architectural design

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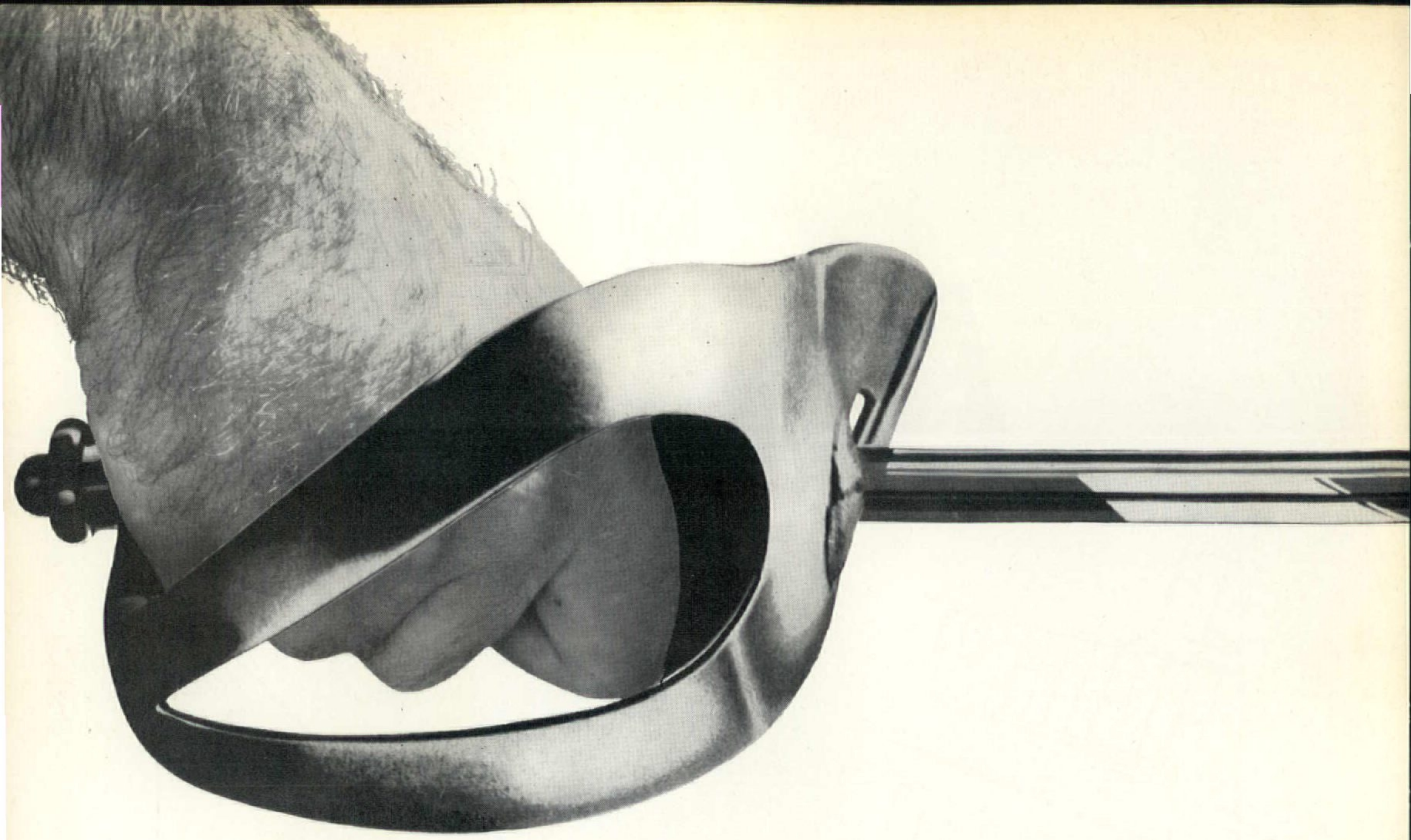

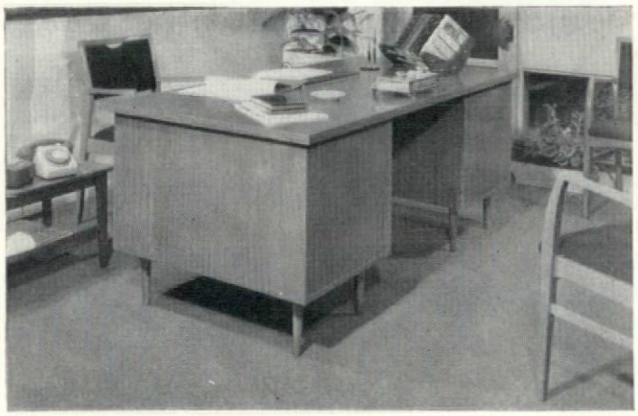

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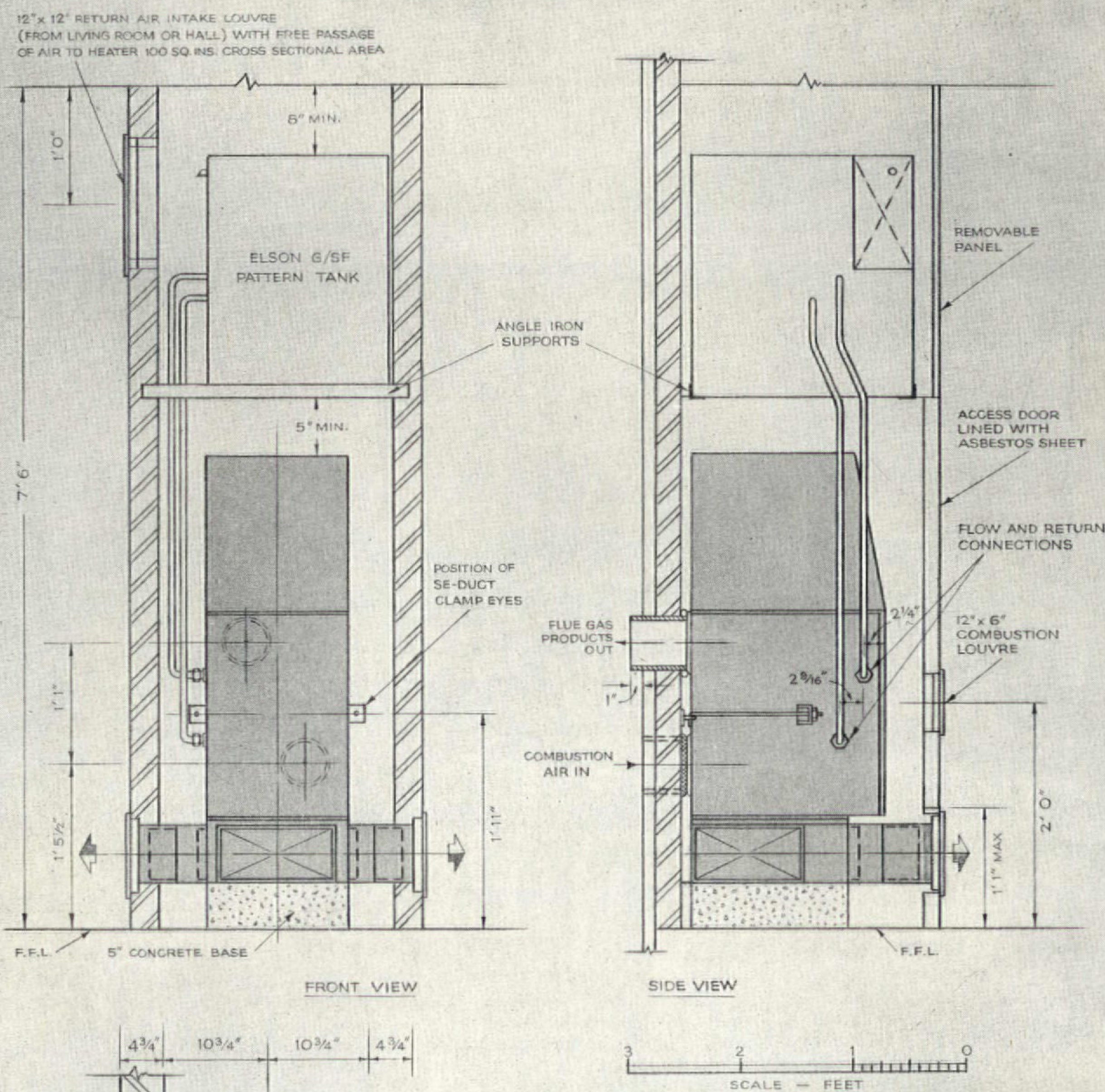

