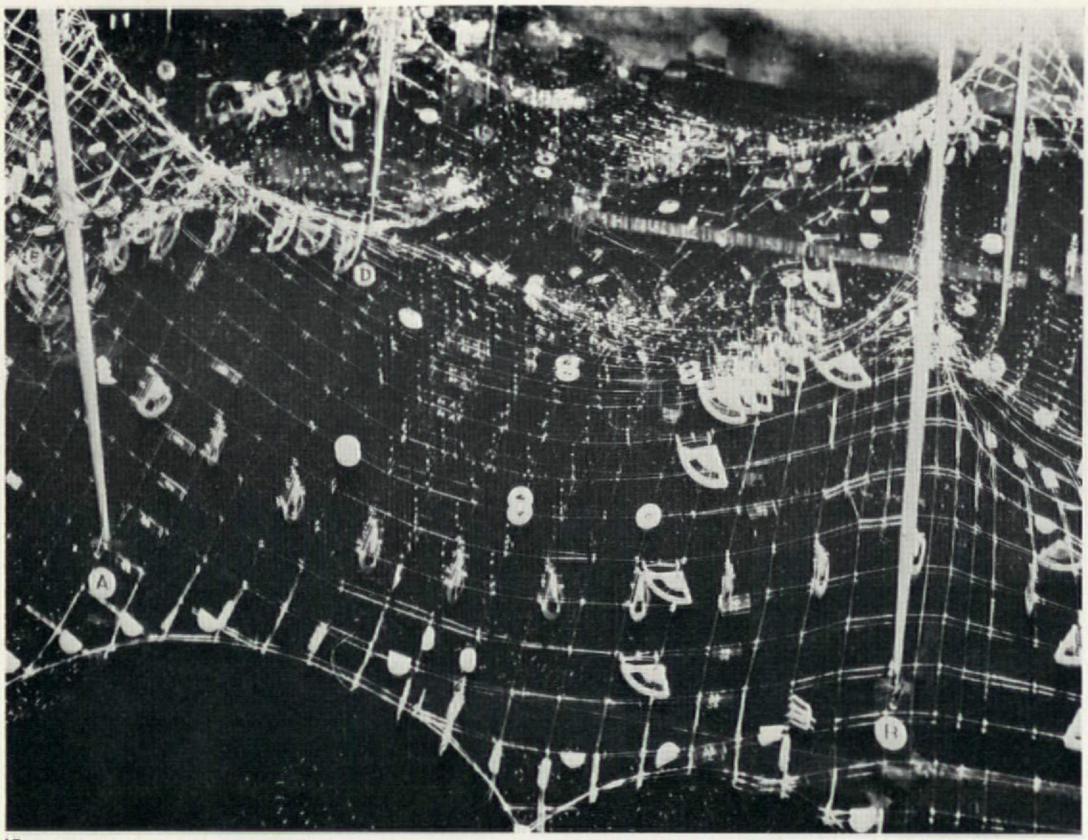
The first attempt to cut the whole net out of one flat piece was abandoned, as the grid became too acutely rhomboid in some areas. A seam was introduced across the net so that the double-curved net was made from two flat pieces. When the design won first prize in the competition, further refinements were made. As there was only 18 months to the completion of the pavilion, extensive departure from the competition design was ruled out. An exact model was built in fabric **10** at a scale of 1 : 100 on which improvements to the edges and loops were made over and over again to satisfy the six conditions outlined above. Further tests of cable loops with silk membranes were necessary, which established that the size of the loop depended on the stress and curvature of the cable; the silk tests showed that the loop diminished as the stress increased and tore out of the skin—the curvature of the skin could not be increased beyond a certain point. As a few loops picked up ridge cables through the seam and this modified their original shape, tests on silk membranes were done **11** for these cases also.

The wind tunnel model

To evaluate the form's stability under wind load a model was built at a scale of 1 : 150 **12**. One-hundred-and-thirty tiny holes were made in it so that the pressure differential between these points and the standard pressure in the tunnel could be measured. The holes were connected by piping to glass tubes, each half filled with alcohol. The pressure differences registered on these alcohol gauges were recorded photographically and evaluated afterwards. The tests were carried out at two wind velocities of 20 and 40 metres per second and in eight different directions.

The scale model

In order to record exactly the basic shape under stress, so that all dimensions for the fabrication of the net and membrane could be abstracted, a scale model was built which approximated as closely as possible to the actual structure. The cable net was built of 0·15mm stainless steel wire to the scale of 1 : 75 in a 1·6 × 2·0 metre distortion-resistant frame **13**. The preparation of the cable net led to the next important problem: the joints had to turn without slipping, for the original square, flat net was deformed by up to 30 degrees when curved—the wires could not be soldered together directly, they were joined with thin copper wires soldered on at an angle of 45 degrees. Every fourth cable was represented by a wire on the model. The length of all cables had to be variable so that corrections could be made; this was managed at first with perlon threads running through the links of a fine chain parallel to the edge cables. Later, copper wires were soldered on so that fine adjustments were more quickly made by soldering and loosening them. The edge cables and loops had tension grips through which their length could be altered. A tensometer was developed to compare the stresses in the cables. It filled one grid exactly and recorded any slight narrowing under stress through its tripod, transferring it to a scale where the stress could be read off. It was found extremely useful as it was easy to insert and could measure the stress quite accurately. When the junctions of the net were disposed on similar curves and the stresses were more or less balanced it was clear that the form most tending to a minimal surface did not produce the best structural form. The minimal surface displayed a tendency to meet the edges at a tangent and to bridge the intermediate spaces in a flat plane. The cable mesh on the scale model was almost closed near the mastheads where it rose nearly vertically, while areas in mid-span were quite flat. The resultant form had to be adjusted for wind and snow loads, i.e. the curvature of highly stressed areas had to be increased so that external deformation of the net was kept within structurally acceptable bounds. The requisite modifications were made by inserting unequal stresses and by doubling up some of the cables so that the curvature of areas liable to deflection could be greatly increased **14**. Supplementary tests were carried out on the control of deformation under snow load (the wind tunnel tests had shown that deformation through wind loads could be ignored). A snow load of 100kg per square metre was represented on the scale model by a 71 gramme weight per junction of the net and the loading was recorded photographically in



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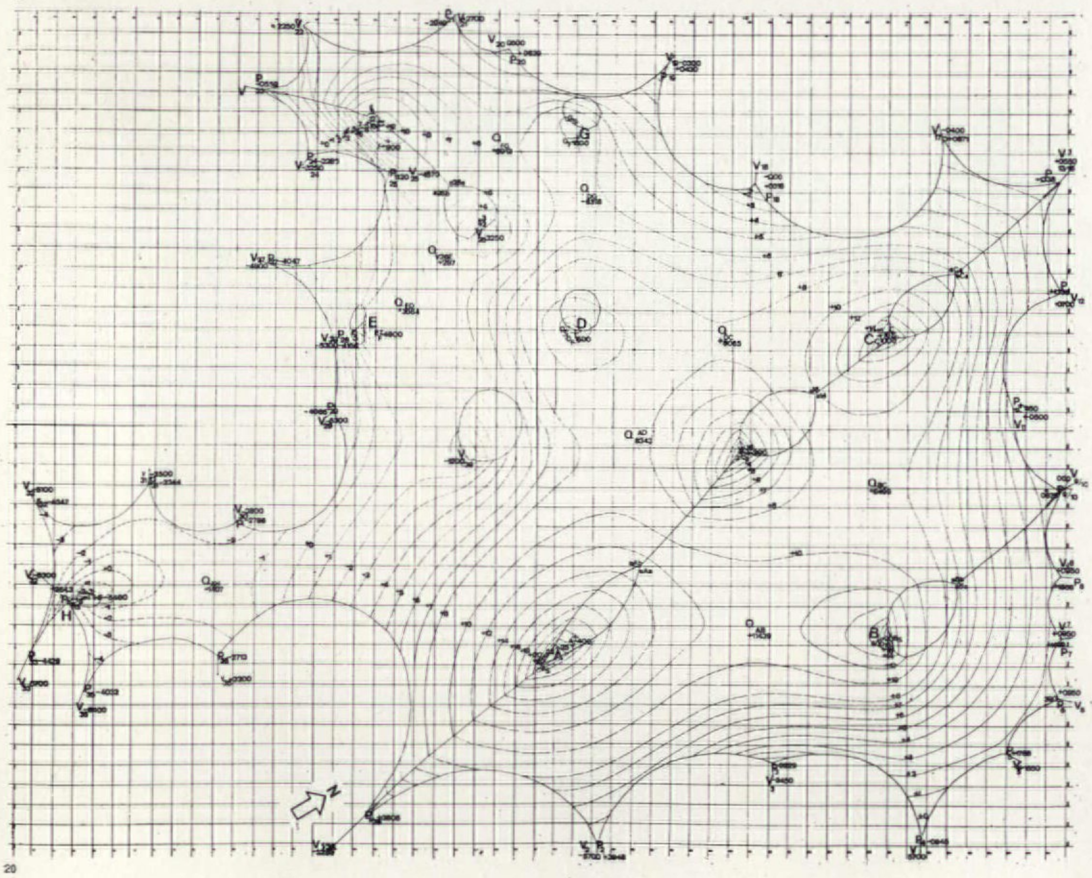

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double exposures **15**. A vertical scale with two white dots on it corresponding to a 1 metre interval was attached to each loaded joint. The deformation of the net could be calculated to within a few centimetres by comparing the position of the points on the scales on the double exposure of the net before and after loading.

Recording the shape

All the work had so far been concerned with finding the right structural form for the system. Now the problem of communicating it arose; how to record it so that exact drawings of foundations, masts, edge cables and net could be prepared. The co-ordinates of a few points on the net were also needed for the calculation of stresses.

The first step in recording the shape was to draw up projections of the net in plan **16** and section, for which a spatial plotting machine was built. The frame of the scale model contained a drawing surface above it consisting of a finely ground sheet of marble exactly parallel to the plane of the model. The dotting apparatus ran on it with a weight suspended below the pencil which marked off individual points on the model. To measure the sections the weight was set at a fixed height and moved over the model. When the weight was disturbed by a point on the net, a dot was made pneumatically.

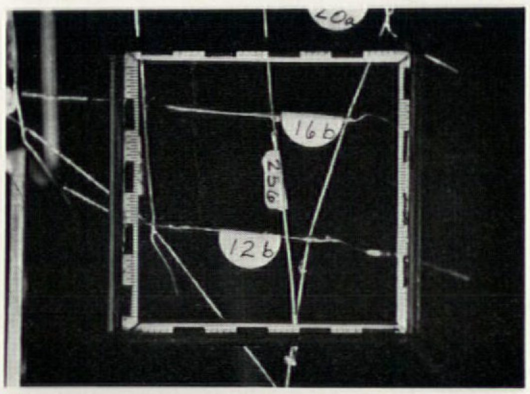
Measurement of the net

To prefabricate the net the length of each cable and the angle at which it met the edge cable had to be known. The net was photographed in 8cm lengths **17**, enlargements were projected onto a drawing surface and drawn up there at a scale of 1 : 10.

Another method of measurement was explored at the same time; the net was photographed stereometrically and the photos evaluated in a 3D-coordinator. The spatial coordinates of each joint were recorded on punched tape with the intention of using an automatic drawing machine to draw requisite sections with their aid in Montreal.

Measurement of the Membrane

Drawing sections through the membrane was technically considerably more difficult than through the net. The membrane of synthetic fabric which hung below the net at an offset of 50cm was stressed to a double curve and was therefore not measurable on one plane. To achieve a reasonably continuous two-way curve it had to be made up of the narrowest possible strips joined together with fine seams. To measure these the whole skin was built in a model from tiny strips of tracing linen with grid lines which could be compared **18, 19**.



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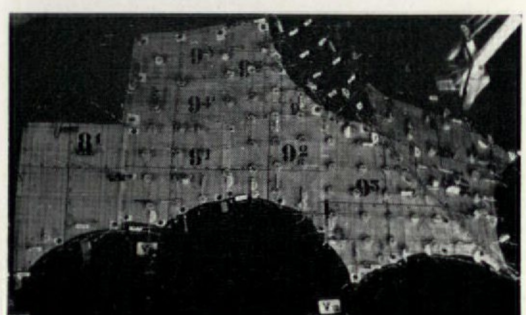

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Prefabrication and erection
As the manufacture of the masts, cables and joints had to start before the form of the model was finally settled, some sizes and dimensions were arbitrarily formed, for the shape of the net depended ultimately on the stressing. A stress of 1000kg had to be taken by each cable. A 12mm diameter cable was selected for the net and 54mm diameter for the edge cables. For ease of manufacture the choice was restricted to two sizes; the breaking strength of the net cables was set at about 10 tons, the edge cables about 200 tons (just under the British ton). The cruciform clips which joined the cables had to be specially developed as there was nothing suitable available. An adjustable clip was ruled out by high costs. It had to be light, easy to fix and cheaply produced—about 40,000 were needed. It was die-cast in three pieces and is fixed by tightening two screws.

Masts
Frei Otto intended to develop special lightweight masts for the supports **24**, but this had to be abandoned through lack of time and simple steel tubes with conical ends were accepted.

Trial erection at Vaihingen
In order to test all details at full size, a trial structure about 30 metres long and 17 metres high was erected in Stuttgart-Vaihingen. It represented a section of the Montreal pavilion **22**.

Prefabrication and transportation
The cable net was completely prefabricated by the firm of Stromeyer in Constance and shipped to Montreal in 8·5 metre long rolls. The galvanized masts, made in Berlin by Steffens and Nölle, were shipped in one piece as deck load except for the 38 metre long mast which was delivered in two pieces and welded together on site. The erection procedure in Montreal followed the trial run very closely. The net was hauled up on the pulleys of the masts, which were set up first and provisionally stressed, without any special help. Climbing about the net was very easy as the 50cm grid meant that no safety measures were necessary.

The erection sequence
Erection of masts and preliminary stressing **20**.
Assembly of prefabricated net sections on the ground.
Raising the net to the loops **21**.
Tensioning the net and checking stresses.
Building cat-walks for hanging the membrane.
Assembly of the membrane sections into large areas.
Raising the membrane and making fast to stirrups **23**.
Fastening the large areas together in the air.
Stressing the membrane.


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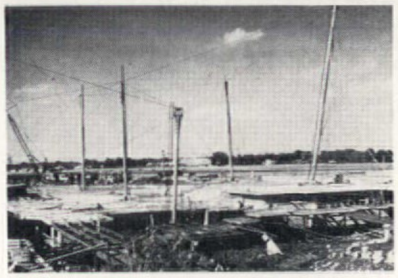
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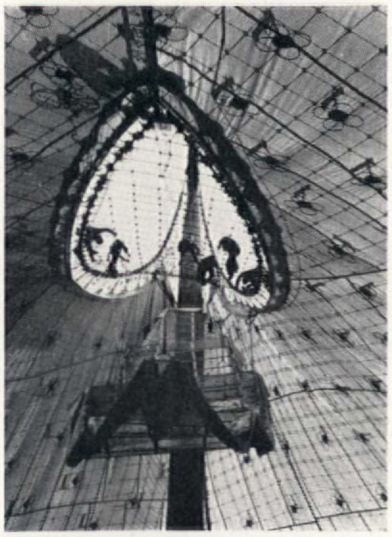
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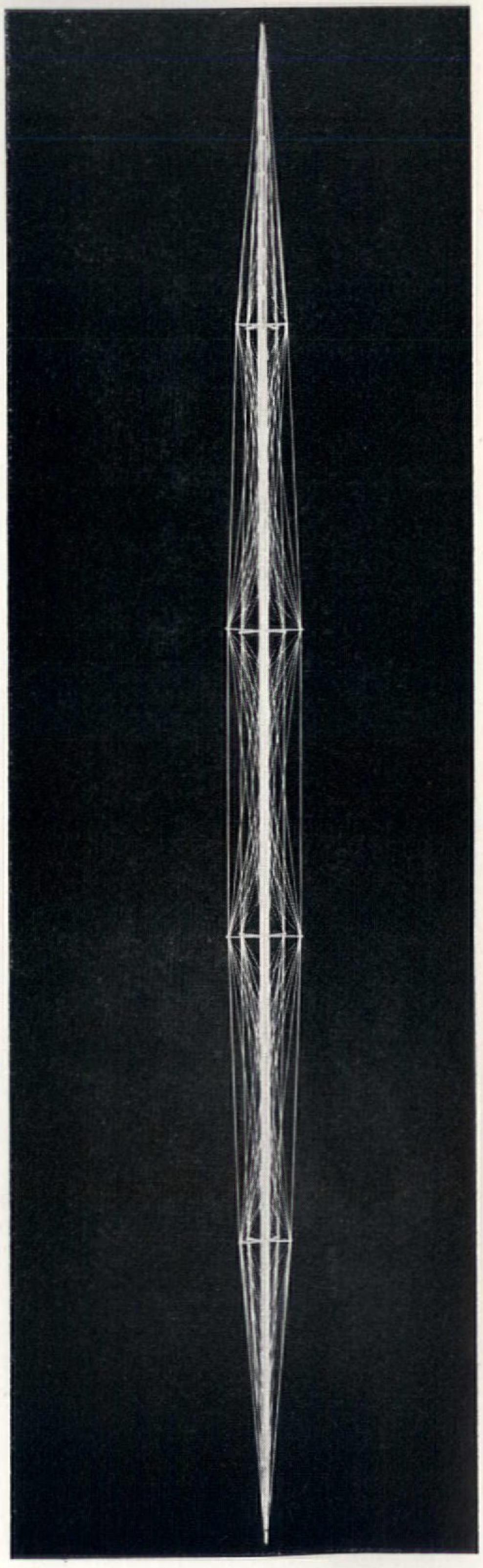
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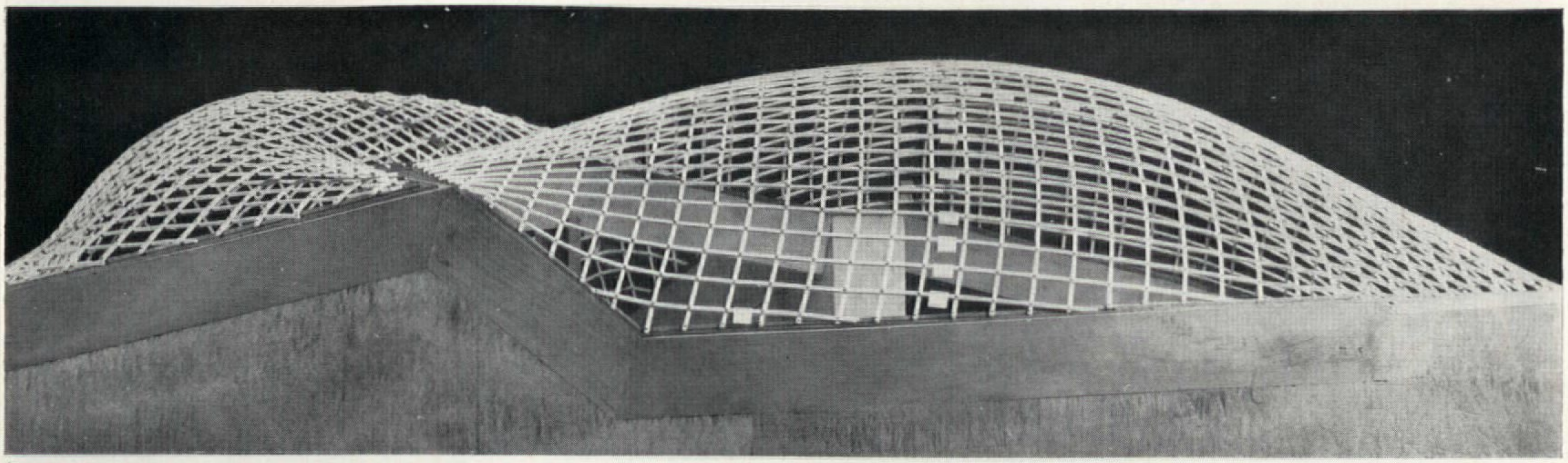
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Auditorium roof, Montreal*

Gernot Minke

The investigation for the lattice shell construction of the auditorium at the German pavilion was carried out in late 1965 and early 1966 by Frei Otto in collaboration with Rolf Gutbrod in Stuttgart—assistants H. Kendel, R. L. Medlin, Schneider. The structure was manufactured and erected by the firm of Wolff and Müller, of Denkendorf.