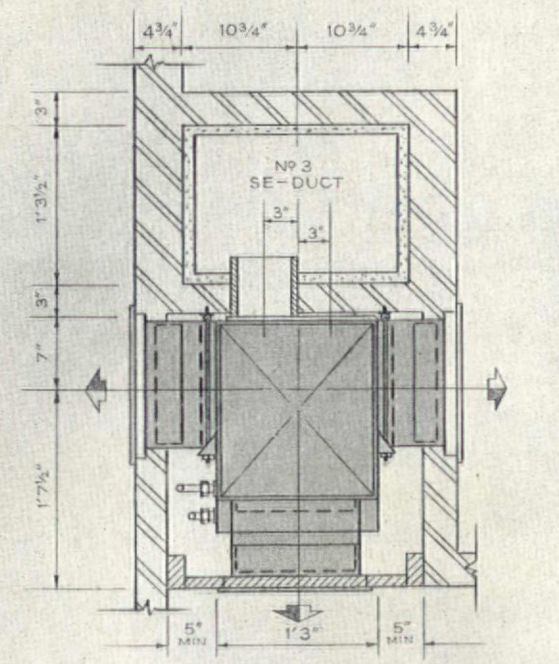

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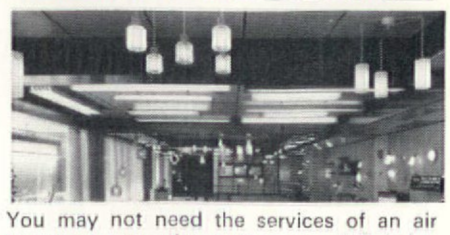
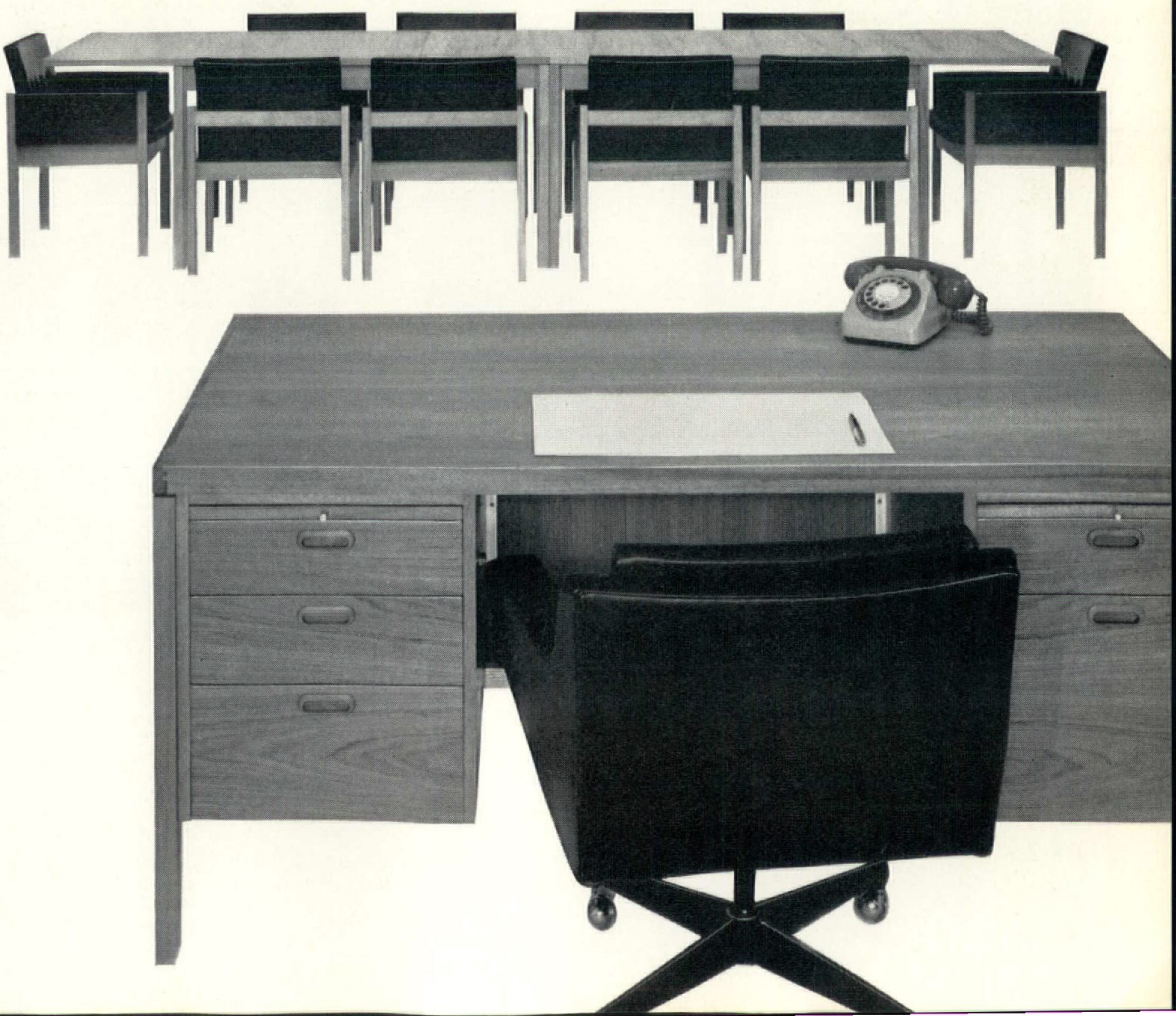


You may not need the services of an air hostess to see the vast range of Tubalux International. The Lighting Centre is at Liscartan House, 127 Sloane Street, S.W.1, where you can see them for yourself, with opal diffusers, prismatic diffusers, metal and hardwood surrounds with louvre or prismatic bases. Failing a visit, please write for publication TYL 41, which will help to introduce Tubalux International to you.



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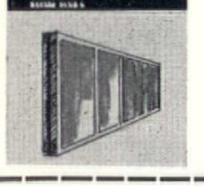

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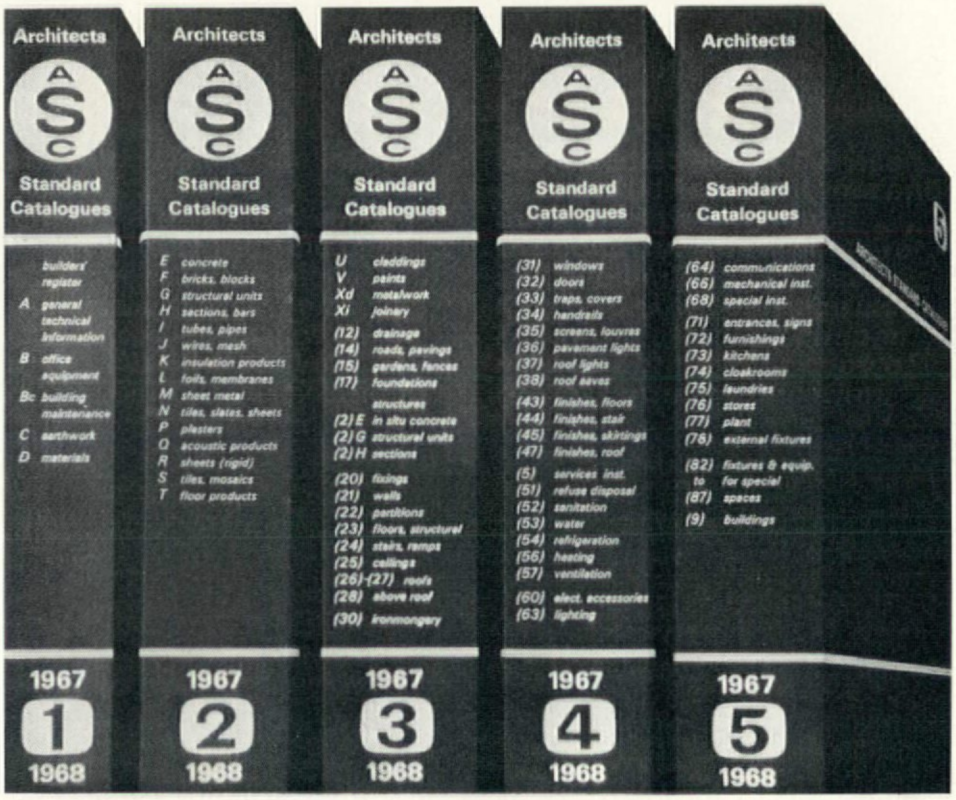

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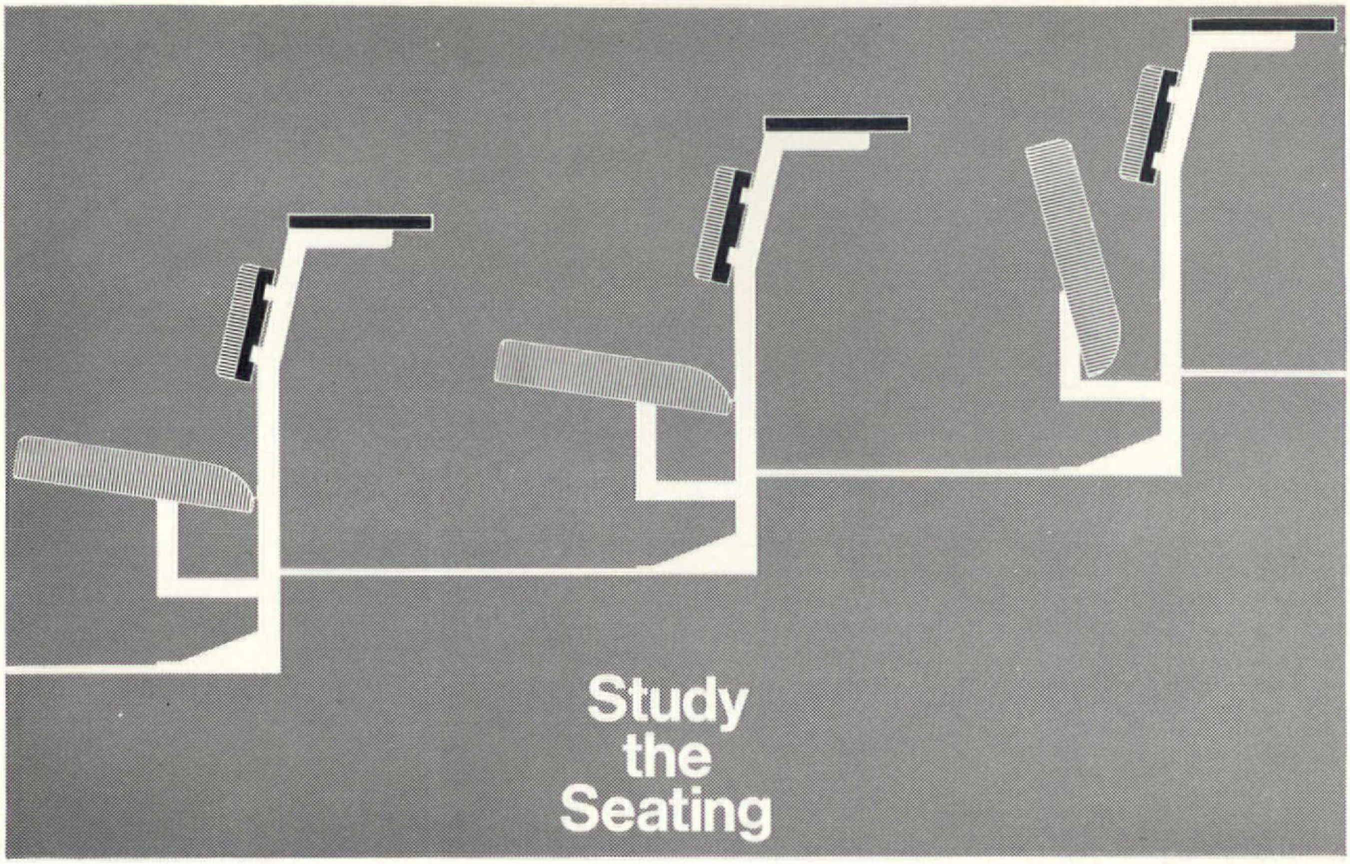

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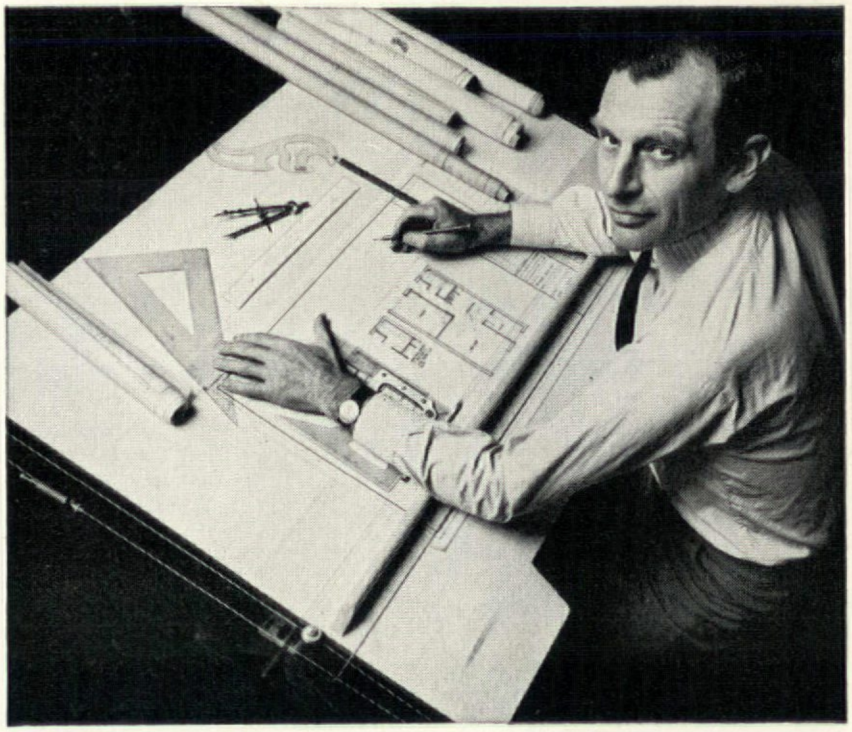

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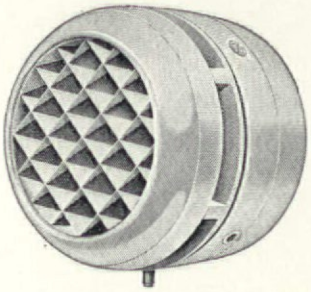