The auditorium was near the main entrance to the pavilion under the great tent which spanned the exhibition area of 10,000 square metres. It seated an audience of 230 people.

The roof consisted of two stressed lattice shells formed of 33 × 42mm lengths of Hemlock Fir on a 50cm grid. The larger 'lattice dome', over the main space, spanned between 13 and 17 metres, and the smaller, over the apse, between 4·5 and 20 metres **1, 2**.

The form of the lattice dome, which had only to support its own self-weight, was first ascertained in reverse as a suspended form, a very carefully made net of fine copper chains. Five requirements influenced the shape of the lattice shell and the length and direction of the individual chains:

A specific headroom had to be maintained.

A certain height could not be exceeded as there had to be sufficient clearance between the dome and the tent above.

All junctions had to lie on curves of similar radius in both directions—this is the most important condition for maintaining a favourable stress distribution throughout the dome.

The direction of the laths had to be such that the stress was as similar as possible in both directions.

The minimum bending radius of the timber had to be observed.

To record the shape established by the suspended chains, the coordinates of a few separate points were measured and drawn up, and the measuring apparatus shown in **3** was applied to them. The model was mounted on a frame with a horizontal surface below; above, on a parallel plane, was the drawing surface with a dot-making machine and exactly under the pencil point of this apparatus hung an adjustable plumbline. To record the plan of the net the junctions were marked off individually **4**, a dot being made pneumatically as soon as the plumbline was over a junction. Vertical fixes were obtained as well when the net was set out with the plumbline at various definite lengths. The length of the chains was found easily by measuring the remainder when cut from standard lengths.

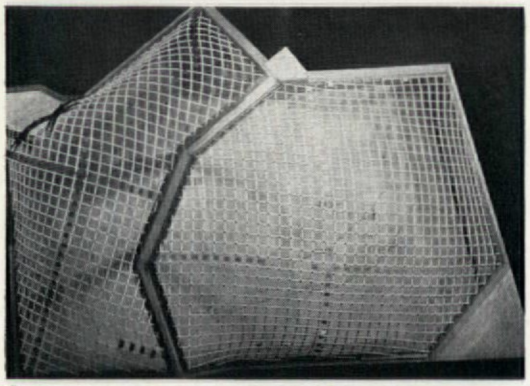
After studying the suspended form, an exact model in reverse, i.e. as a compression structure, was built to the scale of 1 : 20. The shape was corrected slightly to compensate for the resistance to bending and torsion shown by the laths. The entrance was also studied more closely on this model. As the continuously curved laths had to be cut off above ground here, the edge had to be stiffened. The shape of the dome was measured off using the same machine as for the suspension model, and the length of the laths established by measuring off-cuts.

The prefabrication of the grid took place on the ground, a method adapted from the building of the model. The 33 × 42mm thick laths were laid out 50cm apart in two layers at right-angles to each other and fixed together with ordinary bolts tightened from above. The nuts were only lightly screwed so that the laths, the longest of which was 18 metres, could be turned about the axes of the bolts.

For transportation the square grid of the lattice was distorted diagonally so that it became a rhomboid with only 10 degree angles at the points **5**, and as the large dome only weighed about 450 kilos it could be manhandled into the tent at Montreal and straightened out there. It was then raised at various points with the help of the cable net above. When in position, the ends of the laths were made fast to the edge members and the junction bolts tightened.

Especially high bending and torsion stresses appeared where the edge was bent sharply in the vertical plane. Here the surface curved steeply in two directions **6**, but the laths were strong enough superimposed in two directions—it is therefore incorrect to assume that a two-way curved shell must be in tension in one direction and compression in the other.

The shell was stiffened by nailing 5mm ply to the upper layer of laths with a vapour barrier and insulation on top, surfaced with PVC coated polyester fabric.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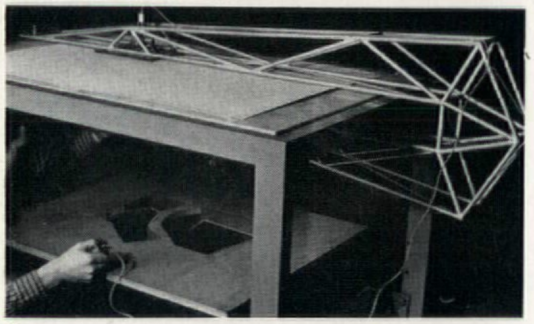
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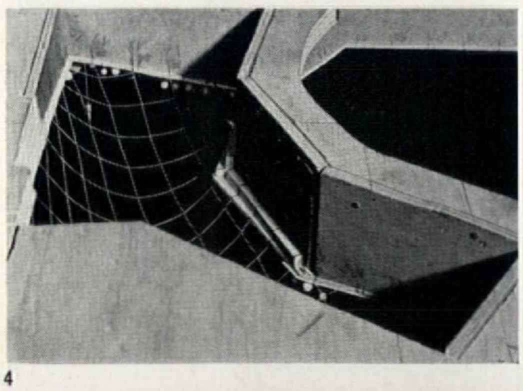
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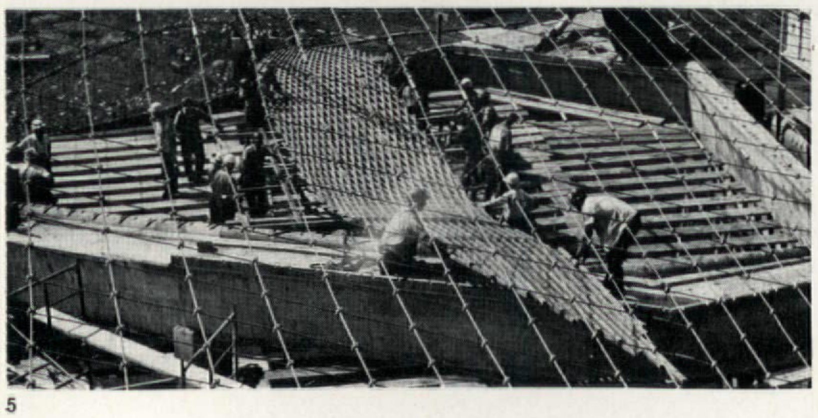
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* Paper read at the nternational Conference on Space Structures, London, September 1967.

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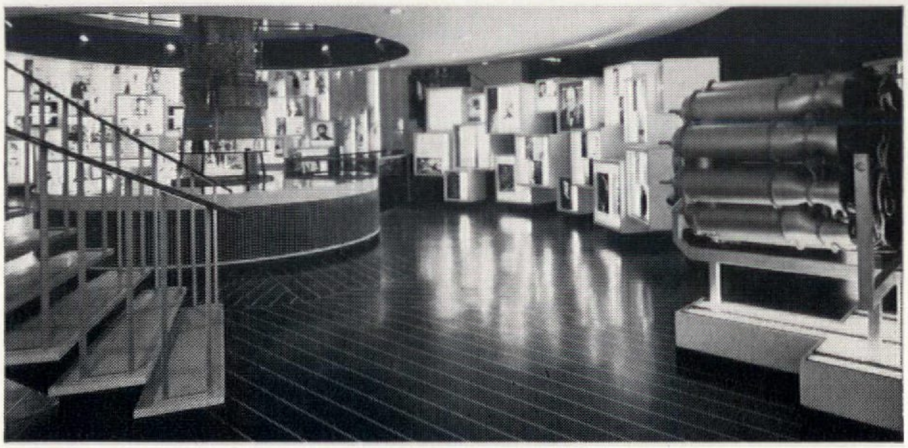

British Pavilion, Expo '67. Architects: Sir Basil Spence, Bonnington & Collins.

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Buckminster Fuller–Sadao/Geometrics

Consulting engineers: Simpson, Gumbertz & Heger, Inc.

An entrepreneur from Japan presented a trio of design firms with a proposal for an observation tower so tall that, if it were built, would certainly discourage any others with the ambition to own the world's tallest anything, if, indeed, it would not extinguish their hopes altogether. The objective of the structure envisioned was to provide an observation point that would overtop Mount Fuji, which, at 12,389ft above sea level, is the highest point on the island of Honshu. For the site selected, this would have required a structure that itself would be 12,250ft high, just over two miles.

The scale of the tower contemplated exceeded the boundaries of known structural parameters so far as to require the consultants to prepare a 100-page report just to decide whether it was practicable to prepare a feasibility study. The answer was no, but, in arriving at that answer, they uncovered some relationships between height, cost, and life at the top that are interesting in themselves.

Among the problems faced by the designers that are not normally encountered in the design of buildings or even, for that matter, tall towers of the size that have been built to date were: icing, high winds, high ratio of structural weight to loads supported, and the need for pressurization of the space at the top.

From the best available data, the designers were forced to assume that all structural members might accumulate as much as 12in of ice; moreover, in any lattice-like arrangement of structural members, spaces between members less than 5ft apart would have to be considered as completely plugged with ice. Not only would the mass of ice add substantially to the gravity load imposed on the tower and its foundation; the encrusted ice would also increase the effective area exposed to wind, and because of its rough surface, the drag coefficient would be increased, too.

Exact data on wind velocity at the elevation contemplated was not available, but the designers suspected it might possibly be as high as 300 m.p.h. The effect of high wind velocity at high altitudes is offset somewhat by the lower density of the air at those elevations. Nevertheless, the lateral forces imposed by wind loading became 'the single most important determinant of (the tower's) safety and economy'.

For the comfort of most airline passengers, and for the very health and well-being of some, the cabins of most aircraft cruising at altitudes above 10,000ft are pressurized to correspond to an altitude of between 5000 and 8000ft—about 10p.s.i. Similarly, the pod atop a 12,250ft tower would require pressurization, as would the elevators serving the pod.

Quite aside from the problem of providing air locks for the elevator doors at both top and bottom terminals, pressurization of the capsule at the top of the tower adds considerably to the structural requirements of the shell of the capsule. The negative air pressure induced on the leeward side of the capsule at design wind velocity, when added to the positive internal pressure, would create unit pressures of 700 to 800p.s.f., much higher than the unit pressures encountered by conventional building wall systems.

Indeed, the design of the occupied observation and recreation facility planned for the top of the tower would not be unlike the design for an aircraft fuselage intended for cruising at 300 m.p.h. at an altitude of 12,250ft. Unlike an aircraft body, however, the tiny, porthole-like windows that serve well enough in airplanes would be wholly unsuitable for an observation tower, since a wide, unobstructed view of the surrounding countryside would have to be one of the tower's most important features.

Two types of configurations were considered: a free-standing tower and a guyed structure. Also, two constructional materials were considered: type T-1 steel (minimum yield point 90,000p.s.i.), and type 7075-T6 aluminium (minimum yield point 60,000p.s.i.).

Free-standing tower configuration with three hollow legs with tubular horizontal and diagonal was selected as having the best potential for further study.

A computer program permitted optimization of weight and dimensions and substantial study of parameters such as magnitude of wind load, weight supported at top, and height of free-standing tower.

A similar approach was used for guyed tower. Basic configuration with three sets of guys, one at each of three corners of triangular central tower. A computer program was developed to determine the optimum guy slope, the optimum number of guy levels, and weight of structure.

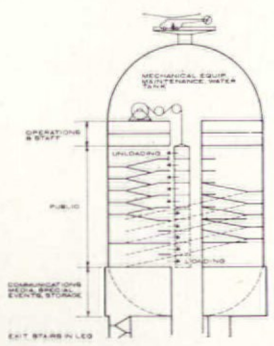
The most economical free-standing tower 12,250ft high turned out to be a three-legged structure with hollow, circular legs spaced about 1000ft apart at the base. It would weigh about 3200 million pounds, which, at an estimated cost of $500 per 1000lb of erected steel, would be $1600 million (excluding foundations), very much more than the $300 million the sponsor of the project had originally envisaged. (A similar tower of aluminium would weigh about 30 per cent less, but the erected cost of aluminium is nearly twice that of steel.) Curves plotted from the computer printouts show how extremely sensitively the total weight, and hence the cost, of the structure reacts to relatively small changes in the design parameters. By cutting the height from 12,250ft to 10,000ft, the weight of the structure drops by 46 per cent. Changing the arbitrarily assigned wind velocity from 300 m.p.h. to 200 m.p.h. cuts the weight by 61 per cent.

An analysis of a guyed tower 12,250ft high disclosed that this configuration could dramatically reduce the weight of the required structure. The optimum design would weigh just 700 million pounds, just under 22 per cent of the comparable free-standing tower. Of the 700 million pounds, the shaft accounted for 570 million pounds, at an estimated $500 per 1000lb erected, and the guy cables for 170 million pounds at $750 per 1000lb erected, a total of $400 million (excluding foundations), which of course is much closer to the sponsor's original expectation.

However, the longest of each of the three sets of guy wires (spaced 120ft apart) would have reached out over 10,000ft from the base of the mast. The vast amount of land beneath the three sets of guy wires posed a severe problem; to acquire the land outright would be costly, and it is doubtful if acquiring air rights alone would be practical in view of the hazardous conditions that would occur under the cables when they shed accumulated ice during a thaw.

Since the guyed tower with its attedant real estate problems exceeded the cost for which the sponsor was prepared, the designers proposed an alternative. They recommended an 8000ft, semi-guyed structure, a model of which is illustrated. Limiting the height to 8000ft eliminated the need for pressurization; by adding three massive structures around the base of the mast, the designers not only provided solid anchorages for the short guys that stay the lower section of the tower, they also generated space that could be turned to revenue-producing activities that would help to amortize the cost of the tower.

Because the preliminary study ruled out the economic feasibility of extending the tower above the height of Mount Fuji, the project is now indefinitely deferred.



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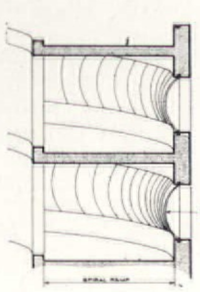

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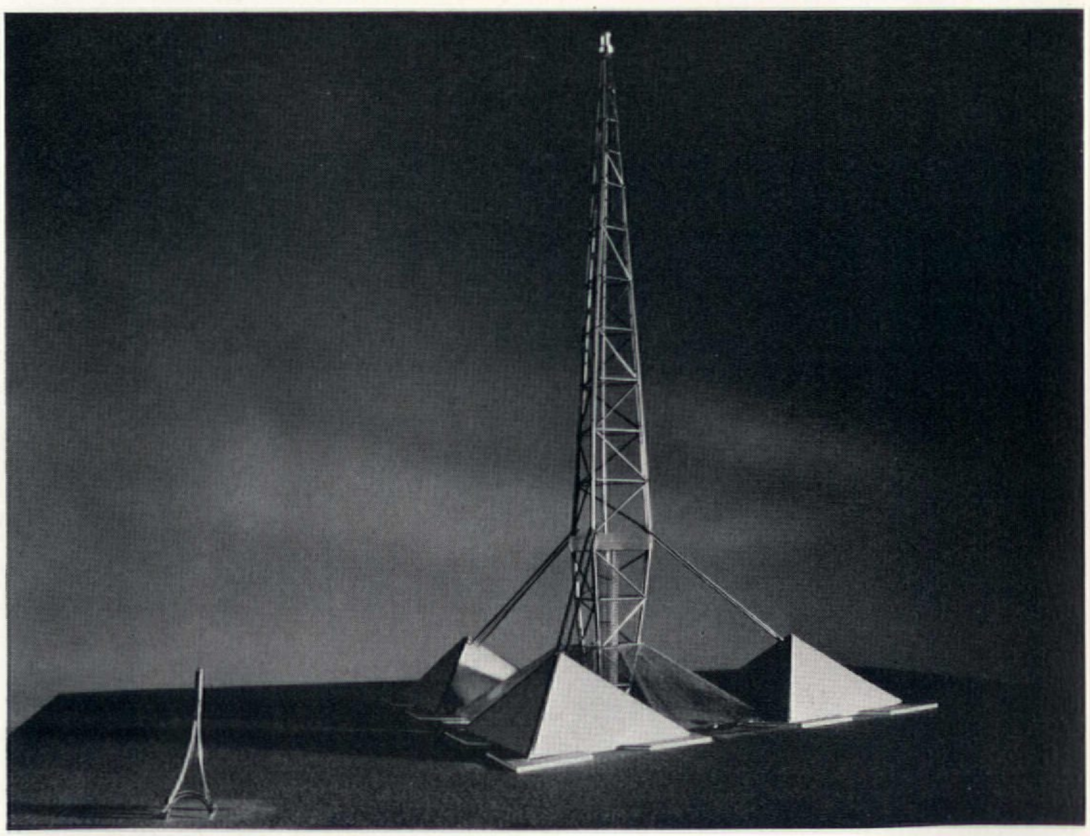
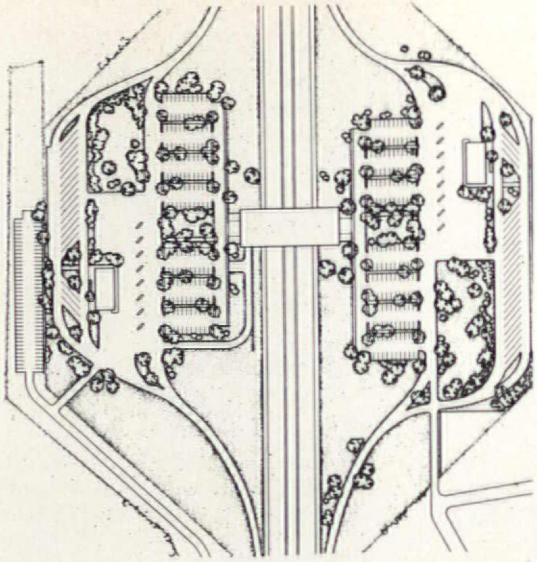


3

1
Diagrammatic section of accommodation unit at the summit of the tower
2
Detail section through spiral ramp in summit unit
3
Model of the two-mile high tower with the Eiffel Tower, at the same scale, to the left
Photograph: Stephen F. Rosenthal

This article is reproduced from *Progressive Architecture*, November 1967



1

Highway service station, Illinois

David Haid
Structural engineers: Wiesinger-Holland
Mechanical engineers: Wallace-Migdal

The site is planned to allow easy and safe access to and from the highway. Passenger car and truck traffic is separated within the site and separate parking facilities for each is provided.

The restaurant building is a weathering steel structure enclosed in glass. The basements and retaining walls are of buff brick. Entries are at either end across granite surfaced bridges between the building and parking areas, over the basements.

Due to the fluctuating volume and types of service in the restaurant building, a flexible space was developed which allows various combinations of table, cafeteria or snack bar service.

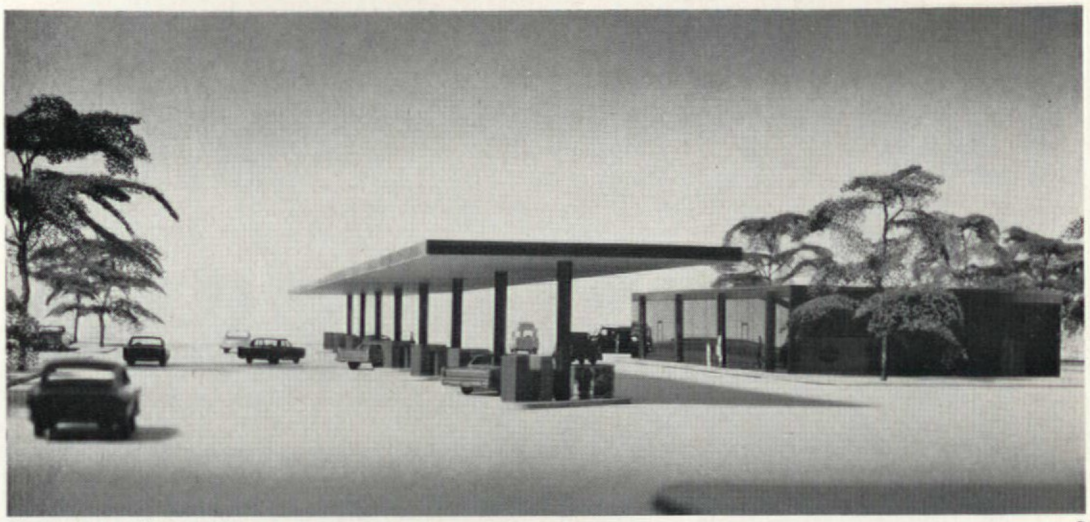
The structure of the restaurant building is a plate girder and truss system of weathering structural steel with a clear span of 225ft × 90ft supported on four columns. The superstructure is structurally independent of the basements and connected in a manner that will allow movement between the steel superstructure and the basements. The cruciform shaped columns are continuous built-up sections from the top of the caissons to the roof and carry the main floor and roof girders. The main floor plate girders are 6ft deep and the roof girders are 5½ft deep. The girders have a clear span of 135ft over the roadway and a cantilever of 45ft at each end beyond the columns. Trusses, 9ft on centre, span 90ft between the girders. This truss space at floor and roof allows for the distribution of all required ductwork and piping. Vertical wide flange mullions, also 9ft on centre, between the floor and roof girders carry the window units and work as hangers to equalize loads between floor and roof girders. Three-eighths inch bronze tinted plate glass is glazed in specially extruded weathering steel window frame sections. The floor and roof decks are poured in place concrete slabs on permanent metal forms.