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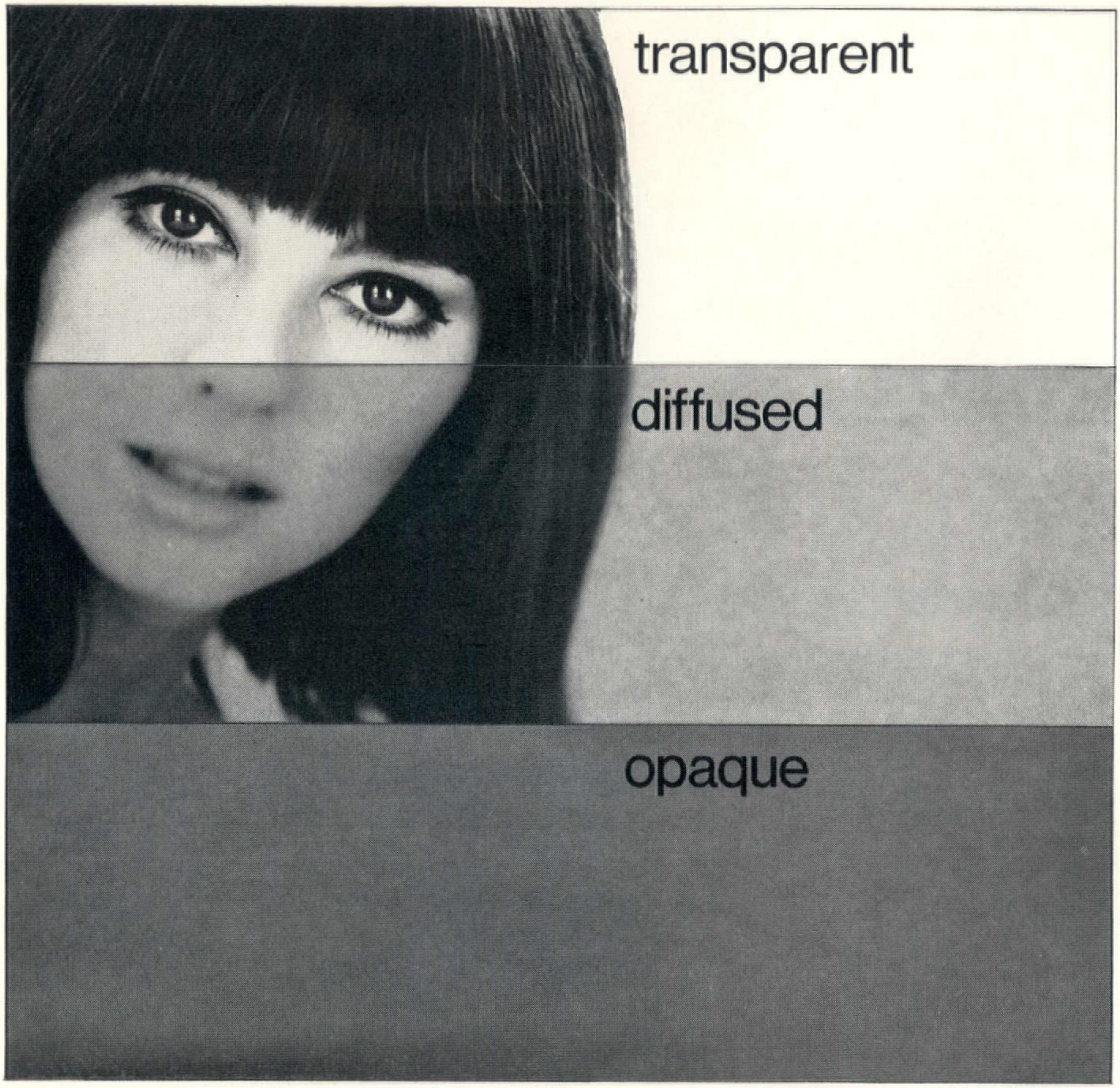
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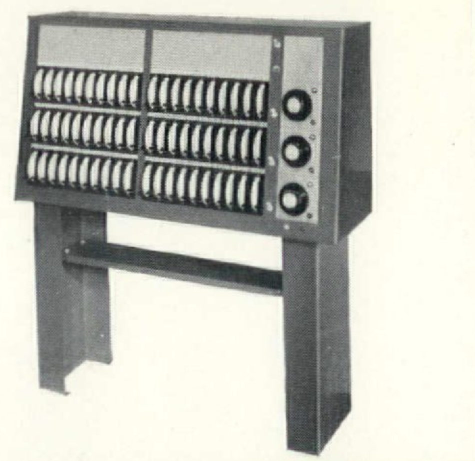

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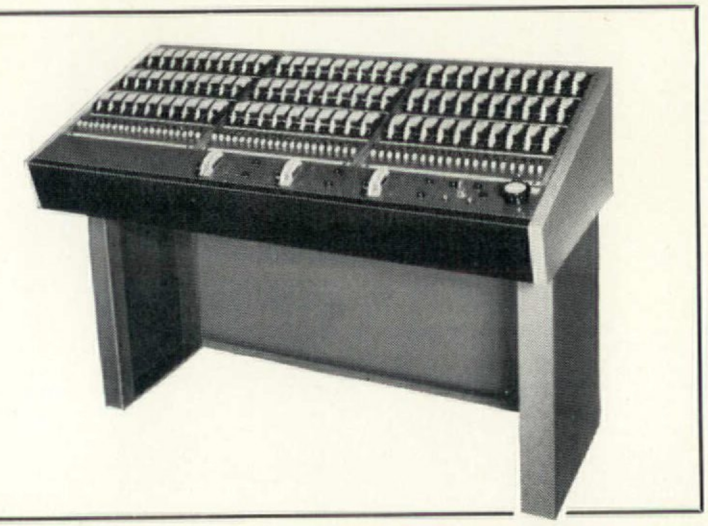

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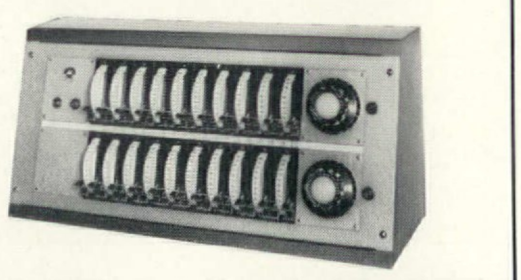

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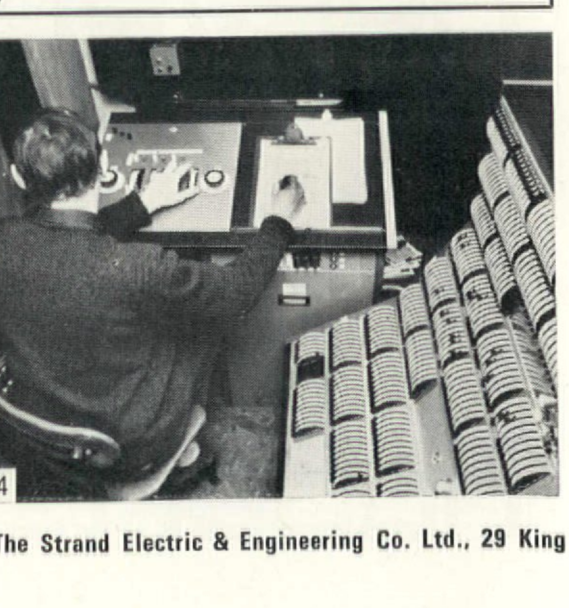

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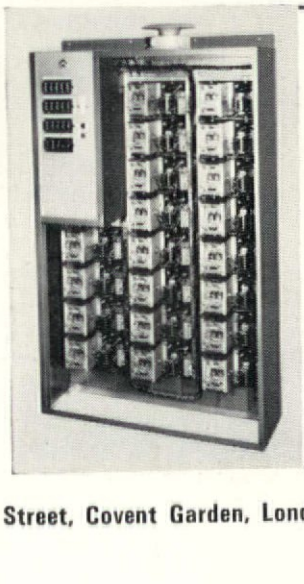

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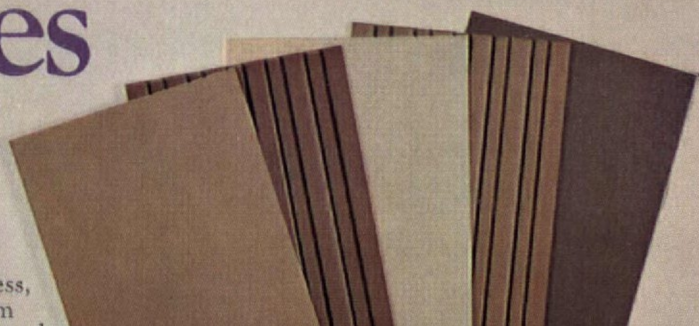