An acoustic tile ceiling with incandescent combination air-light fixtures is suspended from the roof deck.

A service station on each side of the site is located between the truck and automobile parking areas. These are steel structures 99ft × 45ft. A central storage and rest room core of buff brick divides the buildings into two areas, one for auto servicing, the other for sales, travel information and office.

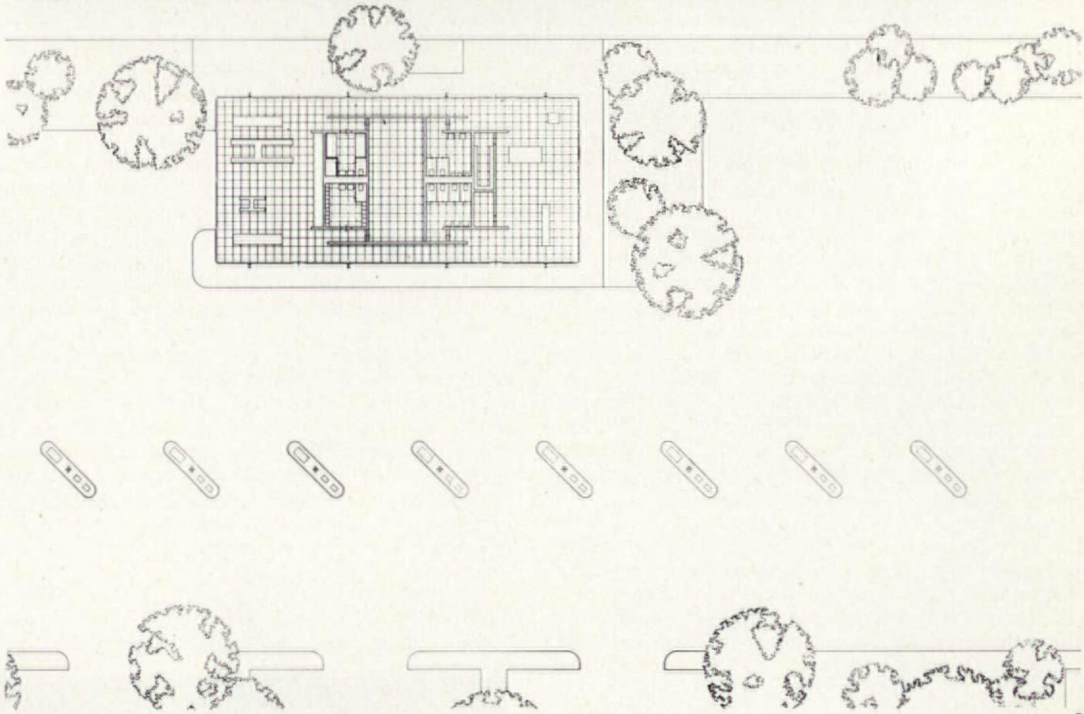
Wide flange columns 27ft on centre support a roof structure consisting of channel fascias with wide flange beams 9ft on centre. The roof deck is exposed precast concrete channel slabs. Window frames of cold rolled steel bar stock are set between the structural columns and glazed with bronze tinted plate glass.

The roofed over pump island areas, 26ft × 255ft, consist of steel frame construction with an exposed precast concrete channel slab deck. A single line of steel columns 34ft on centre support these roofs.



Photographs: Warren Meyer

2



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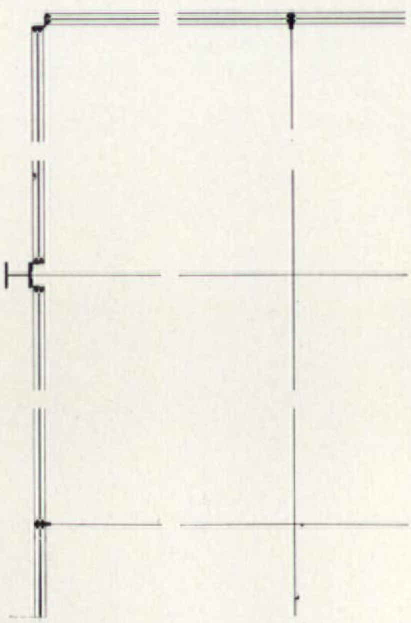

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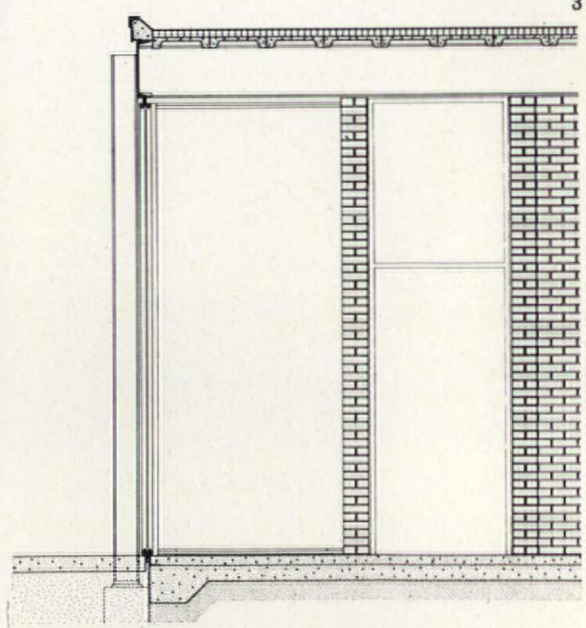
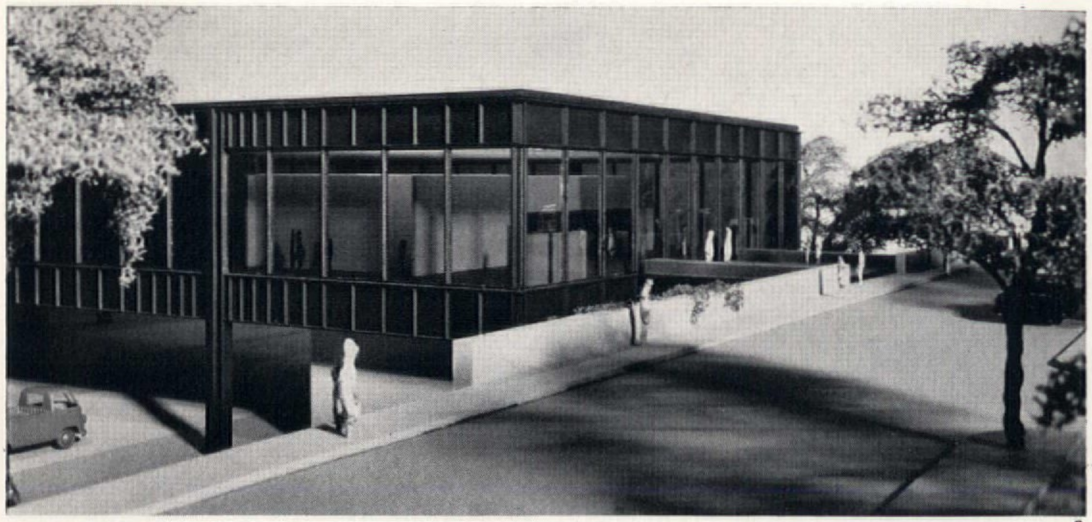


5

1
Site plan
2
Service station, view from approach drive with pumps in foreground

3
Service station plan
4 & 5
Service station, detail plan and wall section
6
Restaurant, from the north-west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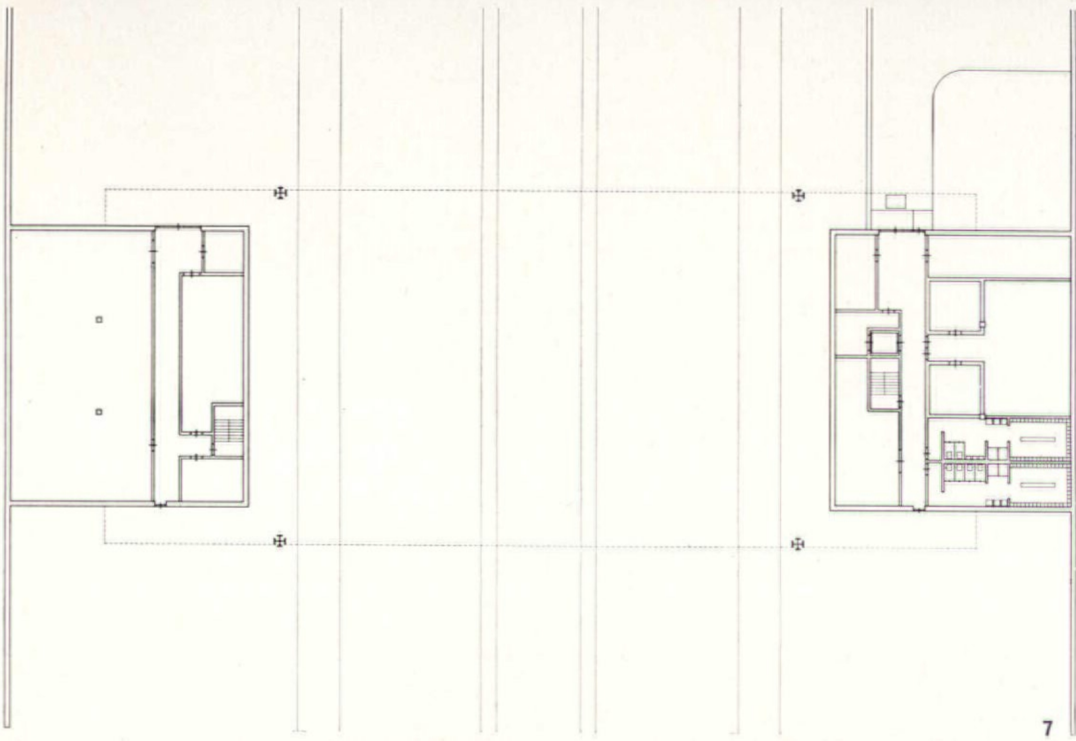
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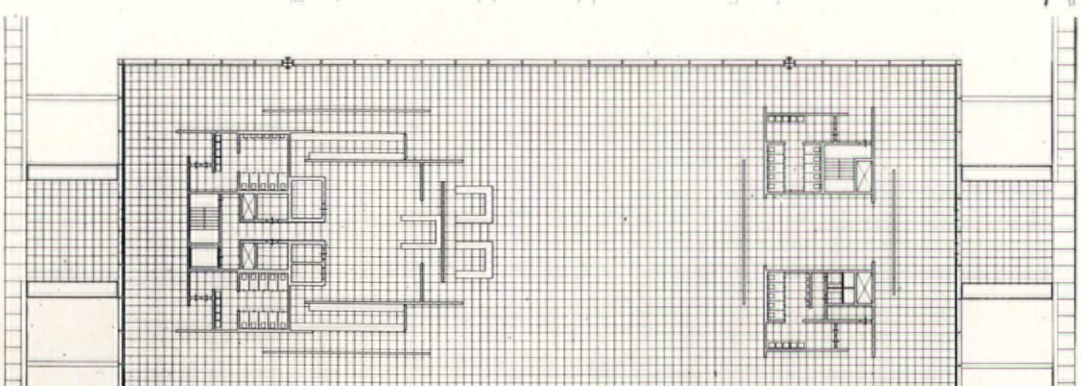
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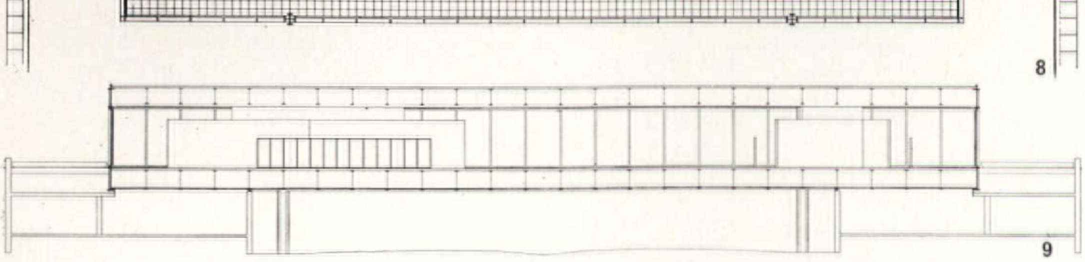
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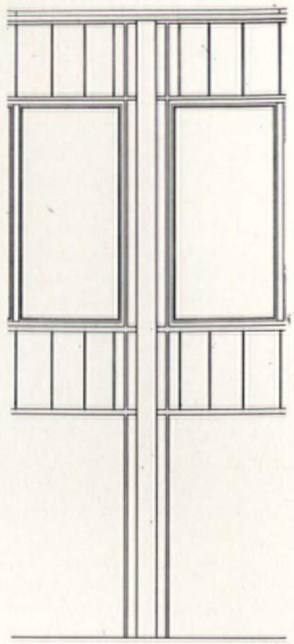
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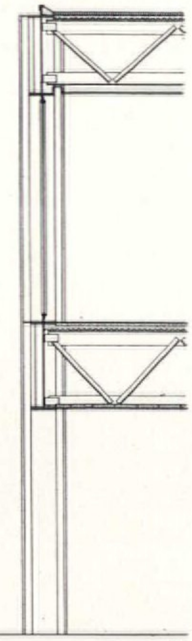
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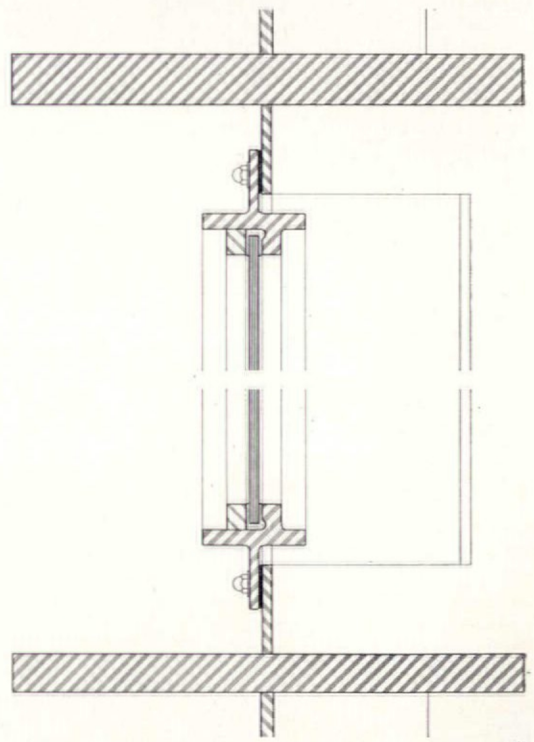
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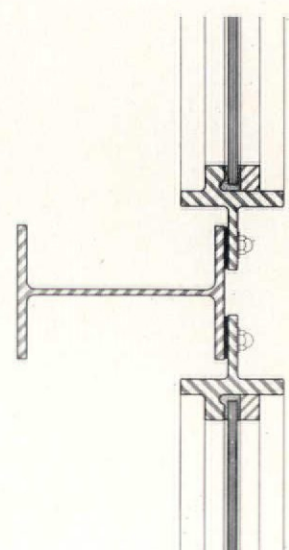

13

7 & 8
Basement and main floor plans
9
Long section through restaurant and highway
10
Detail elevation, restaurant

11
Section at column, restaurant
12
Detail at floor and roof girder flanges
13
Horizontal mullion detail

Modules for house plan*

G. A. Caloyannidis

The usual grids on which typical ground plans of houses are based and which seem to meet functional requirements in a satisfactory way have the major disadvantage of being far too small. Prefabrication systems cannot adopt them for the production of the large standardized components necessary for low-cost building. Development has proved that modules between the international standard of 10cm and 1 metre, currently in use, have more significance rather in dimensional coordination and in introducing a kind of architectural order in house design than in providing a basis for the development of prefabrication systems.

Working teams at the University of Thessaloniki investigated the possibilities offered by considerably larger modules by testing a number of grids on the various spaces of the more or less typical average house. Each module was tried on bathrooms, kitchens, bedrooms, corridors and staircases.

The size of the bathroom, which is the smallest space in a house, played a basic role in the selection of the modules. An area between 3·5 and 4·5 sq. metres was considered adequate for the needs of a fully equipped bathroom. The modules should either correspond to or divide this unit of area. They would therefore lie within the areas of 3·50–4·50m² and 1·75–2·25m². Non-square rectangular modules were not excluded but care was taken so that a simple ratio like 1:2 or 2:3 existed between their two dimensions.

Within each of the selected modules the 'order of spaciousness' for the various rooms was kept on the same level. If for example a module offers a small bathroom with a shower, it should also offer an equally small kitchen or bedroom, etc.

The illustrated examples of equipped or furnished spaces show a series of typical possibilities especially on the minimal space level, characteristic for the versatility of each module.

The research resulted in three modules:

1·20 × 1·80 clear floor space 1·85m²
1·60 × 1·60 „ „ „ 2·25m²
1·60 × 2·40 „ „ „ 3·45m².

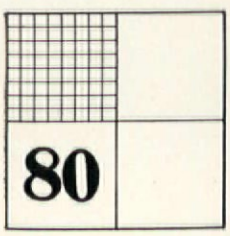
The metric base is 60cm for the first module and 80cm for the other two. *G.A.C.*

Diagram of grids or larger modules

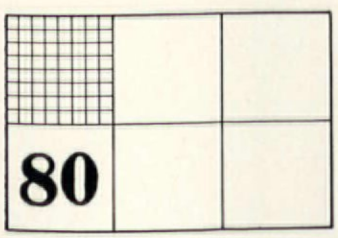
Multimodules of 6 M and 8 M generate three planning grids of 12 M × 18 M, 16 M × 16 M and 16 M × 24 M.

The tables on the right of each mean that one multimodule of 6 M × 6 M encloses an area of 1·9 metres, after deducting ½ M all round from the centre of the enclosing partition, and so on.

Module 120/180	1M²	1·90
	2M²	3·90
	3M²	5·95
	4M²	8·05
	6M²	12·25
	8M²	16·45



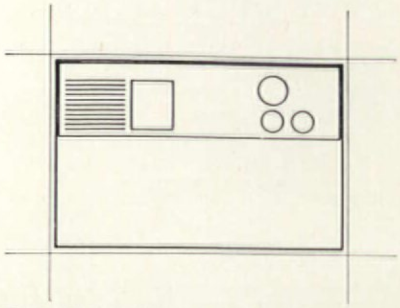
160/160	1M²	2·25
	2M²	4·65
	3M²	7·05
	4M²	9·60
	6M²	14·60



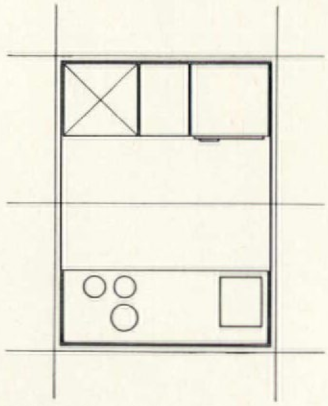
160/240	1M²	3·45
	2M²	7·15
	3M²	10·80
	4M²	14·50

***This study originated from an exercise for the fourth year students of the Aristotle University of Thessaloniki Laboratory of Architectural Design of Industrial Aesthetics, 1967.**

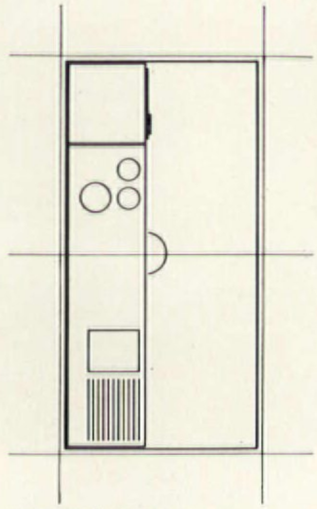
Comments by Mark Hartland Thomas



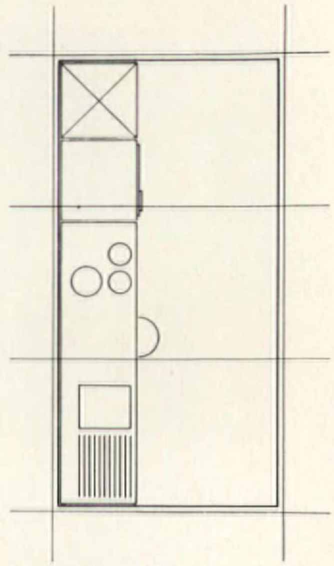
Grid 16 M × 24 M
Kitchen 24 M × 16 M
(15 M × 23 M in clear)
Width 1500 (4ft 11in) is too narrow.



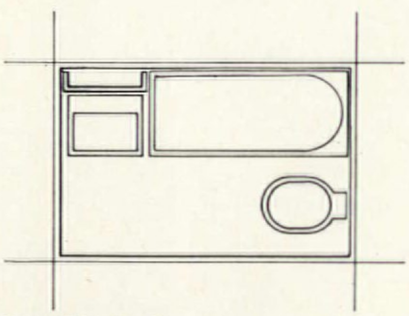
Grid 12 M × 18 M
Kitchen 18 M × 24 M centres
(17 M × 23 M in clear)
Width 1100 (3ft 7¼in) between worktops is at the correct minimum.



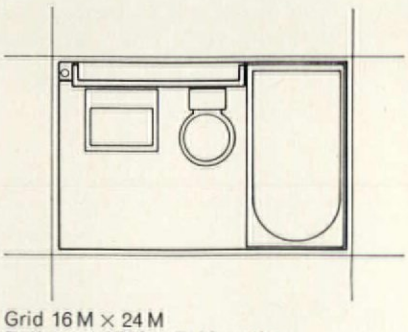
Grid 16 M × 16 M
Kitchen 16 M × 32 M
(15 M × 23 M in clear)
Width 1500 (4ft 11in) is too narrow.



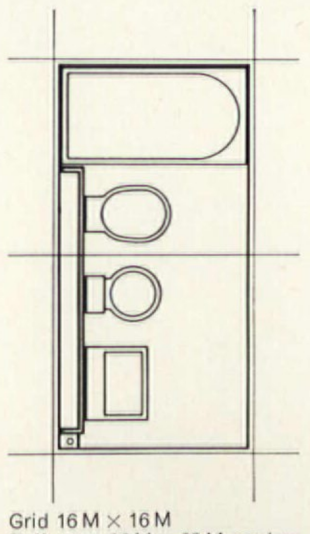
Grid 12 M × 18 M
Kitchen 18 M × 36 M centres
(17 M × 35 M in clear)
Width 1700 (5ft 7in) is at the correct minimum.



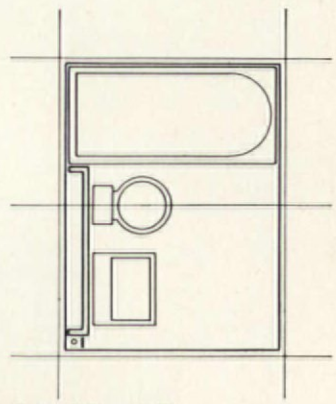
Grid 16 M × 24 M
Bathroom 16 M × 24 M centres
(15 M × 23 M in clear)
Width of bath reduced to 7 M to fit the room and its length reduced to 16 M. In spite of this, there is too little elbow-room at the basin.



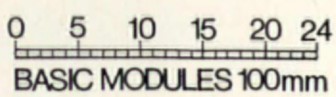
Grid 16 M × 24 M
Bathroom 16 M × 24 M centres
(15 M × 23 M in clear)
Room is too narrow, causing bath to be short at 1500 (4ft 11in) whilst still 800 wide. Length of room 2300 (7ft 6½in) is wasteful; 2000 (6ft 6¾in) is enough.

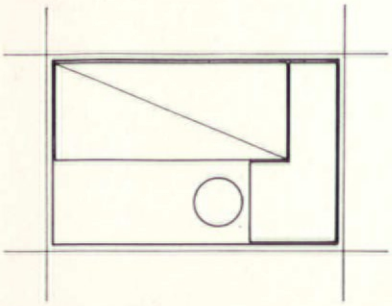


Grid 16 M × 16 M
Bathroom 16 M × 32 M centres
(15 M × 31 M in clear)
Room is too narrow, causing bath to be too short at 1500 (4ft 11in) whilst still 800 wide. Added length occupied by bidet. Bathroom like foregoing, without bidet, not shown for this grid.

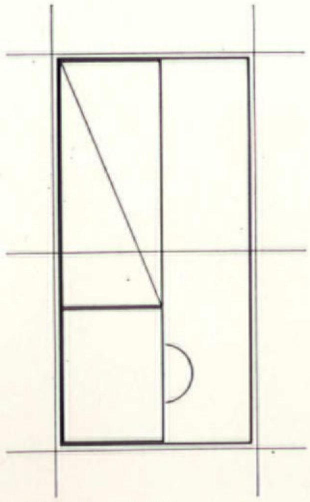


Grid 12 M × 18 M
Bathroom 18 M × 24 M centres
(17 M × 23 M in clear)
1700 (5ft 7in) for the length of the bath is correct. For the length of the room 2300 (7ft 6½in) is wasteful; 2000 (6ft 6¾in) is enough. Bath is 8 M × 17 M.

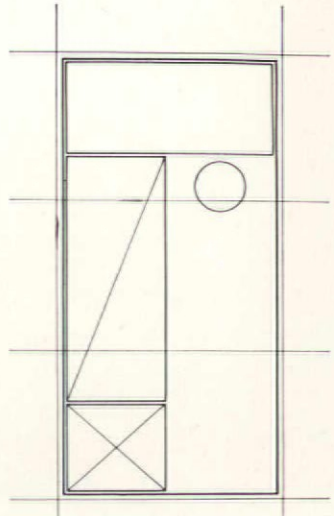




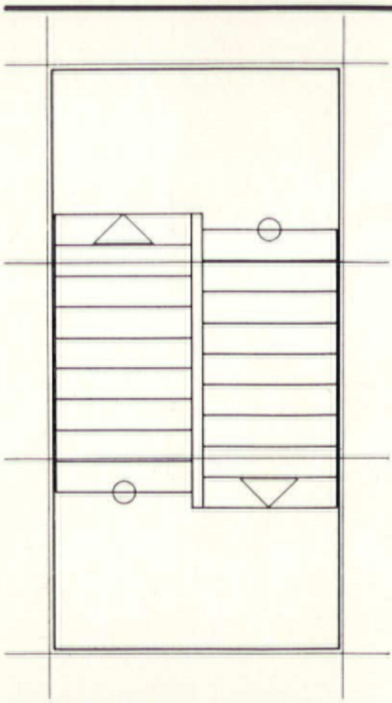
Grid 16 M × 24 M
Bedroom 16 M × 24 M centres
(15 M × 23 M in clear)
Width 1500 (4ft 11in) and length 2300 (7ft 6½in), both too small.
Space for doorset reduced to 7 M.



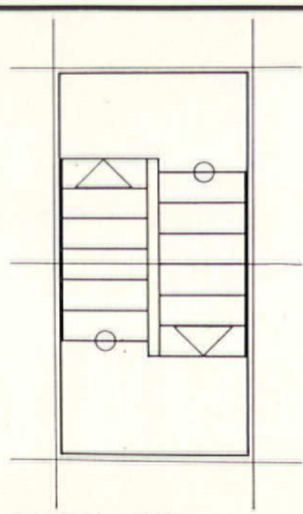
Grid 16 M × 16 M
Bedroom 16 M × 32 M centres
(15 M × 31 M in clear)
Width 1500 (4ft 11in) and length 3100 (10ft 3in) both too small.
Space for doorset reduced to 7 M.



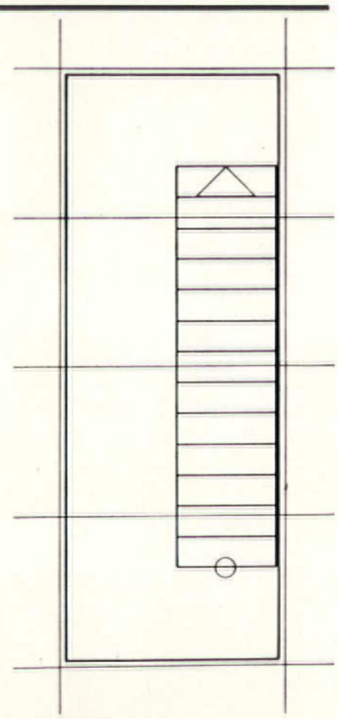
Grid 12 M × 18 M
Bedroom 18 M × 36 M centres
(17 M × 35 M in clear)
Width 1700 (5ft 7in) and length 3500 (11ft 6in) are each at the correct minimum. There is space for 9 M wide doorset.



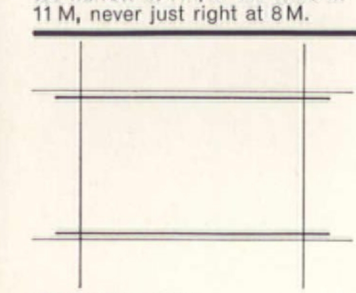
Grid 16 M × 24 M
Staircase 24 M wide centres
(23 M in clear)
Flights each 1100 (3ft 7¼in) are too wide. The 16 M × 24 M grid compels staircases to be either too narrow at 7 M, or too wide at 11 M, never just right at 8 M.



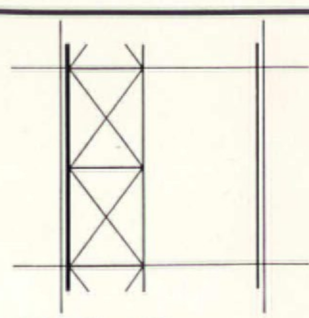
Grid 16 M × 16 M
Staircase 16 M wide centres
(15 M in clear)
The flights have been reduced to 700 (2ft 3½in) which is too narrow.



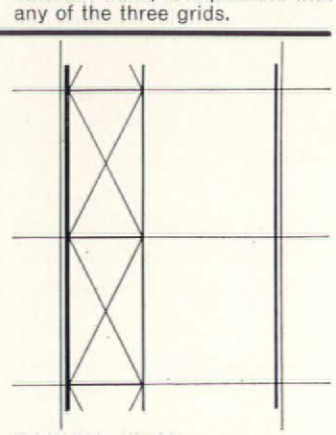
Grid 12 M × 18 M
Stairs and Landing 18 M wide centres (17 M in clear).
The most economical staircase, a straight flight 8 M in clear between walls, is impossible with any of the three grids.



Grid 12 M × 18 M
Passage 12 M wide centres
(11 M in clear)
1100 (3ft 7¼in) too wide for one door, too narrow for two.



Grid 16 M × 16 M
Passage 16 M wide centres
(15 M in clear)
1500 (4ft 11in) too wide for one door, two narrow for two. The superfluous space is filled with cupboards.



Grid 12 M × 18 M
Passage 18 M wide centres
(17 M in clear)
Though not shown, 17 M is exactly right for two doorsets with a 1 M partition between them.
Here the superfluous space is filled with cupboards

Dr Caloyannidis' study is founded, as he says, upon the assumption that the production of large standardized components is necessary for low-cost building. This is a widely held opinion, but it is in my view fallacious. We must be grateful to him for publishing a study that demonstrates so clearly how fallacious it is.

The diagrams that I have chosen, and commented upon, are minimum spaces. This is where the test of accurate house-planning must be applied. The more generous spaces are easier to plan. Dr Caloyannidis, himself, does not include living rooms nor any whole house plans. He was probably wise not to attempt these.

The absurdity of the large module is perhaps shown in the most glaring light by the bathrooms. Here the grid operates upon the size of the bathtub like the bed of Procrustes, stretching out the bath or lopping off its length or width to fit the tyranny of the grid. The bathtub is one of the first components to standardize for production. To sacrifice the standardization of baths to the doubtful advantage of promoting large standard wall and floor components, is to stand rationalization on its head.

Much the same comment applies to the bed sizes shown on the plans. These are shown in various lengths of 18½ M, 19 M and 19½ M and widths 7½ M, 8 M and 9 M. Admittedly, there is not so much advantage in standardizing beds as baths, but it is normal architectural practice to show furniture of standard sizes throughout a set of type plans, as an earnest of good faith. In some countries the authorities require this for plans submitted under the building regulations.

As the examples shown above demonstrate, the three large modules or planning grids completely fail to produce accurate and economical house-planning. In spite of Dr Caloyannidis' claim, they even fail to produce 'dimensionally consistent' houses. For example, the 16 M × 24 M grid produces a monumental staircase, but a substandard bathroom, kitchen and single bedroom.

The grid that comes nearest to success is 12 M × 18 M. This produces a bathroom that is only 3 M (1ft 0in) too long, a two-sided and a one-sided kitchen at the correct minimum size, a single bedroom that is likewise correct and a correct dogleg staircase, which is perhaps 1 M too wide for certain situations. But its minimum corridor is grossly oversized at 11 M (3ft 7¼in) and, by the same token, it does not allow for a straight-flight staircase between walls.

The other two grids, 16 M × 16 M and 24 M × 24 M, both fail at every test: undersized bathrooms, kitchens and bedrooms, oversized corridors and, as for staircases, the 16 M squeezes the flight down to 7 M (2ft 3½in) wide, the 24 M inflates it to 11 M (3ft 7¼in).

The fact that the coarse planning induced by these larger grids sometimes compels oversized spaces and, at other times, undersized, disposes in advance of the argument that the savings to be expected from the development of prefabrication systems will pay for more generous planning of spaces to larger modules. But this argument is sure to be adduced.

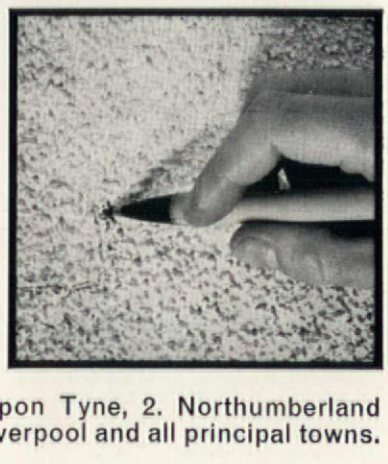
We have yet to see these promised savings. Systems employing large components are everywhere costing more than small components or traditional building. And when such systems do eventually become competitive, if they ever do, it will be those offering the greatest flexibility in planning that gain the day.

Multimodular design may be economical for factories and offices, even perhaps for schools and hsopitals, but for small houses it is certain that one-module (100mm) flexibility is essential. That this can be achieved, even with the most drastic reduction in the variety of component sizes, I have demonstrated in a recent study for United Nations, which is to be published shortly under the title Modular Design of Low-Cost Housing.

The industrialization of building for true economy will be achieved not by the Caloyannidis large-unit prefabrication systems, but by the development of component building on the lines that I have indicated. Fortunately, the great programme of conversion to metric-modular in the construction industry, now in progress at the British Standards Institution, is directed towards the same end. *Mark Hartland Thomas*

BRITISH PAINTS
'ANTI-VANDAL' COATING

prevents defacing of walls, saves maintenance costs



Scribbling by vandals is virtually impossible on walls treated with BPL's high build 'Anti-Vandal' Coating. Chalk disintegrates, pens and pencils cannot withstand the rough usage, even knife damage and similar forms of vandalism are largely resisted. BPL 'Anti-Vandal' Coating utilises a high build epoxy resin, incorporates special aggregates and is overcoated with a Two-Part Polyurethane Finish that forms an outstandingly tough, durable surface. Maintenance coats, particularly in public toilets, subways, etc., are considerably reduced. Many municipal authorities are already effecting a considerable saving by specifying BPL 'Anti-Vandal' Coating.

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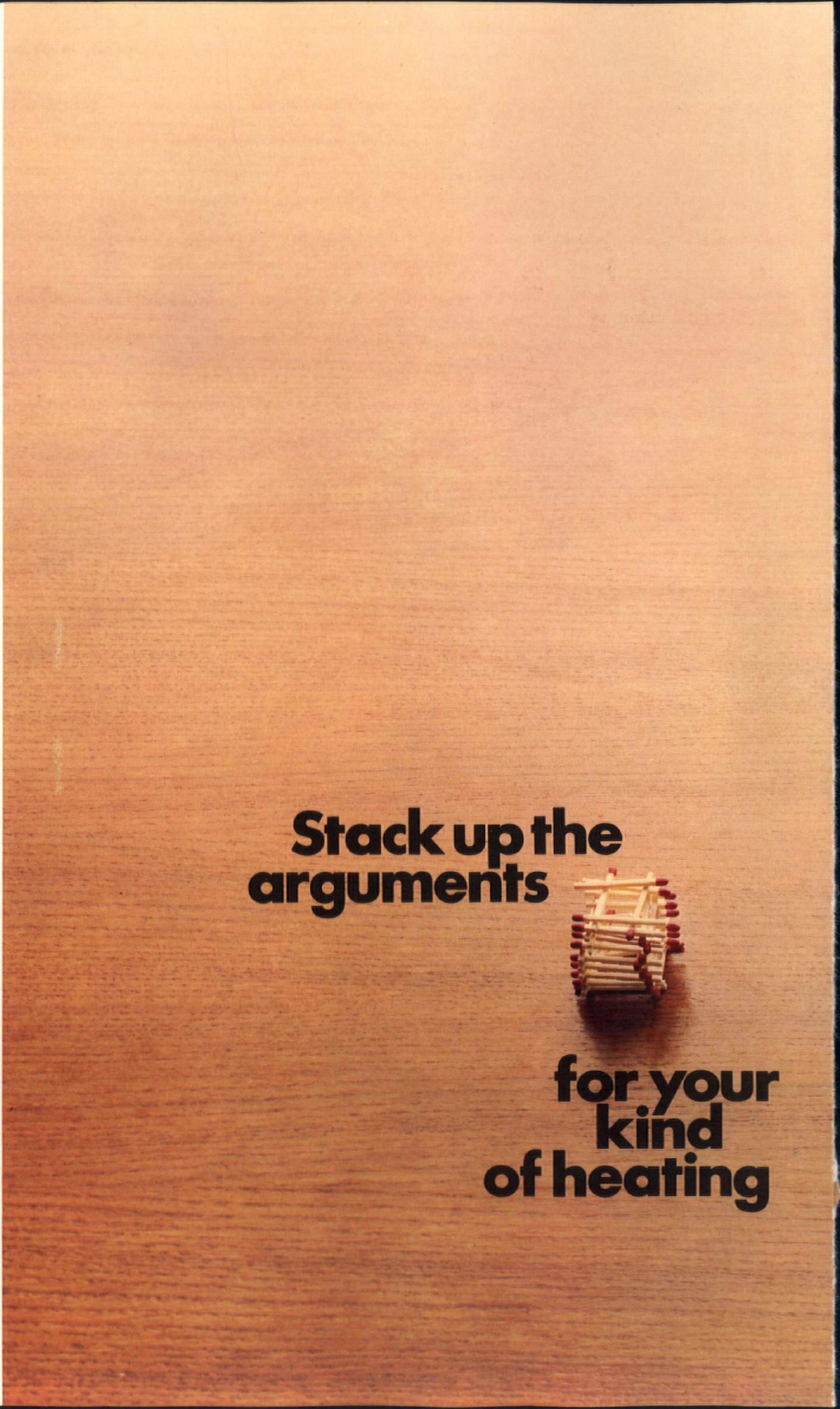
IM 56


Stack up the arguments
for your kind of heating

Rowlatts Hill children are growing up in a warmer world.

Four DSV welded steel boilers supply all the heat for the system. They are fired from the rear by Ashwell & Nesbit bunker-hopper stokers burning locally-mined washed singles. Estimated fuel consumption is 2,200 tons of coal.