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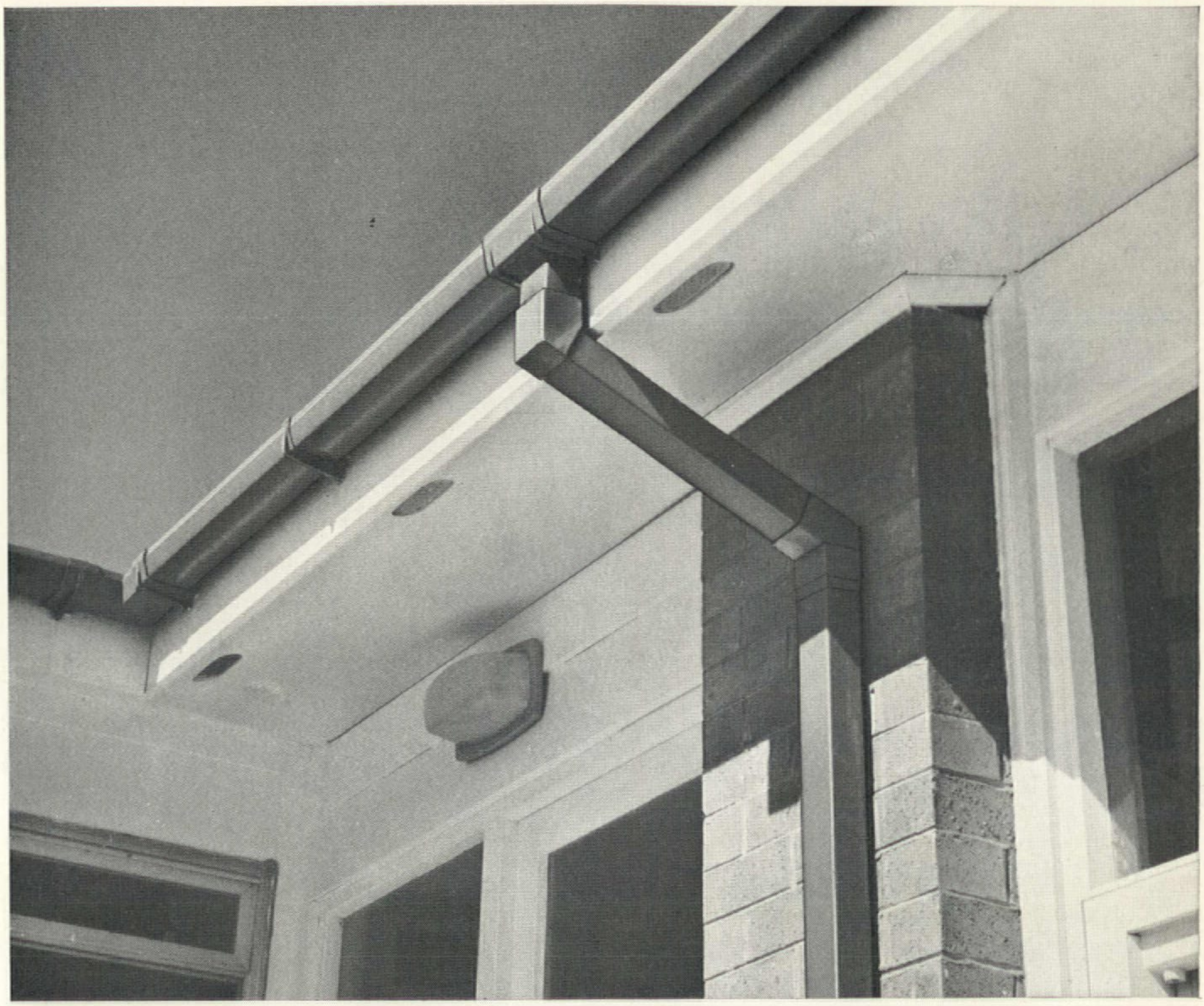

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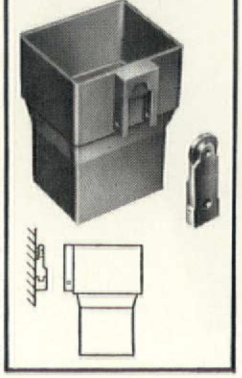

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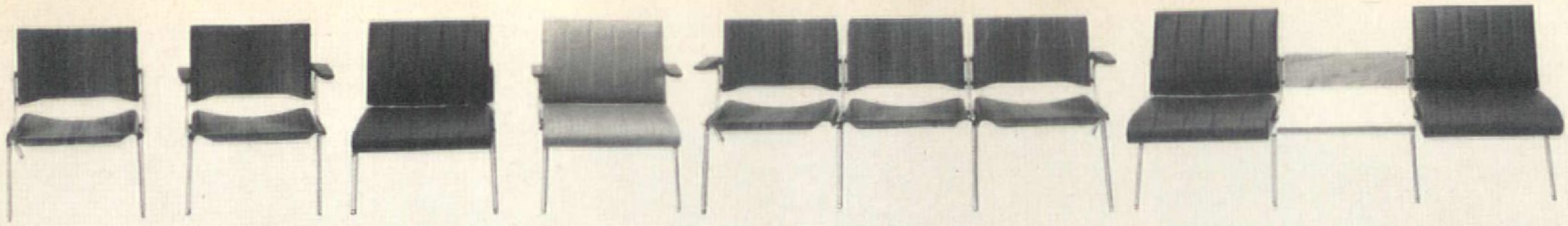