DISTRICT HEATING A SUMMARY OF THE ADVANTAGES

1. The cost of *heat* to the tenant is very low allowing liberal use.
2. Re-payments on the capital cost of the scheme are low as the life of the equipment and re-payment period can be very long.
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The NCB and its associate company, Associated Heat Services Limited, are able to provide you and your clients with all facilities, from feasibility studies to detailed costings. Associated Heat Services are responsible for running the heating requirements for many clients. They work under contract for local authorities, private companies, hospitals, schools, etc., taking care of the whole heating operation: management, day-to-day running of the plant, fuel supply, staffing and maintenance. Write or telephone one of the addresses below and arrange to meet a specialist representative if you would like to discuss a particular project of your own. To obtain copies of our new booklet, 'District Heating for the new Britain', and for any further information about District Heating, write or telephone National Coal Board, Room 573, Hobart House, Grosvenor Place, London, S.W.1. BELgravia 2020, ext. 695.

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District Heating-a big breakthrough made possible by COAL

"The increased demand for personal comfort, legislation such as the Clean Air Act, a tendency to live in smaller units of higher density housing and the all-important need for economy have brought about a keen renewed interest in district heating generally."

From the speech of Mr Tom C. Firth, Chairman of Brightside Engineering Group, at the press conference to mark the completion of the Rowlatts Hill District Heating Scheme.

Rowlatts Hill, Leicester

Rowlatts Hill, in Leicester, is a newly completed housing development in the Crown Hills part of the city. The District Heating scheme is based on the proven Scandinavian principle which has been developed on the Continent over the last 40 years.

Rowlatts Hill is a community of 507 dwellings, comprising single and multi-storey buildings. Each is supplied with heat from an underground network of pipes radiating from a central station. Of this there is no visible sign. Even the chimney, which is built into the core of one of the 24-storey blocks, is concealed. The boilers are fired with coal, using automatic feed equipment which takes the fuel directly from the storage hoppers. When the coal is delivered it is conveyed directly to the hoppers by means of pneumatic delivery pipes attached to the delivery lorry. Each dwelling which is heated by steel column radiators to a temperature of 70°F also has its own storage cylinder for domestic hot water. This is heated by means of a coil connected to the mains, the storage temperature being automatically controlled by a valve.

Heat for the radiators and hot water cylinders is available to the tenants throughout the year. This eliminates the need for extra portable fires. The average flat rate cost per dwelling is

22/- per week, which includes the capital repayments for the installation as well as running costs.

Heat meters are fixed to all the radiators and hot water cylinders and a proportional payments scheme is in operation, giving a rebate or excess charge at the end of the year depending on the amount of heat used. Meter reading and invoicing of tenants is done by a specialist company.

Whatever the weather, the fortunate people who live at Rowlatts Hill can always rely on continuous, reliable heating, with no worries about boilers or fuel space. What is now exceptional is becoming commonplace. District Heating is the warm outlook for the whole of Britain.

NCB District Heating on the boardroom table

Start with the principle that all great ideas are basically simple, add a touch of ingenuity and you'll have no trouble explaining District Heating to *any* client.

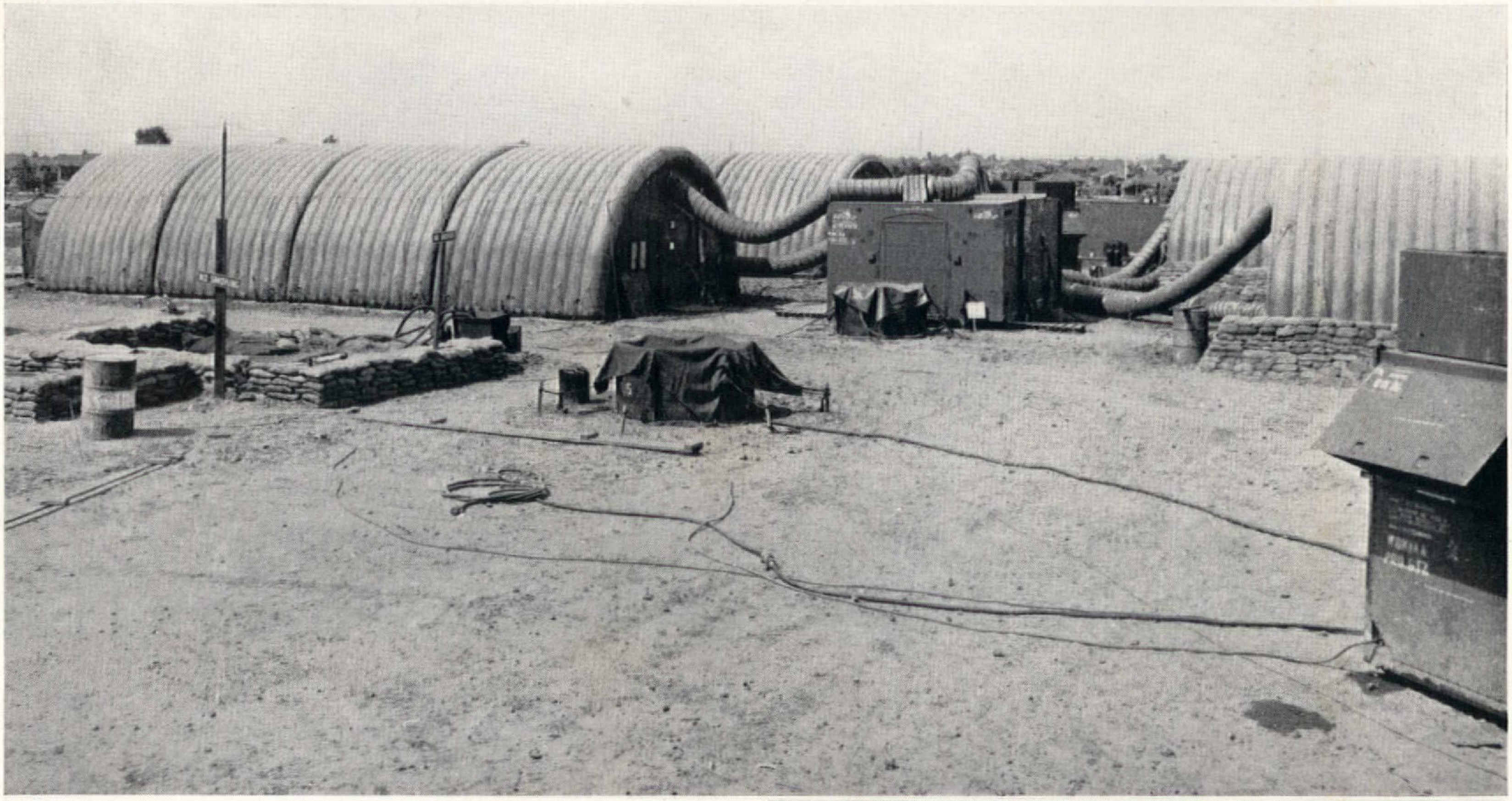
The simple but great idea is having one central source supplying all the space heating and hot water for an entire estate. The ingenuity was added by NCB, who pioneered and developed District Heating in this country. The result is higher living standards with lower running costs – as the Rowlatts Hill story overleaf shows.

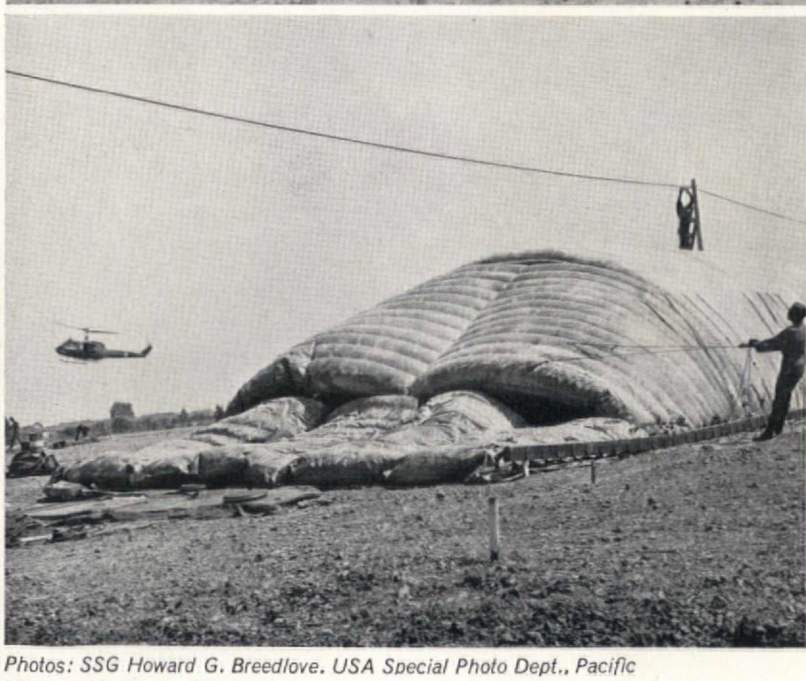
'A home without good heating is a house built to the standards of a bygone age. There is a clear trend of demand towards heating systems which are clean and have little or no work associatedwith them.' From the Parker Morris Report, 'Homes for Today and Tomorrow.'

MUST

Wars have tended always to throw up the most rigorous forms of architecture, from the castles and tents of the Crusades to the Thames forts and pill boxes of the Second World War. Ends and means have been clearly defined, limits set and strictly adhered to. The function of such buildings has never been in doubt. They are thus a salutary study whenever artistic pretentions threaten to suffocate the art of architecture. For architecture is essentially a limited art, bound by problems of use. Ignore these and the *raison d'etre* of architecture disappears. Such homilies, of course, are enough to enrage anyone who has at any time given half a thought to architecture. There is a lot more to it. 'Cant, cant, cant,' as Keats wrote, 'it's enough to give the spirit the guts-ache!' But rather the functional guts-ache than aesthetic indigestion, so, unabashed, we illustrate here an exemplar of the instant, lightweight and mobile non-architecture fomented by the new techniques of warfare—MUST (Medical Unit Self-contained Transportable)* set up by the 45th surgical hospital unit at Tay Ninh, Vietnam. This most complex of communities, with all its services and power requirements, can be erected on barren ground and begin operation within a few hours.

The elements consist of a gas turbine (3800lb) providing 90 kw (400 cycle) for electrical power, refrigeration, air and water heating and compressed air; an expandable unit (12×8×7ft when packed) incorporating X-ray, laboratory and surgical units with hot and cold water services, waste removal, air-conditioning connections and telephone jacks; and an air-inflatable element, a dual wall rubber-coated Dacron fabric structure with a floor area 20×52ft (4000lb) which can be joined to other sections with zippers and buckles.





Photos: SSG Howard G. Breedlove, USA Special Photo Dept., Pacific

*Developed by Garrett Corp./AiResearch for the US Army Medical Service.


contract carpets
BOND·WORTH

Design

1

Opus 22

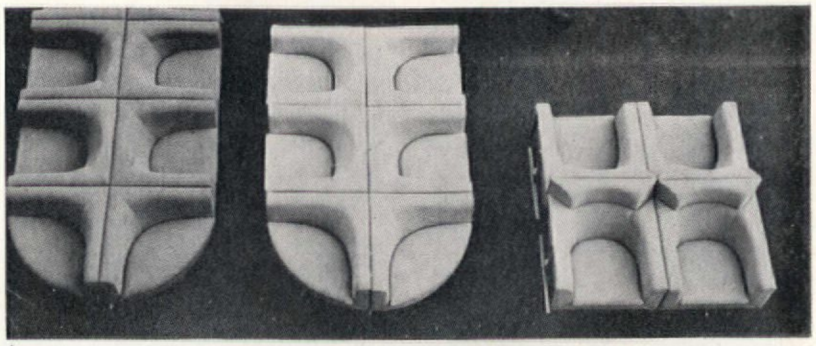
Stag Cabinet Co. have extended their Opus 22 range of storage furniture **1, 2** (made under licence from Interlübke; designer Walter Müller). Based on 22in and 36in widths, it now includes shelves, cabinets and drawers in addition to wardrobes and chests, giving very full cover for all requirements. Finishes are in matt white lacquer, walnut, teak or natural oak. Details such as fastenings and hinges are superb. To give an idea of price: the unit with four drawers and two shelves shown **1** would retail at £45.
Haydn Road, Nottingham

Foam

Pierre Paulin has been experimenting with foam-padded moulded steel forms covered in stretch fabric, for Artifort of Maastricht, Holland **7** to **9**. A recent chair of his **9** made of continuous metal tube and rubber webbing layered with foam resembles a Max Bill sculpture.

Also by Artifort is Geoffrey Harcourt's 'London Combination' seating **4, 5** (sequel to his designs for Lima's air terminal, *AD* 10/66). The foam-padded seats are suspended on cast aluminium I-frame supports; and there is a rounded corner-unit **5**; islands of seats are attached to an oval lateral aluminium rail below, while double-edge saw-tooth metal connectors grip under the seats to prevent shifting.
Interiors, 12/67. *Mobilia*, 10–11/67

2

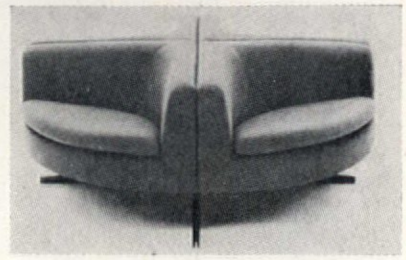


4

Another example of rigid polyurethane foam being used for seats (cf. also the Hille seats in *AD* 1/68, p. 47) is the new range, 'Meniscus' **10**, designed by Max Clendenning and manufactured by Charles Page Interiors Ltd in association with Aerofoam Ltd.

The foam is injected in a fibre-glass mould, and then covered with a layer of polyether foam before the outside cover of nylon-and-cotton-backed wool is put on. Prices are £42 17s. 6d. for the high back, £39 for the low back, and £35 for the tub chair.
48 High Street, Edgware, Middlesex

The one-piece 'Bobo' seat **6** by Cini Boeri designed for Arflex of via Borgogna, Milan, is made up of layers of expanded foam shaped to user-contours and glued to form a homogenous whole, after which it is covered in stretch fabric. The seat is either 60 or 120cm long and 87cm deep. (Arflex's agents in Britain are Oscar Woollens, 421 Finchley Road, London, NW3.)
Mobilia,



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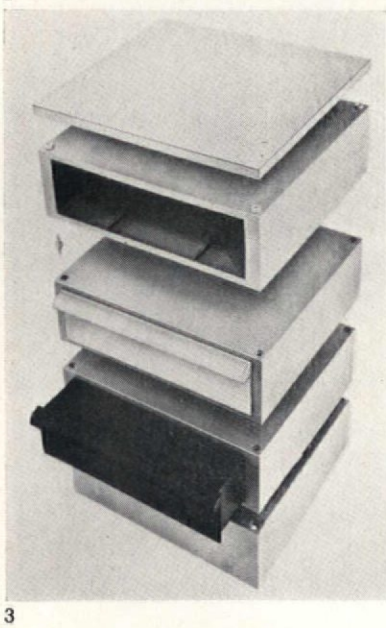
OK drawers

They indeed look and seem okay. The system consists of standard Kerridge plastic drawers each in a light grey polystyrene sleeve $15\frac{1}{2}$in × $16\frac{15}{16}$in × $5\frac{7}{16}$in **3**. The sleeves stack, held in place vertically by plastic corner plugs, and horizontally by steel connectors; and there is an optical grey-enamelled steel plinth. The polystyrene drawers—white, black, dark grey, maroon or clear—can be suspended under work tops or shelves, and shelves can bridge between banks of drawers by means of standard fittings. Prices: base £1 11s. 3d. Drawer 17s. 9d. and £1 0s. 9d. Sleeve £1 6s. Plugs 6d. each. Thus a stack of four sleeves containing white drawers and standing on a base would come to £12 7s., including packing cartons.
Kerridge Joinery Ltd, 184 Sangley Road, London, SE6.



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10

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◁ 190

Cologne Furniture Fair 1968

This mammoth exhibition of furniture from Western Europe and America occupied fourteen halls traversed by over 20 miles of gangways. Amongst acres of immaculately boring storage walls were these oases of imagination:

Astrea series, designed by Joe Colombo **2, 3, 4.** Chairs, two- and three-seater settees with glass-fibre reinforced resin shells, formed as intersecting circles on plan. The cushions are wedged-in over a springy grid of elastic cords. Leather, material or Skinflex covers.

Manufacturer: Comfort, Milan. Price for two-seater, £85 FOB.

Anna series of chairs and tables, designed by Casati Ponzio **8.** The illustration shows a table with lacquered wood top and supports of interlocking acrylic sheets. Manufacturer: Comfort, Milan.

Remy series, designed by Casati Ponzio **5.** Sectional easy chair with acrylic sheet frame, segmented rubber cushions covered in suede leather.

Manufacturer: Comfort, Milan.

Chaise-longue with polypropylene shell base **6**, upholstered in velvet corduroy. Manufacturer: Strässle International.

Bed with polypropylene base **7.**

Manufacturer: Strassle International.

Four-in-one coffee table, designed by Mario Bellini **1.** In Fiberlite, red, white, yellow, black for C+B, Meda, Italy.

Jumbo lounging furniture, designed by John Hardy of Design Workshop **9, 10.** Simple Dunlopreme rigid polyurethane foam shapes with patented laminated reinforcement. Wooden bases with skids. Stretch fabric covers. Recommended retail price for chair £19 7s. 6d., arm unit £8 4s. 7d.

Manufacturers: Beauvale Furniture Ltd, Ilkeston, Derbyshire, and Berkeley Square House, London, W1.

The Poly-Bel 'Twen' collection: design and manufacture by the Beltzig brothers at Wuppertal, W. Germany: three brothers, the eldest a furniture designer (sitting on the chair **13**), the second a plastics technician, the youngest does advertising/selling. *The Floris chair*—they call it a scurrilous object for sitting—supports the seat, hips and neck. The V-shaped seat has an air channel, avoiding stickiness through long sitting (press quote). Price at Maple's, London, is £29. The low-backed version **14** is £25, and a stool is £20.

The same designers already market a saucer plaything **12** and a slide with integrally-formed steps **15.**

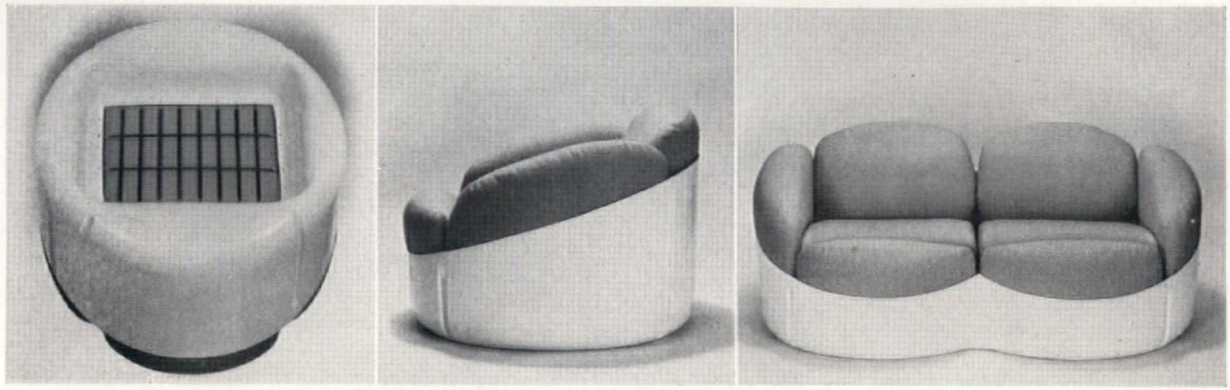
'Jamaica' mobile bar, designed by Eugenio Gerli **16.** A simple and ingenious design in plywood, veneered or lacquered. Each half has two casters. Maker: Tecno, Milan.

Entrance hall unit, designed by Motomi Kawakami **11.** A very compact item, rather mean on coats but good for the phone, parcels, briefcases, etc.

Makers: Alberto Bazzani, Milan.

Tony Leitch

1



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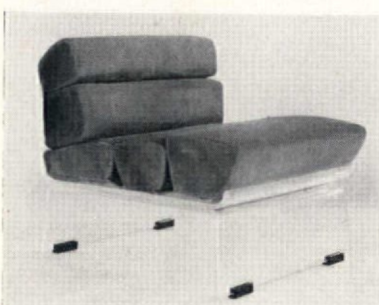

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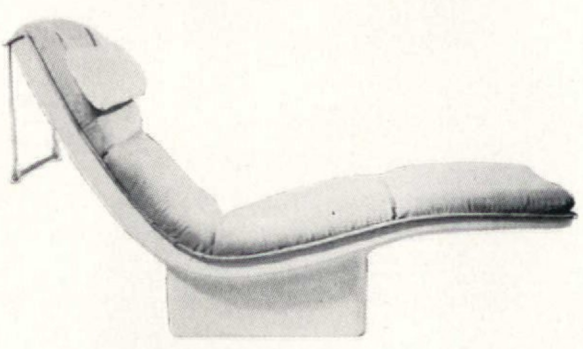

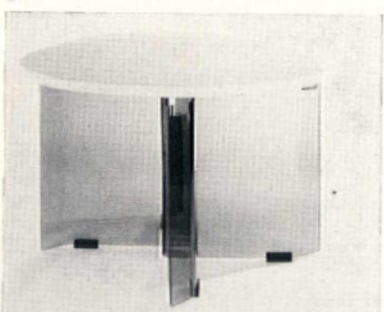

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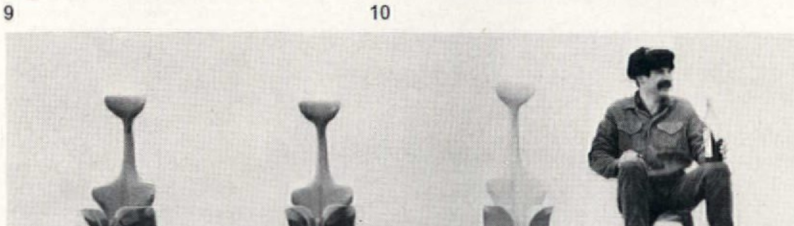

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Exactly. What else do you expect from the people who invented Multigroove Downlighters?
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Nice to know that the lighting equipment you choose for your designs is exactly right for the job. That's why we have built a comprehensive range of Downlighters for every lighting application.
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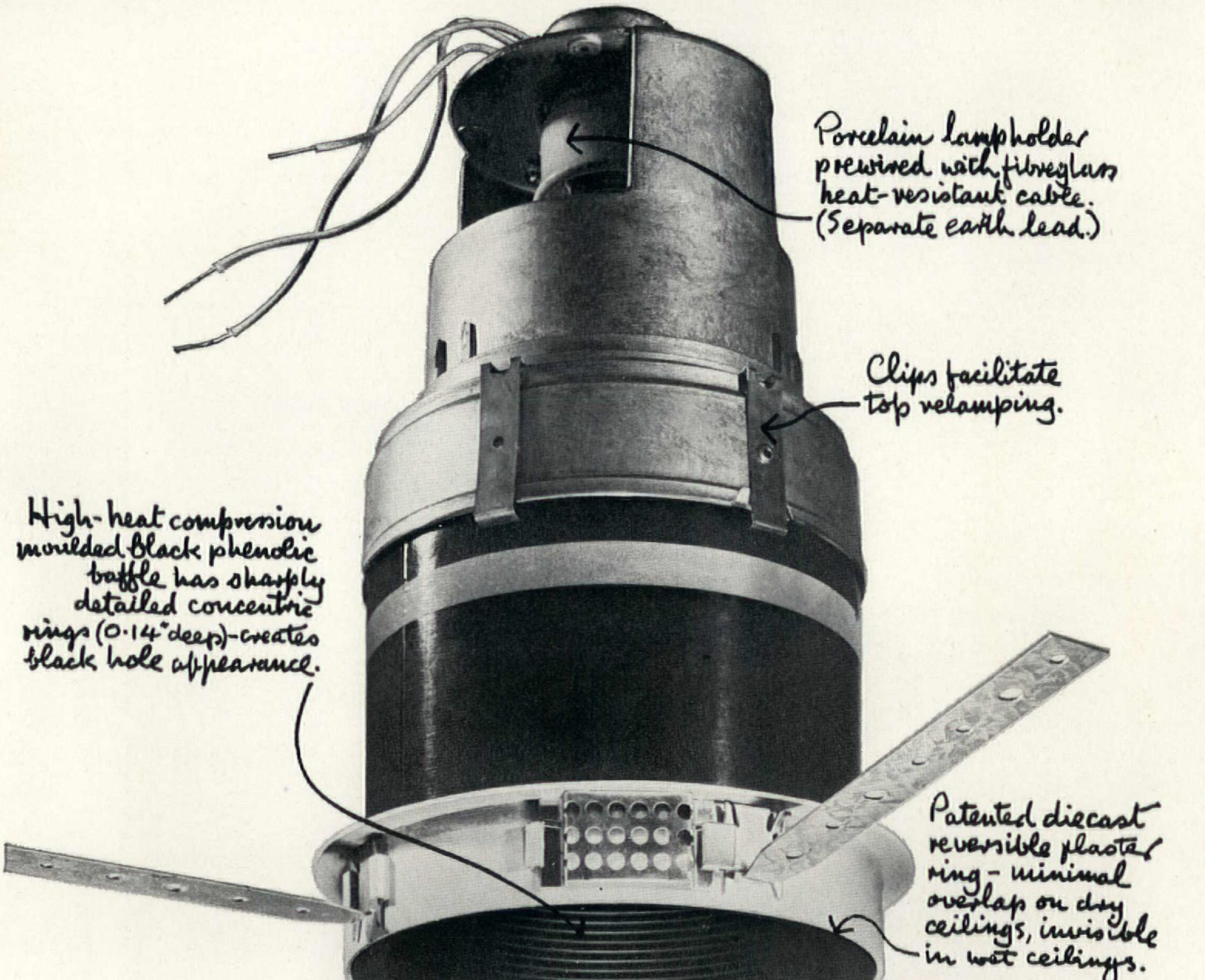

Rotaflex Concord
leading lights

Downlighter and Multigroove are registered trade marks.

Send for the Downlighter book to Dept. 8, Rotaflex (Great Britain) Ltd., Rotaflex House, City Road, London E.C.1. Tel. 01-253 8371

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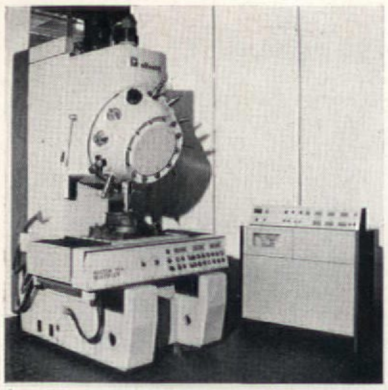
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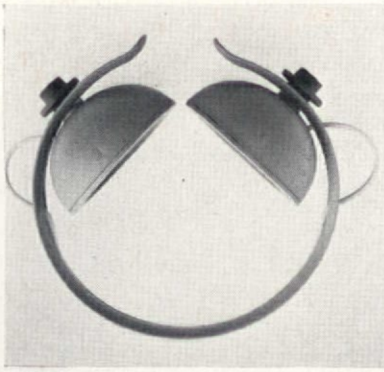
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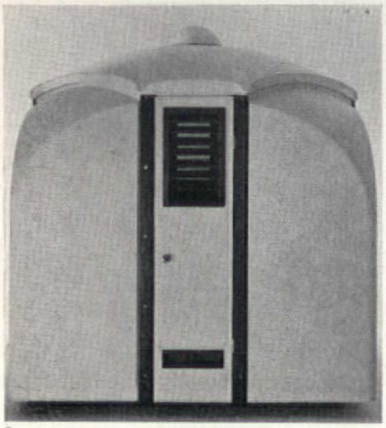
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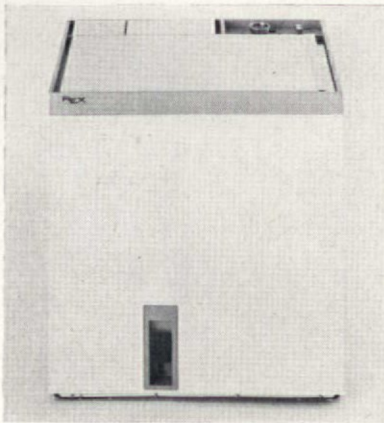
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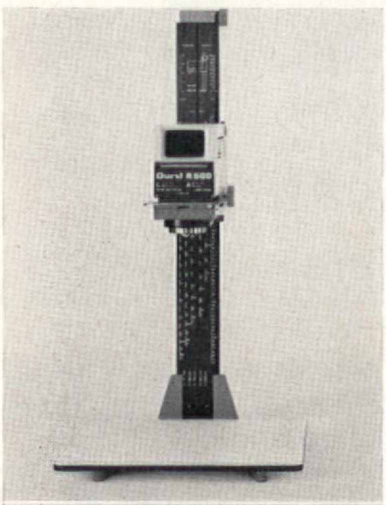

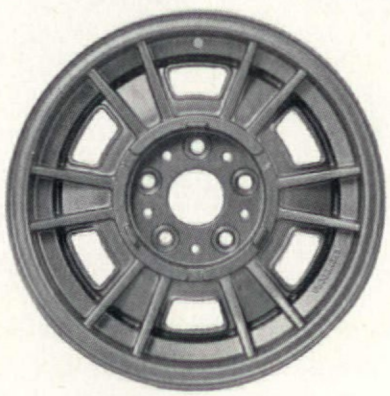
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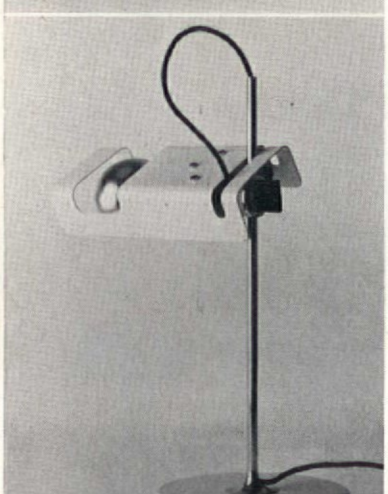
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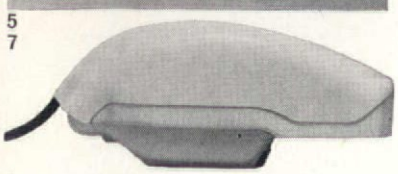
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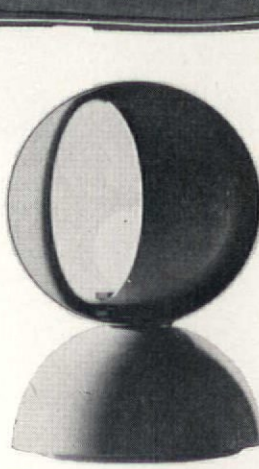
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Compasso D'Oro

For the past 15 years, the biennial Compasso d'Oro has been Italy's most coveted industrial design award. Presented in the past by its founder, the store La Rinascente, in conjunction with the Association of Industrial Design, it was taken over completely last year by the AID and its scope extended to cover theory and criticism.

The 1967 product design winners, announced in December, are shown here. Additional awards were given for the special number of *Edilizia Moderna* magazine on 'Design' (Editor Vittorio Gregotti, publisher Perelli, Milan); research in the design field, 1964–67 by Roberto Mango of the school of Industrial Design in the Faculty of Architecture, Naples. Individual research on design, by Enzo Mari. (See *Domus* 458, 1/68.)

Machine-tool 'Auctor' multiplex MUT/40A designed by Rodolfo Bonetto and made by Olivetti **1**.

Earphones for simultaneous translation (6 bands), designed by Achille and Pier Giacomo Castiglioni and made by Phoebus Alter, Milan **2**.

Bungalow 'Guscio' (shell) designed by Roberto Menghi and made by ICS (Industria Composizioni Stampate), Canonica d'Adda, Bergamo **3**.

Automatic washing machine 'Rex' type P5 designed and made by Industrie A. Zanussi, Pordenone **4**.

Photographic enlarger and duplicator 'Dust A 600', designed by Giulio Durst, Wilmuth Pramstraller and Josef Hollrigl and made by Durst, Bolzano **5**.

Light alloy wheel designed by FIAT and made by Cromodora Spa. Venaria Reale (Torino) **6**.

Lamp, 'Spider', designed by Joe Colombo and made by O-Luce, Milan **7**.

Ski boots 4S: designed and made by Calzaturificio Giuseppe Garbuio 'La Dolomite' **8**.

Telephone apparatus 'Grillo' (cricket), designed by Marco Zanuso with Richard Sapper and made by Società Italiana Telecomunicazioni Siemens **9**.

Table lamp 'Eclisse', made by Vico Magistretti and produced by Studio Artemide **10**.

Floorcovering

Coir matting tiles at last, 'Florida', from Morris & Co. (Kidderminster) Ltd. PVC backed, they are designed for heavy duty, come in a number of tonal colours, are 19½in square, cost 36s. each and can be cut to size without ravelling.
Viaduct Works, Hoobrook, Kidderminster

'Mascon Hartuft R' is a resin-treated carpet which is so tough that, on test, it even stood up to six months outdoor garden-path use through autumn and winter, rain and snow. It is for sticking direct to sub-floors of any surface. Comes in a number of different colours, and the contract price is about 25s. the square yard. The manufacturing process of the Hartufts was developed by Courtaulds. Mascon is a branch of Bury & Masco Industries Ltd.
Ramsbottom, Lancs.

Lights

Studio Artemide latest products include two gay light fittings that can lie around on the floor; *Pallade* **12** by Studio Tetrarch, in white or red lacquered metal, 40cm diameter; and *Vacuna* **11** by Eleonore Peduzzi' Riva in smokey white glass, 42cm diameter; both are segments of a sphere. Also, in moulded plastic, red, white or black, a simple umbrella stand **13** designed by Emma Schweinberger Gismondi, 39cm high, it costs 9600 lire. Finmar Ltd is their UK agent.
32–34 Avon Trading Estate, London, W6.


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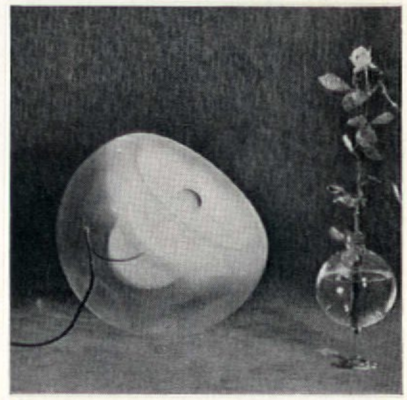
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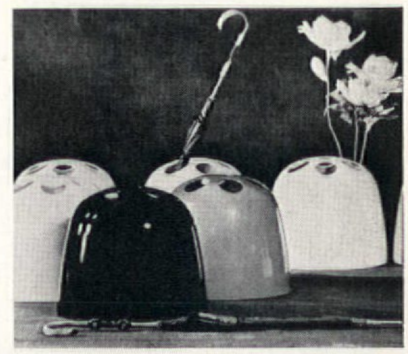
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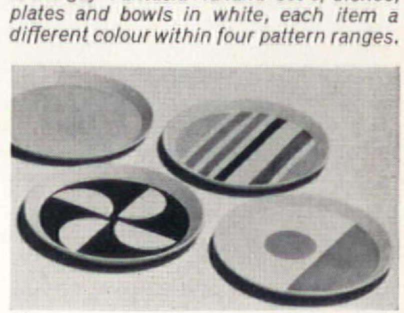
Gio Ponti's latest tableware creation for Ceramica Franco Pozzi, Gallarate, Varese, is the gay 'Fantasia Haliana' set of dishes, plates and bowls in white, each item a different colour within four pattern ranges.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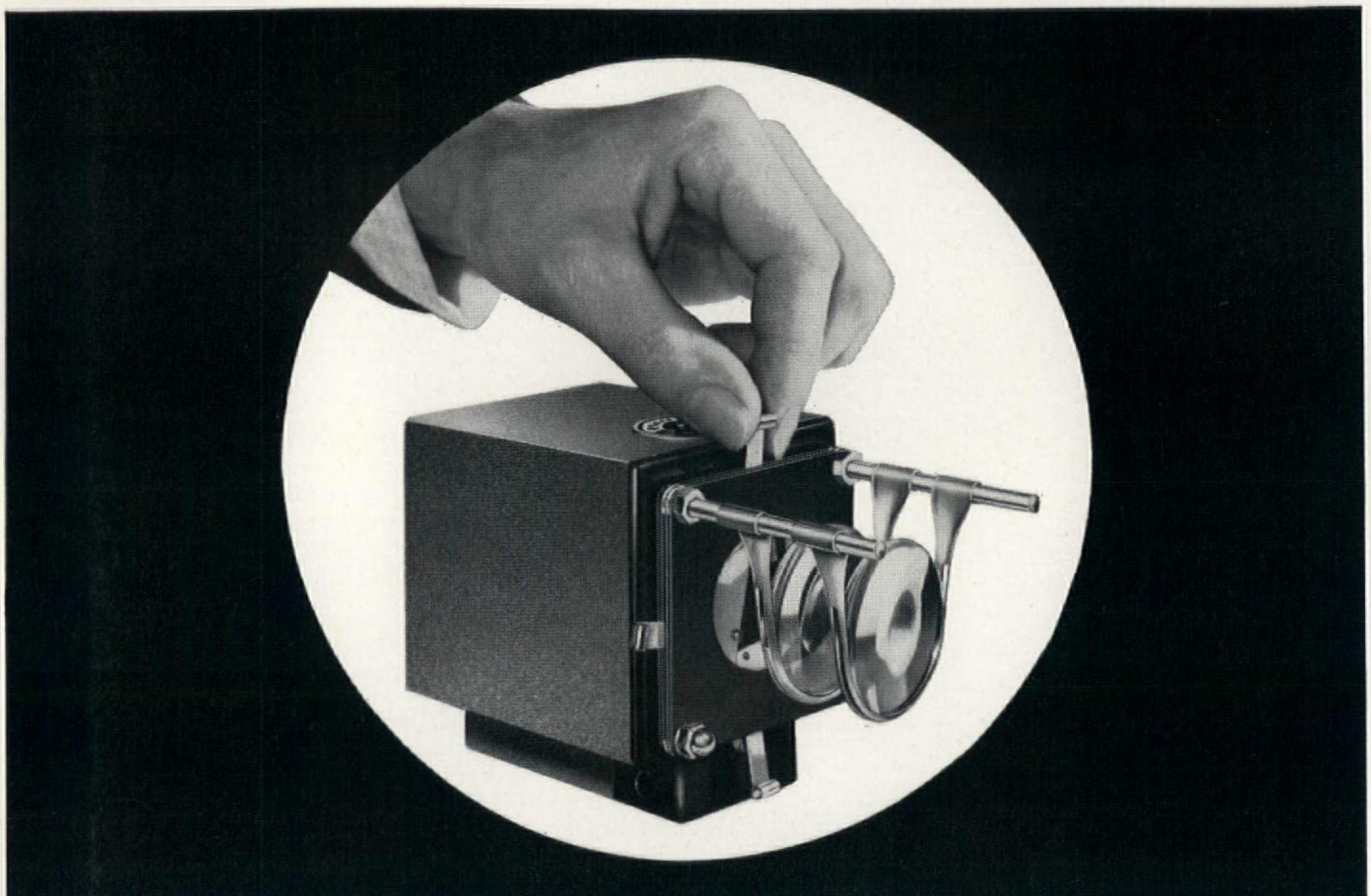
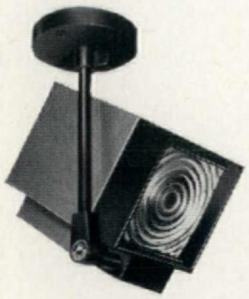


Minispot does everything a stage spot can do-

but with its 100w lamp it can be used anywhere

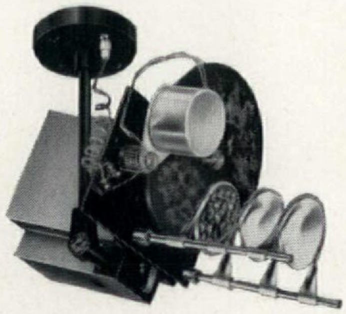
Minispots can be focused, directed, beam-shaped and dimmed to suit any lighting effect you require. For the very first time, Strand bring stage lighting techniques to the aid of the designer . . . the opportunity for creating original lighting decor in restaurants, hotels, clubs, stores and exhibitions–in fact anywhere that a 100w lamp can be used.