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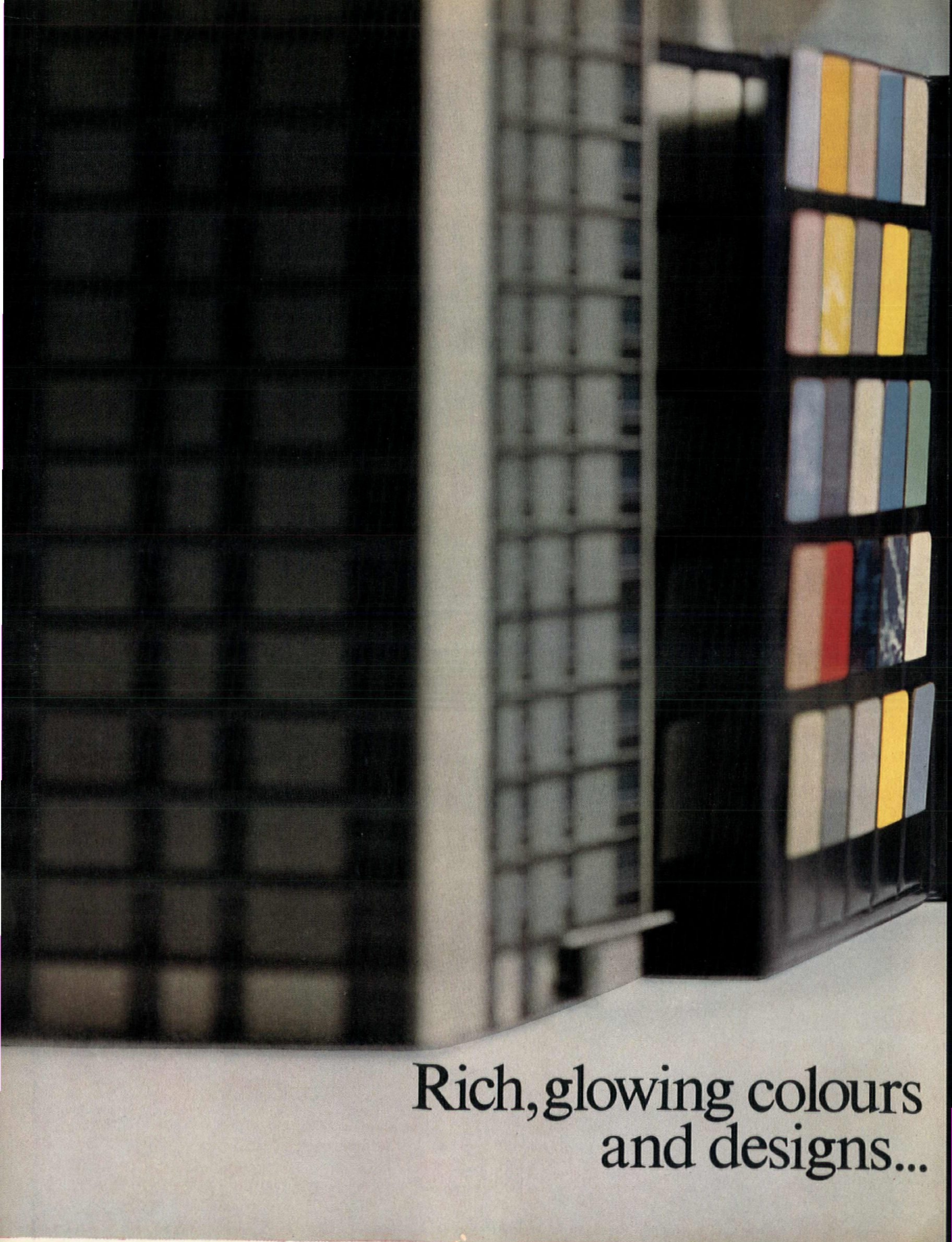
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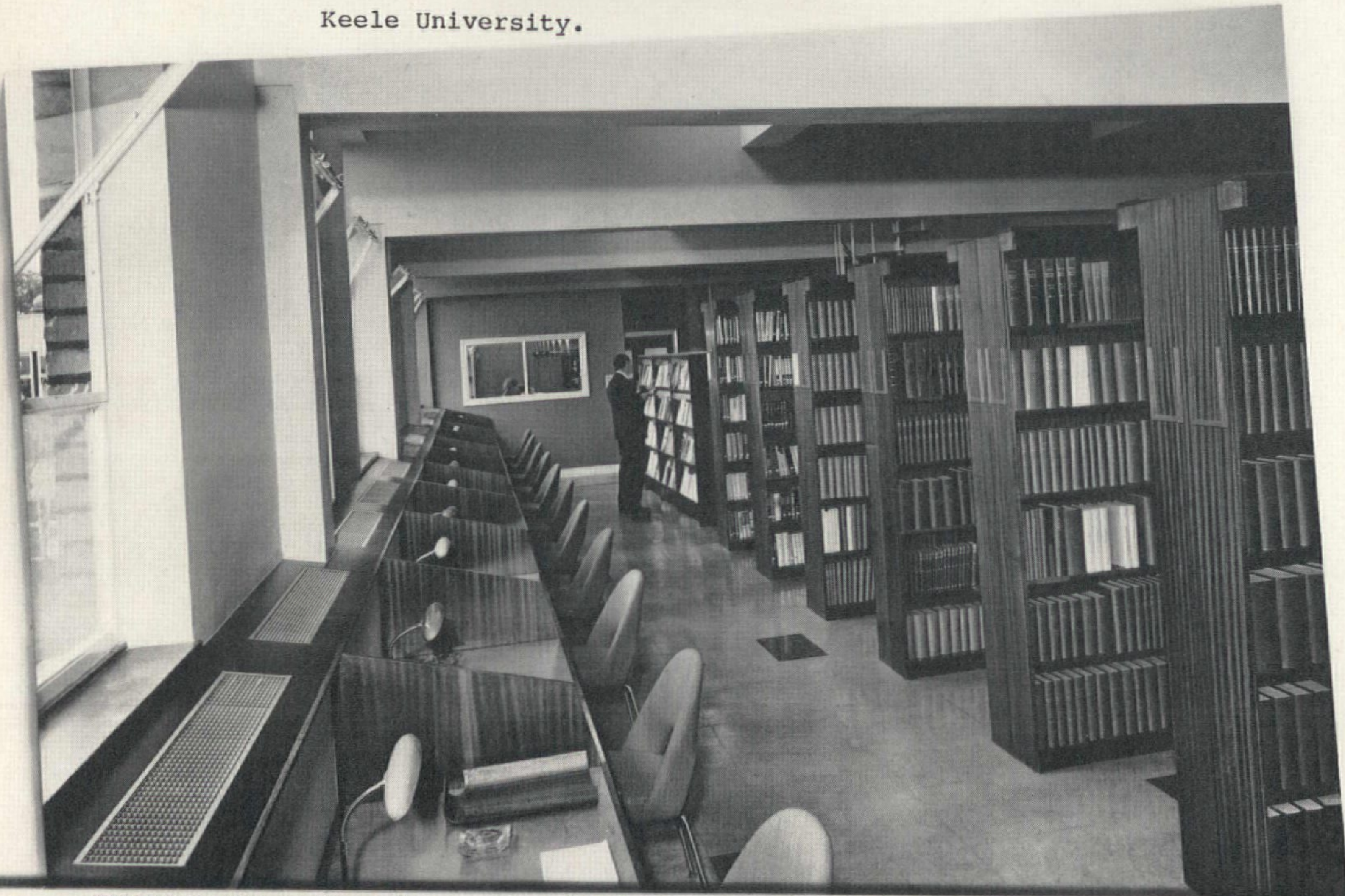

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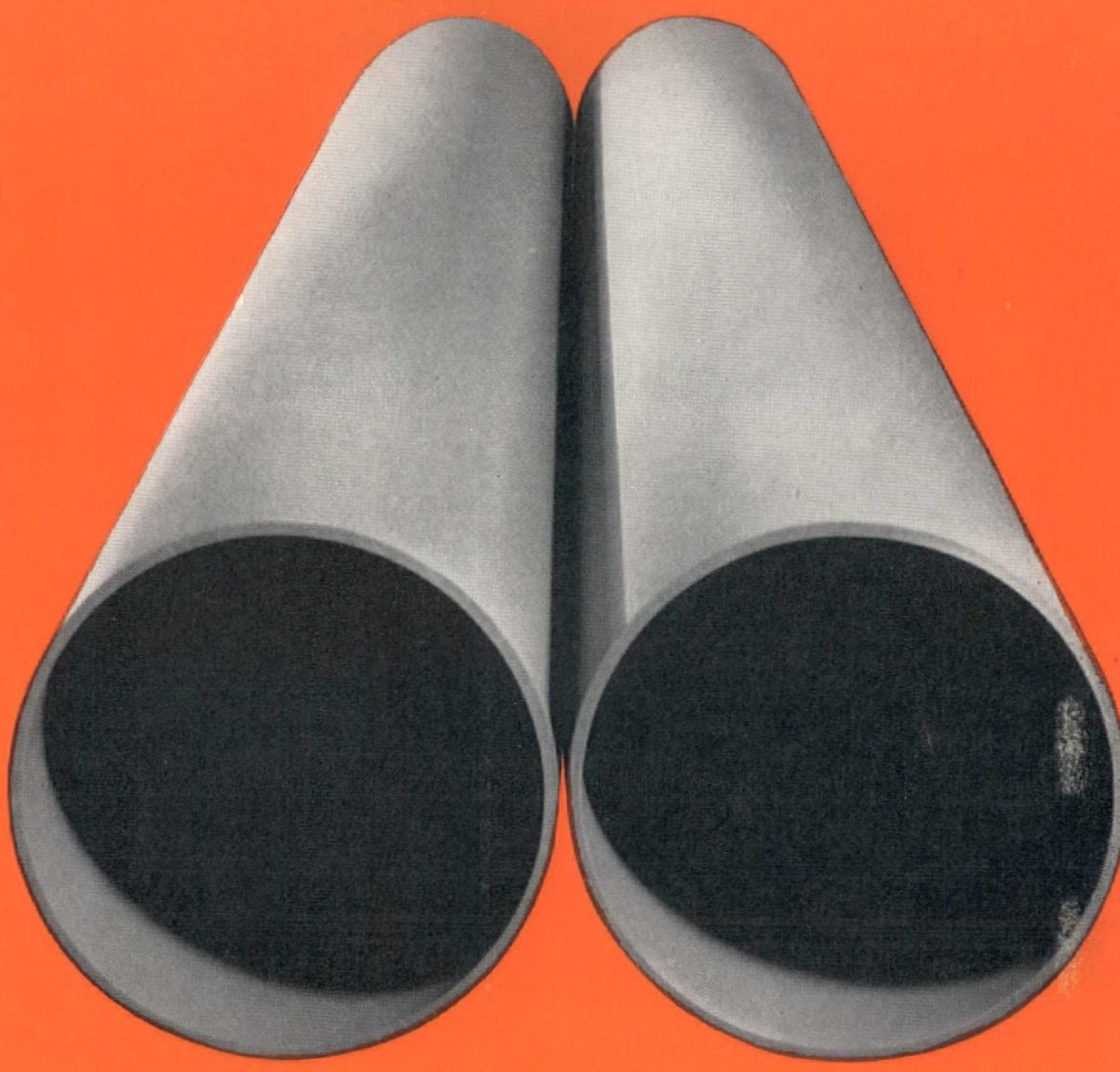