These new exciting Minispots, possessing all the versatility of theatre lighting, can be used functionally or decoratively, and there's even a projector version offering unlimited scope for using movement and colour (psychedelic effects) in any lighting scheme. Minispots and their control equipment are described fully in our catalogue, available on request.

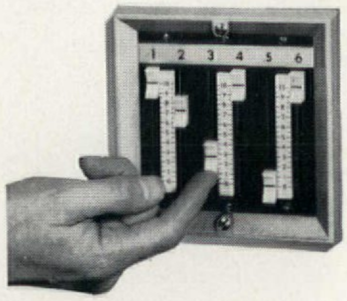


Mini-Softspot *Fresnel type step lens gives a soft-edge spotlight or, by adjusting a single knob, a 45° floodlight.*

Minispot (Top) *Any hard-edge beam shape can be achieved by simply altering the angles of the four shutters. The beam will then cover the area to be lit.*



Mini-Kaleidospot *This unique unit projects still or moving patterns and introduces the range of optical effects, clouds, snow, colour mixing, commonly used in the theatre,*



Minispot control *This simple unit allows infinite regulation of intensity with every Minispot in a lighting scheme. With this dimmer you can effect gradual changes such as dawns and sunsets.*

THE STRAND ELECTRIC & ENGINEERING CO. LTD., 29 KING STREET, LONDON, W.C.2. Telephone: TEMple Bar 4444

STRAND ELECTRIC

Alexander Pike

DEVELOPMENTS

To obtain additional information about any of the items described below, circle their code numbers (F1, F2 . . . etc.) on the Readers' Service Card inserted in this magazine.

F1 Automatic draughting equipment

Computaquants Ltd., 1 Broad Street Place, Finsbury Circus, London, E.C.2.
Ferranti Ltd., Ferry Road, Edinburgh, Scotland.
d-mac Ltd., Queen Elizabeth Avenue, Glasgow, S.W.2., Scotland.

The computer is now moving into the drawing offices and new equipment finding its way on to the market may radically alter drawing office practice in the very near future. Computaquants, specializing in the preparation of Bills of Quantities by computer, was formed in 1961. They have now reached an agreement with Ferranti, who produce drawing office units incorporating many of the newest electronic techniques, to market and develop these units.

The first element is an Automated Drawing Reader, which is already available to the engineering industries, and is a digitilizer allowing an operator to translate information from architectural drawings into numerical forms, automatically punched into eight-channel tape, at very high speed. By linking the computer programme with the reader, this tape can then be converted into a set of detailed instructions. These are also in the form of punched tape, which can be fed into the other items of equipment available, the Mechanical Plotter, which is equipped with a pen, scriber or optical head, capable of producing a drawing automatically, or a Microfilm Plotter, which can produce a completely dimensioned microfilm drawing in less than a minute. To the machine, a detail drawing is merely design information transferred from one form to another.

The ability of these plotters to generate automatically a working isometric or perspective drawing from plans and elevation, thereby saving considerable man-hours, should be welcomed in the building, architectural, structural engineering, heating and ventilating and petrochemical fields, where the shortage of skilled draughtsmen is constituting a bottleneck against increased productivity.

Similar equipment is produced by Kongsberg Vapenfabrikk, in Norway, and d-mac Ltd. of Glasgow are to collaborate in the marketing in Britain of the Norwegian company's Kingmatic Automatic Draughting Machines. Two models are available, a general purpose machine with a draughting area of 47in × 59in and a maximum speed of up to 400 inches per minute, and a large format machine with a draughting area of 102in × 145in with a maximum speed of 156 inches per minute.

Both companies have marketing agreements with Byggedata AS, a leading Norwegian computing bureau which has evolved a series of computer programmes for use in conjunction with this equipment.

The d-mac company produce a Cartographic Digitizer **1**, which provides a rapid means of digitizing selected information contained in maps, charts, drawings and photographs. In use, pictorial data is placed or projected onto a reading table; using a Pencil Follower **2**, the operator traces outlines or selects individual points to be digitized; an automatic sensing device beneath the reading surface follows the pencil accurately and position signals are passed to the electronics console, where they are displayed and converted into a suitable form for feeding the output unit. Used in conjunction with the Automatic Draughting Machine, this equipment has a very extensive variety of uses in many fields. Its value in quantity surveying and for road traffic analyses are obvious, but it is also capable, for example, of translating a map to a digital terrain model. From the input information, the computer programme will give cross-sectional drawings, mass diagrams, or a new plan with new structures superimposed.

The accuracy of the draughting machines is more than adequate for most building purposes. The smaller machine works to an accuracy of ± 0·1mm, and the larger to ±0·2mm. The potential advantages of the use of this type of equipment will only be partially realized if a standardized system of coding and method of drawing is employed. A Research Group has been set up by the GLC in the department of Architecture and Civic Design to develop a computer-based system to code information throughout the building process The objective will be to devise a method of coding information which can be used by all the professions and operatives concerned with building. Drawing presentation and detail will be standardized and methods of identifying information on the drawings will be rationalized.

The research group will be multi-professional and will have CBC of Copenhagen as consultants for the exercise.

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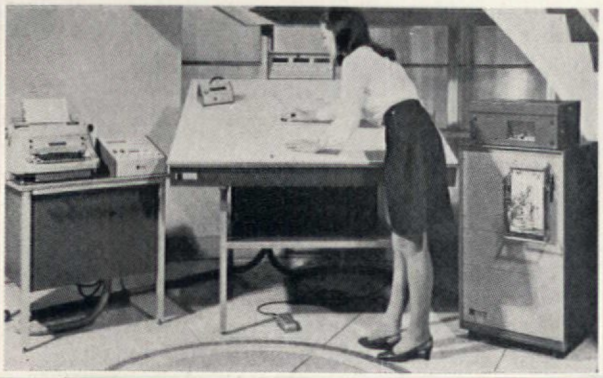

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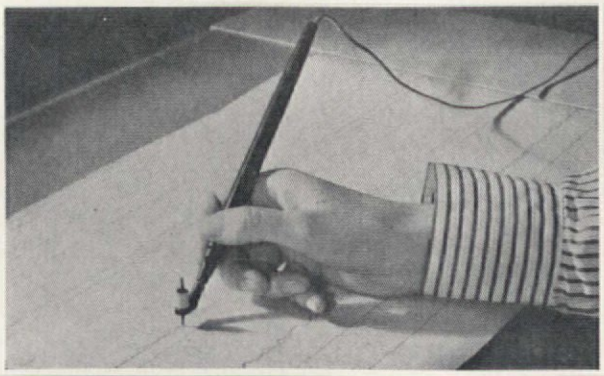
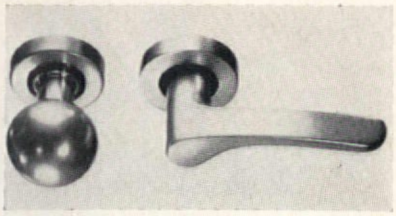




F2 Aluminium door furniture

Dryad Metals Works Ltd., 40–42 Sanvey Gate, Leicester

The Dryad 70 range designed by Robert Welch is manufactured almost entirely from aluminium extrusions, combining a high standard of finish with a modest price range. Both the lever and knob handles have a simple, concealed fixing which places the strain on the spindle and not on the screws.

F3 Delrin door handles

V. J. Breen (Holdings) Ltd., Crawley, Sussex

Breelock door handles are manufactured entirely of Delrin acetal resin mouldings. Handle, backplate, spring, cam and spindle are therefore all corrosion resistant, making the fitting especially suitable for exposed and coastal locations. The design utilizes the properties of fatigue resistance, resilience and rigidity inherent in the material.

F4 Universal door closer

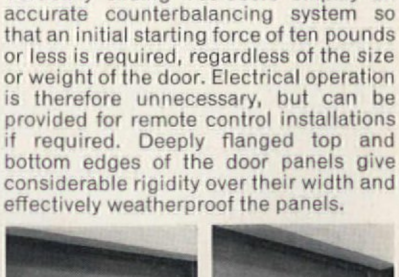
Armstrong Patents Co. Ltd., Eastgate, Beverley, Yorks.

The Strongarm universal door closer is supplied for direct application to left-hand hinged doors but can be converted to right-hand applications by a simple adjustment. It is supplied with a separate back-plate which is fitted first and into which the closer is then slotted. The closer has a tension adjustment to meet most door weight requirements and a selector screw which provides a choice of closing times from 3 to 115 seconds. Enamelled finish in silver, gold, copper bronze or blue.

F5 Vertically sliding doors

Dennison Kett & Company Ltd., Kenoval House, Farmers Road, London, SE5

Vertically sliding Vee-doors employ an accurate counterbalancing system so that an initial starting force of ten pounds or less is required, regardless of the size or weight of the door. Electrical operation is therefore unnecessary, but can be provided for remote control installations if required. Deeply flanged top and bottom edges of the door panels give considerable rigidity over their width and effectively weatherproof the panels.



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When you're the leading Silversmiths your carpets must have the hallmark of luxury.

That's why Mappin & Webb chose pure new wool.

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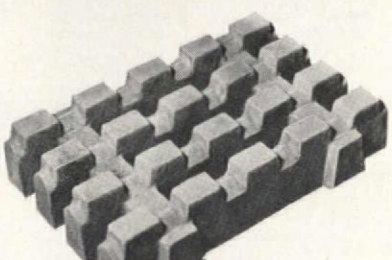
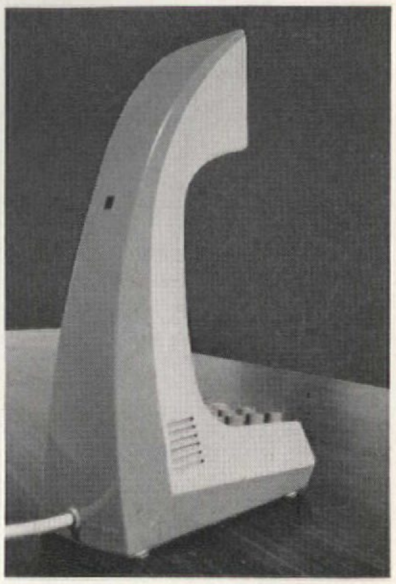
F6 Domestic delivery hatch
Harvey Fabrication Ltd., Woolwich Road, London, SE7
The Harvey Tradesman's Delivery Hatch has two compartments, each with its own external door and aluminium handle. Each external door has a separate automatic locking device so that once the compartment has been loaded with goods and the flap shut, it can only be released again by opening the inside door. Constructed from 16g mild steel sheet and pre-treated by the Zintec process for maximum resistance to rusting, the hatch is finished inside and out in white stove enamel. Size, 1ft 10in wide, 11in deep, Price £15 15s.



F7 Grass-concrete surfacing
Mono Concrete (Northern) Ltd., Oxclose Lane, Mansfield Woodhouse, Nottinghamshire
Mono Bg slabs provide a means of soil stabilization for load-bearing whilst retaining a grassed effect. The grass-concrete surface provides an alternative to a fully metalled area, giving a finish which is visually 75 per cent grass and 25 per cent concrete. Concrete grids, 23¼in × 15⅝in × 4¾in, weighing 80lb are manufactured of high-grade concrete without reinforcement, to facilitate site cutting if necessary. The slabs are laid on a sub-base suitable for the loads anticipated, and contain pockets which are filled with soil and in which grass is sown. The portion of the slab at surface level gives direct support to wheeled vehicles and provides a durable and skid-resistant surface.

F8 PVC bricks
The Inca Construction Co. (UK) Ltd., Stokenchurch, Buckinghamshire
Inca Bricks are manufactured in rigid PVC and are 4in high × 4in deep × 4in, 8in and 12in long. The bricks are laid dry and are accurate enough to be laid both plumb and square without skilled labour and are claimed to be capable of being laid at a rate of 600 bricks an hour. The bricks are acid- and alkali-resistant and require no dpc. Door and window frames merely slot in, and in most cases lintels are not required since the bricks weigh only 13oz each. Transparent bricks can be built in to provide light where necessary. The demand for this product has been very high and it is estimated that something like 20 million plastic bricks will be made during 1968, and the manufacturers are planning to produce a do-it-yourself housing kit which will cost between £1250 and £1500.



F9 Push-button telephone
Modern Telephones (Great Britain) Ltd., Chalcot Road, Regents Park, London, NW1
The Triphone is a push-button telephone which when used standing upright on a desk permits conversations to be carried on from distances of up to 18ft away. For confidential conversations the Triphone is picked up, and the caller's voice level is automatically adjusted to conventional telephone handset level. An added feature is the privacy control which can be provided by laying the instrument face downwards on a desk. In this position the instrument will not accept incoming calls and can automatically transfer the call to someone else. A push-button device is incorporated to increase the voice level when calling someone in a noisy area.

F10 Electrically operated curtain track
Rank Audio Visual Ltd., Woodger Road, Shepherds Bush, London, W12
The Rank Auton controls the opening and closing motion of the curtain by a twin push-button control box. This operates a motor giving a draw speed of 9in per second. The track is of PVC laminated steel and is supplied with nylon-coated steel runners. A clutch mechanism prevents curtain over-run. Price, complete with fixing brackets and track in any length up to 18ft, £22 10s 6d.

F11 Domestic lighting fittings
Nina Breddal Ltd., 5 Newburgh Street, London, W1
A new catalogue illustrates the complete range of Fog & Morup Danish lighting fittings.

F12 Fluorescent lighting
Osram (GEC) Ltd., PO Box 17, East Lane, Wembley, Middlesex
A new range of fluorescent lighting fittings includes a model with a diffuser designed to depart from the normal linear luminous form. Five circular units, with concentric louvres in white plastic, appear as separate light sources set in a matt finished aluminium panel. The diffusers are claimed to combine the economy of fluorescent lighting with the appearance of tungsten fittings.

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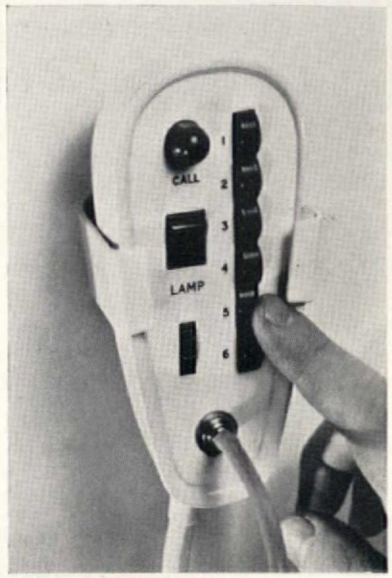
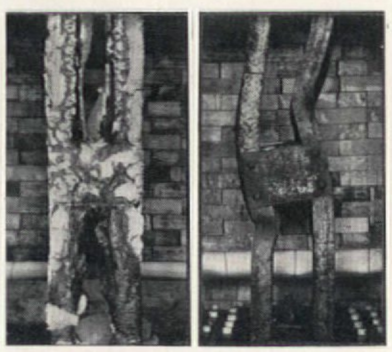
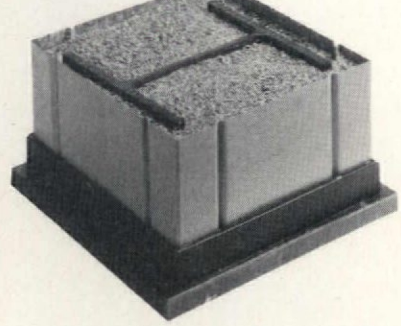


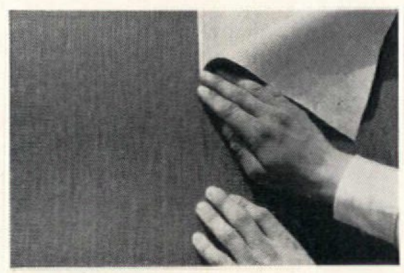
F13 Patient's hand unit
Nelson Tansley Ltd., 144 Holland Park Avenue, London, W11
The Nelson Tansley Hand Unit has been ergonomically designed for ease of operation using the thumb or finger of one hand. Facilities are provided for nurse-call and reassurance by means of a red illuminated push-button which also glows at very low brilliance to aid location in the dark. Control of the bed light is achieved by a rocker switch operating at low voltage in conjunction with the bed light relay. Up to six entertainment programmes can be selected and controlled by means of electrically and mechanically interlocked push-buttons. The unit is injection moulded in white ABS and is normally fitted with a shrouded 19-pin plug, although other types of plug to suit any bedhead unit are available. A nylon-coated steel mounting clip is supplied which allows all controls to be operated when the unit is stowed.



F14 Fire protection for structural steel
Domolac Duresco Ltd., Abbey Wood, London, SE2
The Intutherm Process for the fire protection of steelwork claims to retain the profiles in the slimmest possible form. The treatment consists of the application of a number of coats of a material which intumesces on being heated and forms a meringue-like layer which acts as a barrier to the transmission of heat. The coating is built up to an overall thickness of approximately 50mm and can normally be applied after all other building operations are complete. The Fire Research Station have awarded a certificate confirming a half-hour period of protection.



F15 Fire-resistant pre-fabricated column
Pyrocol Ltd., Halton House, Holborn, London, EC1
Pyrocol columns consist of a steel core to which lightweight Vermiculite insulation is factory-applied and protected in steel sheathing. The columns achieve fire ratings of up to five hours and eliminate the time-consuming attention of finishing trades on the site. Two additional major advantages of the columns are their extreme lightweight and the wide variety of finishes and profiles that can be selected.



F16 Lead cladding
The Lead Development Association, 34 Berkeley Square, London, W1
A new 12-page booklet deals with lead as a cladding material. It describes principles and methods of fixing and is well illustrated with details and photographs of recent examples.

F17 Glass fibre wall covering
British Paints Ltd., Portland Road, Newcastle-upon-Tyne, NE21BL
The Scandatex system for the protection and decoration of wall surfaces consists of a specially woven glass fibre textile which is affixed to the wall surface like wallpaper and then overcoated with a paint finish. To ensure that the pattern of the glass fibre weave is retained and not filled in, paints of appropriate viscosity must be used. The treatment claims to provide wall protection in areas subjected to heavy wear or to abrasion and impact damage.

F18 Vinyl wall covering
W. W. Chamberlain (Associated Companies) Ltd., Higham Ferrers, Northamptonshire
The Muralon and Super Muralon range of vinyl wall coverings have been subjected to standard spread of flame and light fastness tests. They meet the surface spread of flame tests to BS 476 Class 1 and prove light-fast to at least Grade 6 of BS 1006/LFS.

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It takes a dozen tiles and as many seconds...
. . . to show you the full effect of Marleyflex Tuscan.
Don't mess around with snippets and single tiles. See the full effect on *your* office floor. Get our man to show you the full range. He'll tell you just two things. That Marleyflex Tuscan vinyl asbestos tiles are the nearest you'll get to real Tuscan marble. So close to nature that no two can ever be the same. And that no one else in Europe makes them.
Then he'll leave you alone. With a colour swatch and specification leaflet. We know he won't need to persuade you: Tuscan sells itself. All you do is mail the coupon.
Included in Barbour Index
To Marley Floors, Sevenoaks, Kent.
☐ I have cleared a space for a dozen tiles. Ask your man to phone for an appointment.
☐ I prefer to rely on my imagination, so just send me a colour swatch and specification leaflet.
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TUSCAN
SEVENOAKS · KENT
Tel: Sevenoaks 55255
Telex: 95231
London Showrooms: 471-473 Oxford Street W1
Branches throughout the country: see local directories

B2

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F19 Lightweight wall cladding
Ets Dervillé, 164 Quai de Jemmapes, Paris 10e, France
Dervimap panels consist of an outer surface of stone, marble or granite; an inner skin of aluminium, galvanized steel, stainless steel or plastic; and a core of rigid polyurethane foam. It is claimed that low prices can be quoted as a result of mass-production on new in-line equipment. The weight of the complete panel varies between 6 and 9lb per ft^2, according to finish. Panel sizes up to 3·15m × 1·65m. Thicknesses from 35mm upwards.

F20 Extruding aircraft wings
Lockheed-Georgia Company, Marietta, Georgia, USA
Ribbed panels 22in wide and 50ft long in extruded titanium are produced in a matter of seconds by heating the titanium billets to 1900°F and passing them through a 12,000-ton horizontal extrusion press.