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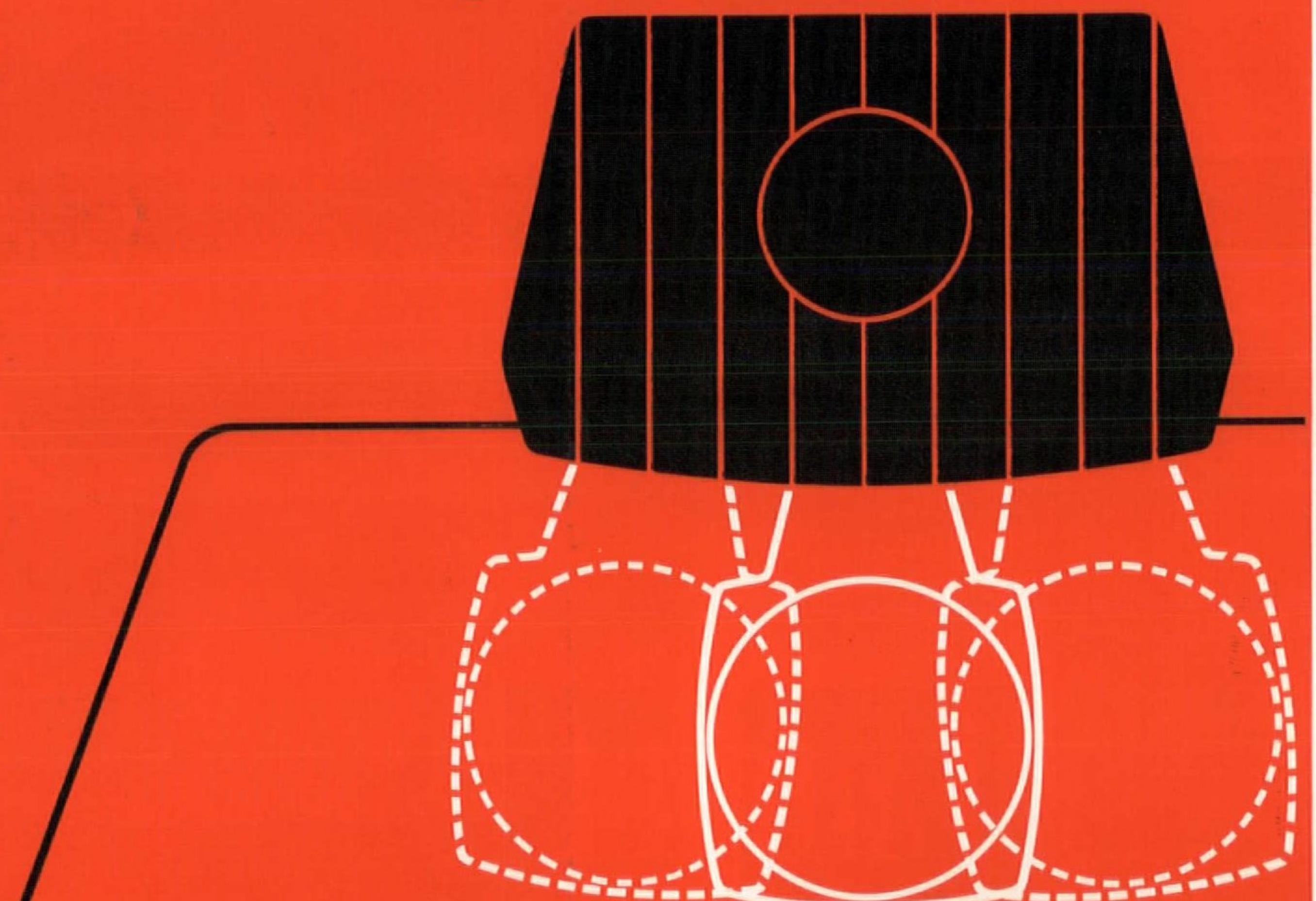

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ANNOUNCEMENTS

John Gelsthorpe, ARIBA, and Rex Savidge, MSIA, Dipl. TP, Dip. Arch, FRIBA, are now practising in partnership as Gelsthorpe and Savidge, Chartered Architects, 23 Lenton Avenue, The Park, Nottingham 48132.

Code 33

Cosmorama

The month in Britain

Michael Manser

No snow came to Britain, but Mr Kosygin did.

The Electricity Council splashed out on a great publicity promotion to counteract High Speed Gas's success. But down my street on a busy Saturday afternoon the Board's premises were closed because they only work a five day week.

A.C. Delco announced a system for clearing exhaust fumes, Dr Stephen Black said the conventional gearbox 'evokes in all of us dangerous feelings of excitement and power' which 'the steady acceleration of the electric car would help to eliminate,' and Barbara Castle invited private interests to participate in the financing of the Channel Tunnel.

A mock-up was displayed to show purchasers the inside of Concorde, and the first stage of a project to expand the passenger handling facilities at London Airport was commenced.

Thomas Mitchell put a case for a National Building Act, and made the revolutionary suggestion that regulations should be written in plain English supplemented by diagrams. He also pointed out the absurdity of employing one set of experts to check every detail of the work of another set of experts. As he said, if we insisted on having a surgeon's work constantly checked by another surgeon, many people now alive would be dead.

Colin Hughes-Stanton became editor of *Design* magazine; a Tudor building was discovered under Hampton Court; brick stocks increased by another 66 million; and Loughborough University of Technology initiated an Engineering Design Centre.

The undesirable £12m. marina/hotels/casino plan for Brighton (unaccountably supported by Sir William Holford) got through its second reading in the House of Commons (only 141 out of 630 members voted). Delegates to the RIBA July Conference in Brighton will be able to pass judgment themselves.

In the meantime, the theme for the conference was announced as 'Living in Britain—the future pattern of housing'; Black Bayes & Gibson have been appointed architects to the new Chase Manhattan Bank in Berkeley Square; the GLC are going to make generally available their 'Development and Materials Bulletins'; and Data Solve offer a computer service to professional firms on a subscription basis.

The *Financial Times* announced an annual award for an outstanding work of industrial architecture (architects may nominate their own work, by June 9th, and Philip Dowson, Tony Cox and Sir Colin Anderson will decide if it's any good).

The Council of the Royal Welsh National Eisteddfod has decided to award annually a Gold Medal in Architecture. (Here again architects may nominate their own work, before April 12th, but this time it will be Douglas Jones, Bill Howell, Professor D. Prys Thomas, Alex Gordon and G. Parry Davies who will judge its value.)

The Aluminium Federation and the Institution of Structural Engineers offer a two years research scholarship (£700 p.a., plus fees) in the use of light alloys in engineering, starting in October.

Balloon photography

Snell Aerial Photography (Park Road, Yeovil, Somerset) offer a balloon photography service specially well suited to low altitude oblique and survey work.

Corrections

Feb. '67, opp. page 54. Portrait of the female mind as a young girl.
Line 29, 'work' instead of 'waste'.
L. 37, delete 'legitimates'.
L. 42, 'ground' instead of 'stand'.
L. 60, 'none' instead of 'time'.

Jan. '67, page 1, Month in Britain, Col. 1, para. 9.
Line 2, insert 'per sq. ft' after 2½d.

Dec. '66, p. 614. Owen's Park tower block.
Room area: 120sq, ft (not 100 as printed). Cost per SBU: £1190.

Integrated services

Those for whom the normal unrelated services systems in buildings represents a constant source of irritation will be heartened by a small gleam of light from a dull subject. A system known as Lite-Therm, manufactured by Environmental Systems Corporation, USA, integrates the normally separate heating, cooling and lighting circuits into a single inter-related system. The design incorporates two main elements; fluorescent lighting units surrounded by water jackets are connected to a circuit which carries away the heat generated by the lamps, and a series of aluminium window louvres transfer the solar heat gain by means of water circulating through their hollow interior. These louvres can rotate so that they can face the direct rays of the sun throughout the day.