F21 Plastics heating panel
Arborite Ltd., Bilton House, Uxbridge Road, Ealing, London, W5
Consisting of a blackheating element embedded in resin between two sheets of inert material, the Clayton de Luxete heating panel has a rating of 70 watts per sq ft. The panel radiates 80 per cent of its heat and will therefore not discolour the walls. The version illustrated is 8ft wide × 3ft deep × ⅜in thick and is surfaced in the new embossed grade of Arborite decorative laminate.

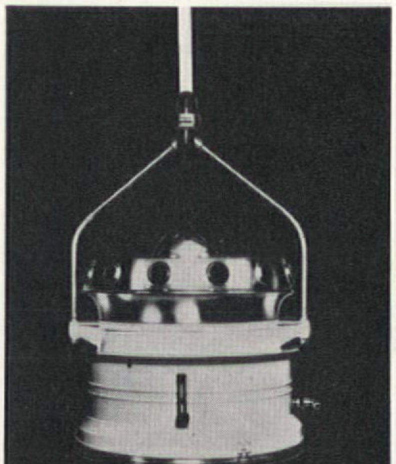
F22 Plastic window panes
Farbenfabriken Bayer AG, Leverkusen-Bayerwerk, West Germany
Transparent polycarbonate sheeting has a high impact resistance and is dimensionally stable. These properties, together with excellent rigidity and a satisfactory plane surface, are offered in support of the claim that the material may be used as a substitute for glass. Resistant to heat and flame up to 135°C, the sheets are available in sizes 1·2m × 2·0m in thicknesses from 1·0mm to 5·0mm.

F23 High strength glass
Corning Glass Works, Corning, NY, USA
Said to be four times stronger than annealed half-inch plate glass, polyvinyl-strengthened laminated glass has been supplied for 20 new high-speed trains on the Cleveland Transit System. The windows are scratch-resistant, and when shattered will break into blunt particles with no jagged edges, offering greater protection to everyone.

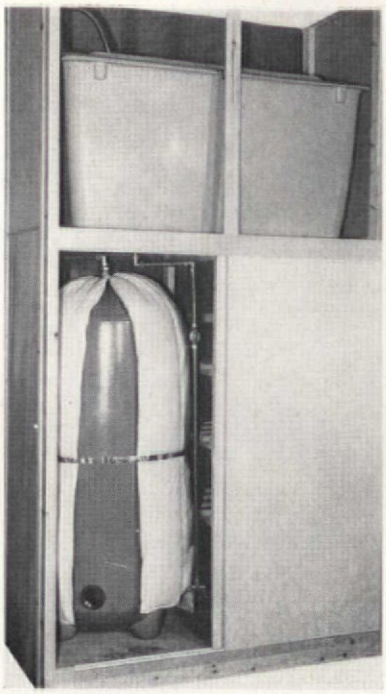
F24 Development of float glass process
Pilkington Brothers Ltd., St Helens, Lancs.
A new process, known as surface modification, enables the mass production capacities of modern float glass plants to be adapted for the economic production of small quantities of glass with special characteristics. Hitherto, special glasses could be made only by entailing the loss of a week's production and 2000 tons of glass, or by treating the surface of ordinary glass using very expensive secondary plant. By the new process, many permutations of heat and light and aesthetic properties can be produced at the flick of a switch. The system employs an electrochemical unit which drives metallic ions into the glass to a controlled depth and intensity whilst the ribbon is advancing. It has so far been used to produce three coloured glasses in the range grey-bronze to copper bronze, whose main applications are to limit solar heat gain and glare, but it is expected that further development will lead to the production of glasses with other properties.

F25 Heat-resistant glass
Corning Glass Works, Corning, NY, USA.
A borosilicate developed for oven windows to be heated to 1000°F provides a material proof against breakage due to sprays of cold water. It can be used in ovens in which high temperatures are developed to dispose of spilled food by combustion. Used in electric room heaters the glass provides insulation for the element whilst still permitting the transmission of heat.

F26 Automatic window washer
Alpana Aluminium Products, 14.105 State Highway 55, Minneapolis, Minn., USA
Claimed to reduce the cost and eliminate the dangers of manual window washing, a climbing window washer has been devised, cutting the cost of cleaning by one-third. A unit 5ft wide, powered by a 1-h.p. motor can ascend at a rate of 60ft per minute, automatically cleaning 300 sq ft per minute. There may be some very good reasons why the machine does not operate whilst descending.

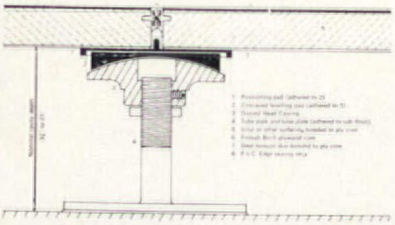


F27 Air humidifier
Turbojet Humidity and Temperature Control of Instrumentation Ltd., 34 Brighton Road, Coulsdon, CR3 2BA, Surrey
The Turbojet SP402 is claimed to be the most versatile and efficient humidifier of its type. An internal jet nozzle throws water on to a spinning disc which atomizes it to micron moisture particles, which are ejected through the holes on the cowl of the unit. It has an infinitely variable moisture output capacity of approximately 3 gallons per hour and is suitable for a volume, depending on ambient conditions of approximately 30,000 cu. ft. Size 21in diameter, 21in high. Air circulation 350 c.f.m.



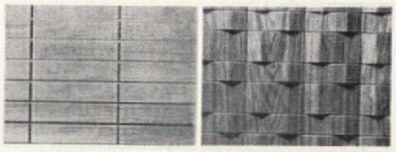
F28 Combination water heating unit
Osma Plastics Ltd., Hayes, Middlesex
Designed to use off-peak electricity the Osma Combination Unit can be used in a variety of ways to suit requirements as free-standing self-contained hot water systems, cold water storage cisterns and airing cupboards. The off-peak storage system employs a 53-gallon cylinder whilst the solid fuel, oil or gas-fired types use a 25- or 28-gallon cylinder. The airing cupboard has 16 sq ft of shelf area.

F29 Cavity floor
H. H. Robertson (UK) Ltd., Ellesmere Port, Wirral, Cheshire
The Robertson Cavity Floor consists of light removable load-bearing slabs with a plywood core, each supported at the intersecting corners by fully adjustable jacks that do not require supporting framework. A system of levelling pads insures correct alignment at the joints which are fitted with a PVC edge sealing strip.



F30 Demountable partitioning
S.M.P. (Lockwall) Ltd., Ferry Lane, Hythe End, Staines, Middlesex
Lockwall Partitioning embodies a simple spring-loaded mechanism installed within the top of each partition element to give positive clamping between floor and ceiling. The mechanism, operated by a removable lever is claimed to give unrivalled speed and ease of installation. The system is completely independent of any fixings and requires no retaining channels in floor or ceiling. All vertical joints rebated and interlock against foam edging strips.

F31 Partitioning system
Roneo Vickers Partitions, Roneo House, Lansdowne Road, Croydon, Surrey
Decor Line Aluminium Partitions consist of a framework of anodized aluminium with infill panels of Stelvetite plastic faced steel sheet. As the PVC facing is molecularly bonded to the steel, the material has a Class 'O' spread of flame certificate. Sound deadening material is bonded to the back of each panel, and each of the two facing sheets have no direct contact with each other. Wiring facilities are provided behind each upright and skirting, and points can be installed at any time anywhere in the partitioning. The system is completely demountable and re-usable, and is claimed to have a sound resistance of 35db.



F32 Moulded decorative panelling
Ets Bouniol, 250 Rue de Charonne, Paris 11e, France
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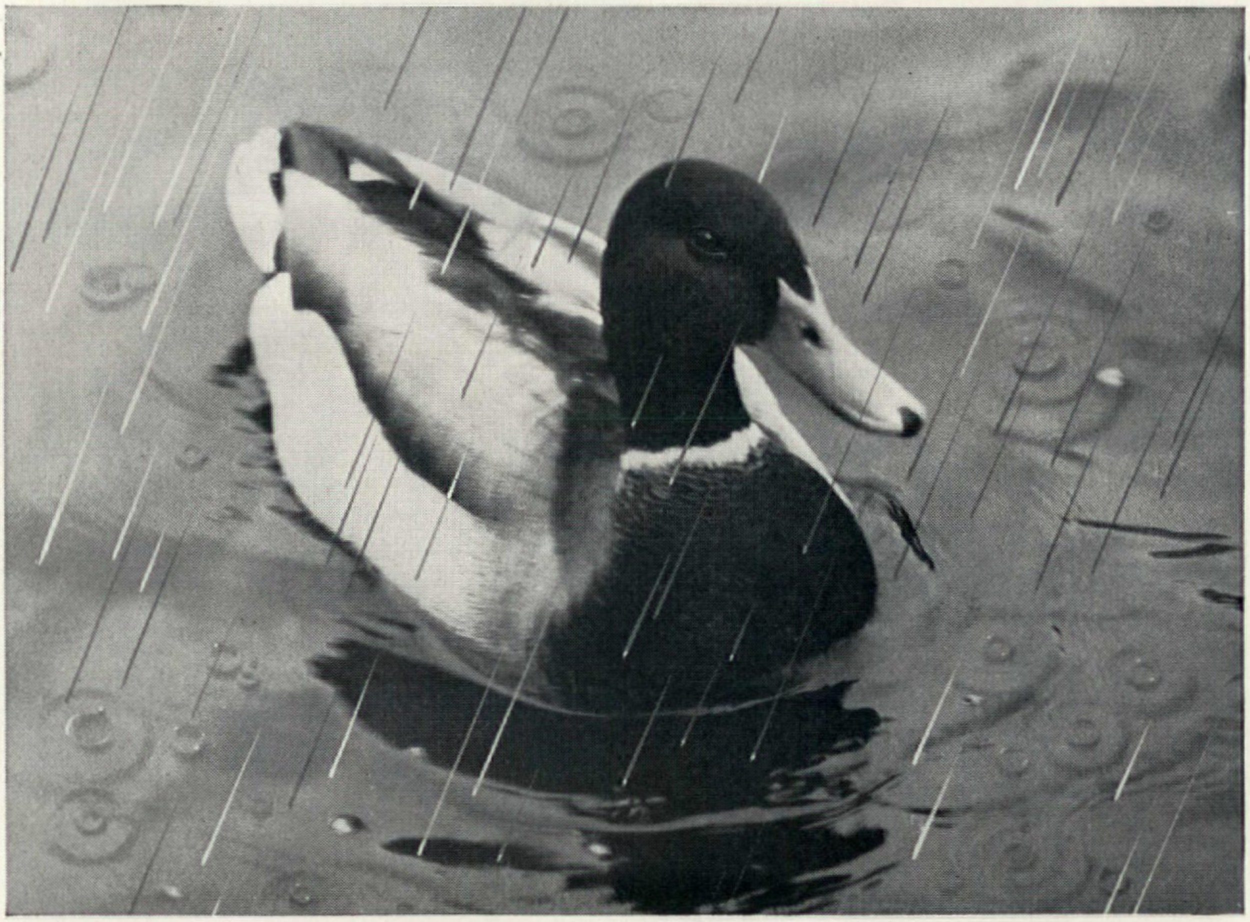

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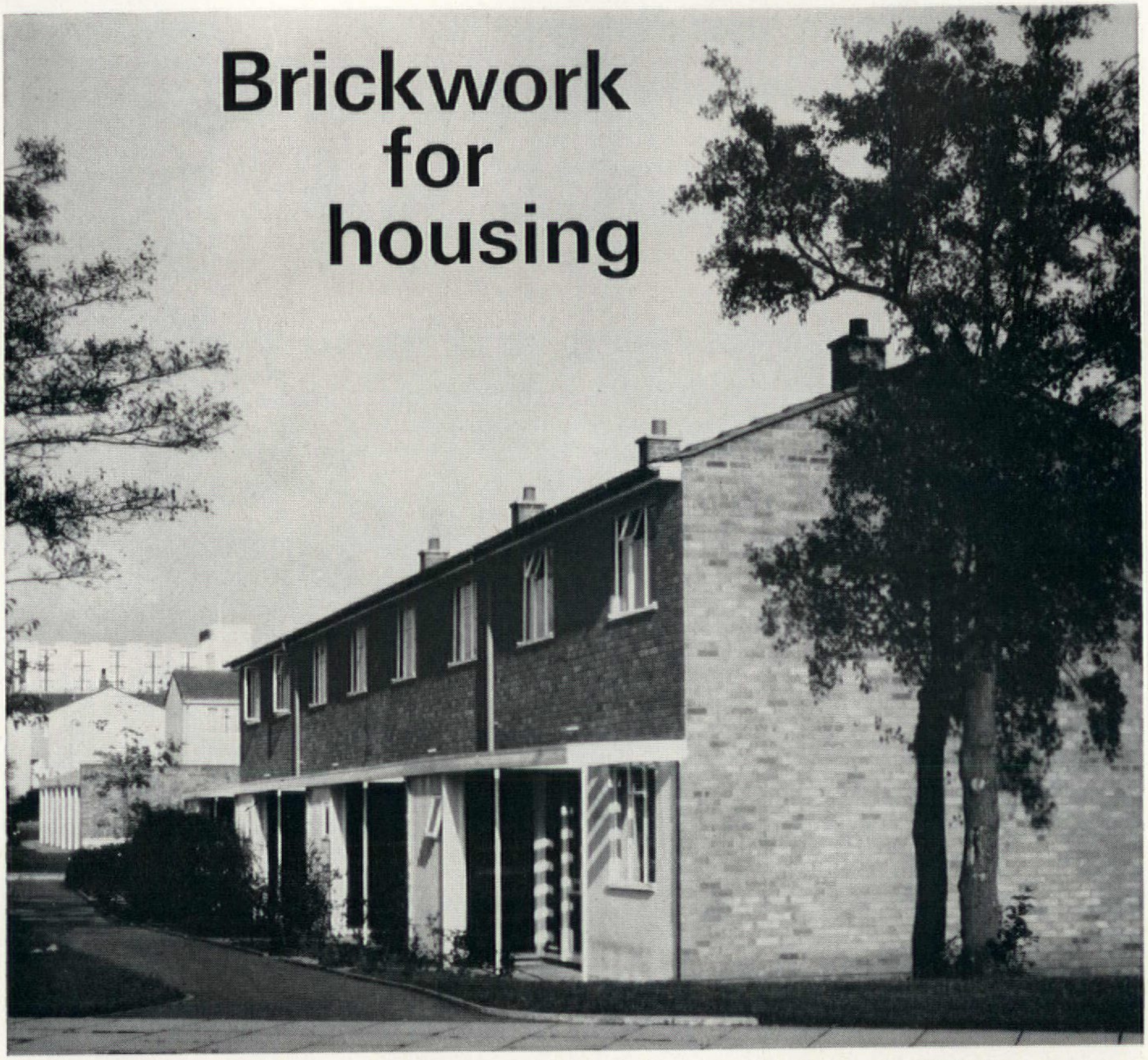

Housing at Cwmbran new town. Chief Architect: Gordon Redfern Dip Arch ARIBA. Cwmbran is the subject of the March Issue of The Brick Bulletin.

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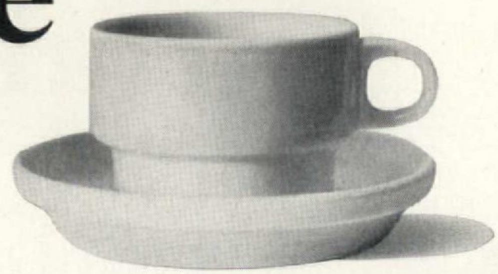

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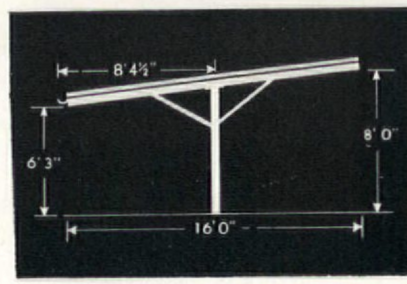
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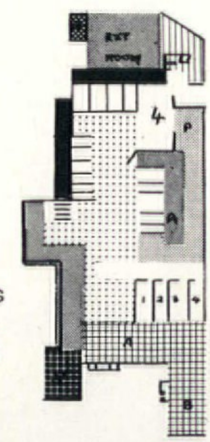

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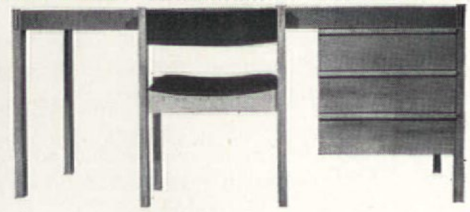

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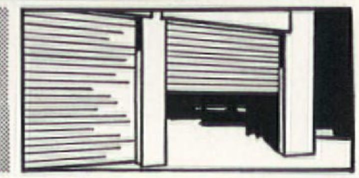

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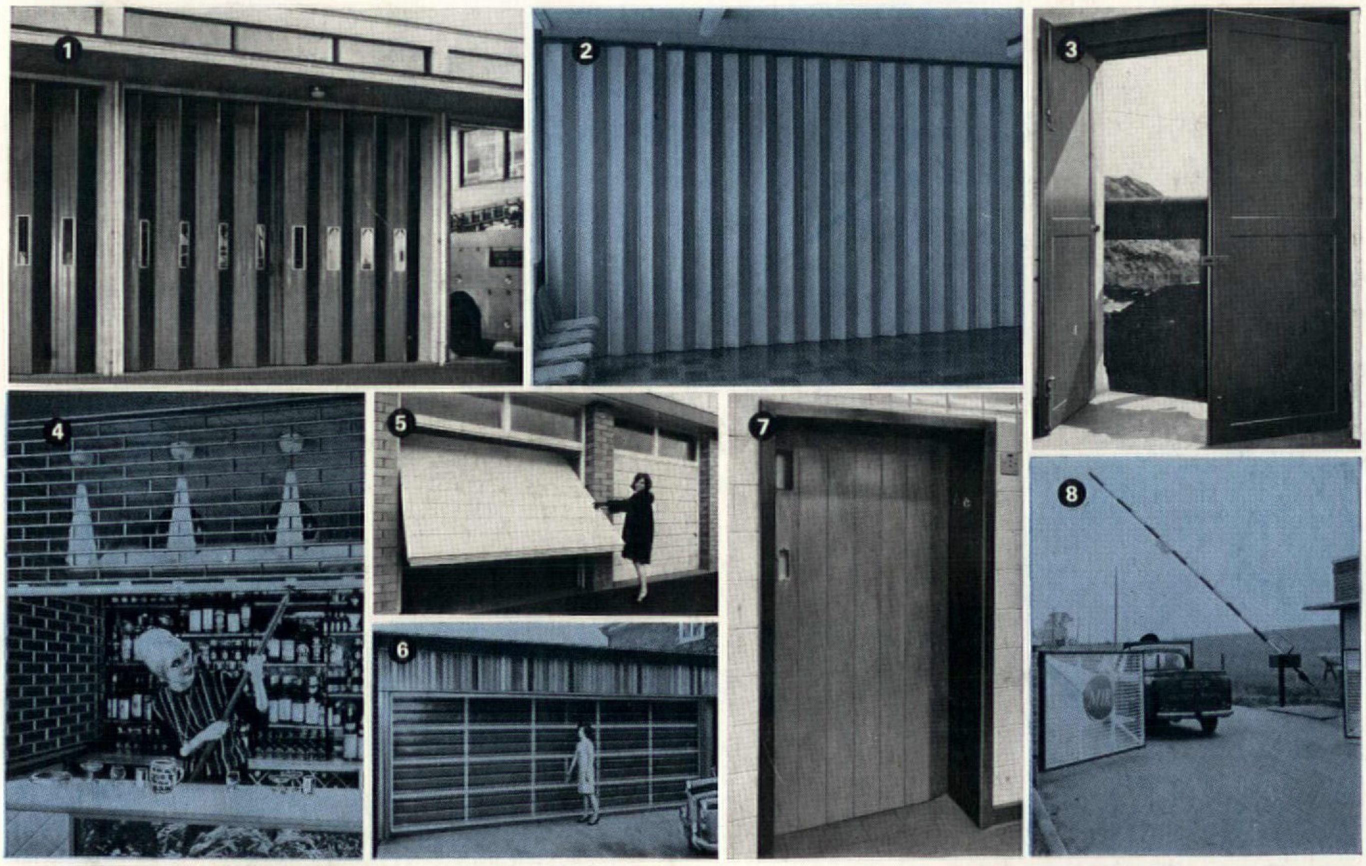

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