In winter the heat output from the lighting fixtures is transmitted to the louvres, which act as radiators and counteract heat-loss through the windows. The water then re-circulates back to the lighting fixtures.

In summer the circuits are reversed and the water passing through the louvres enters an evaporative cooler introduced into the system which lowers the water temperature and re-circulates it through the louvres. The claimed efficiency of the system has been vindicated by an installation recently completed in Atlanta, Georgia, where testing shows that 70 per cent of the total KW input to the lighting fixtures is being captured even with water temperatures of between 77° and 85°F. As about 20 per cent of the input into a fluorescent tube comes out in the form of light it is calculated that 98 per cent of the total heat available at the fixture is utilized. Measurements of heat gain through the louvres indicated that without water circulation 65 per cent of the solar energy entered the interior space and approximately 32 per cent was reflected. With water circulating, even at temperatures ranging up to 95°F, only 12 per cent of the solar heat enters the building.

Operating costs have been reduced considerably. Cooling savings of 50 per cent and heat energy savings of up to 70 per cent have been experienced.

Alexander Pike

HUD

President Johnson is at present considering a report by HUD (Department of Housing and Urban Development) for an Urban Development Corporation—modelled on the Communications Satellite Corporation—to replace five million sub-standard dwellings in the USA by 1977. Cost $50 billion.

One goal of the programme is to bring space technology and methods of organization to bear on housing, and to reduce the present $16,000 per unit to $10,000 through technological advance.

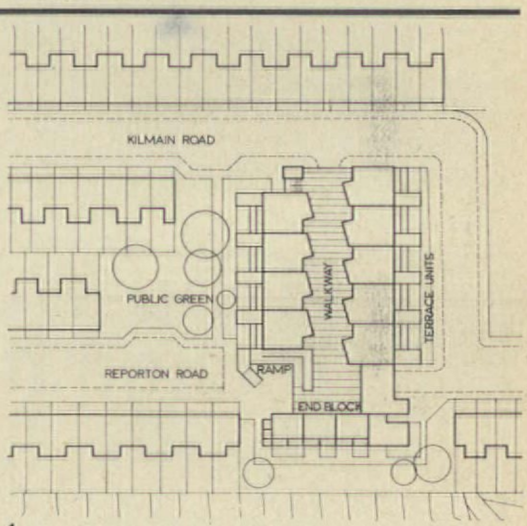
Forum, December 1966

Reporton Road housing

Reporton Road housing (now under construction in Fulham) by Higgins, Ney and Partners, is a prototype for the low rise, high density redevelopment of the whole suburb. The system uses four-storey, wide front terraces and gives a density range of 136 to 175 persons per acre. A 16ft level pedestrian deck gives walk-up access to all dwellings as well as a segregated pedestrian network and a covered garage (100 per cent car parking).

Typical diagrammatic section and dwelling unit plans at ground floor and walkway level. Each unit has a 27ft frontage (i.e. 3 × 9ft bays) which gives a range of types from a two person flat to 3-, 4-, and 5-person maisonettes. Knockout panels in the party walls allow subsequent replanning to meet changed accommodation requirements.

The dense terrace form is particularly suitable for the staged redevelopment of Victorian street patterns. It also allows partial redevelopment in conjunction with the preservation or improvement of sound properties. This is indicated in a hypothetical site plan which showed how the preferred east/west orientation may be achieved in a number of typical street patterns. The prototype site plan **1**, is rather smaller than any of the prototypes. But it will be appreciated that the deck circulation system is conceived as part of a much larger comprehensive scheme. Such a scheme is projected for a large area of Fulham in conjunction with the widening of the King's Road.



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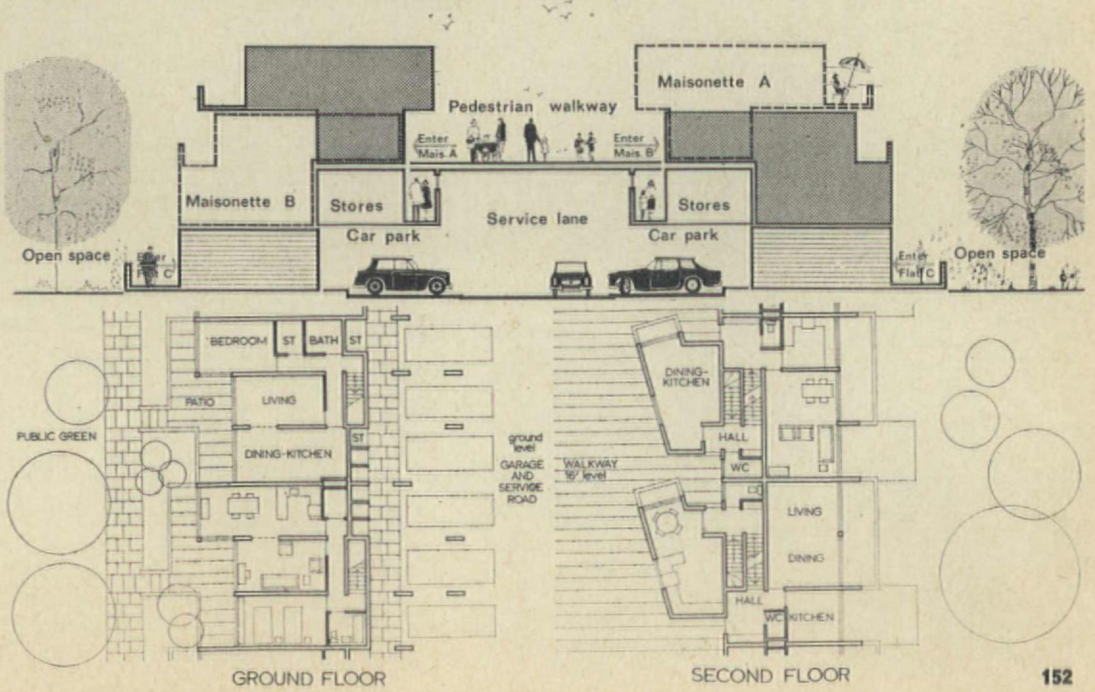

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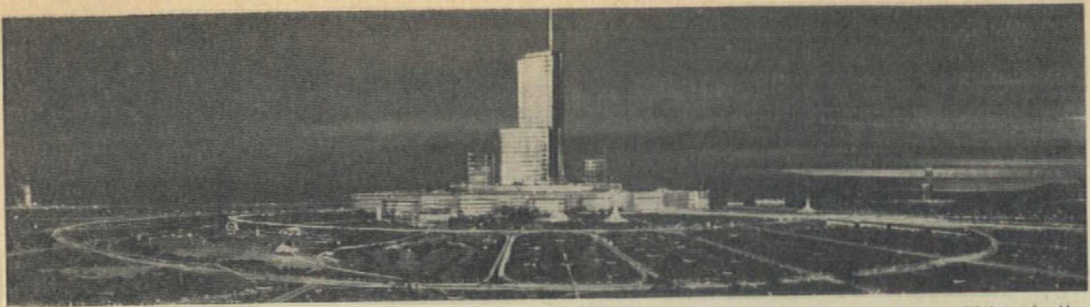
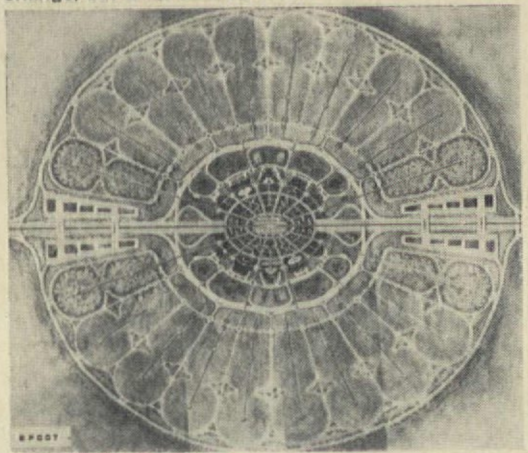


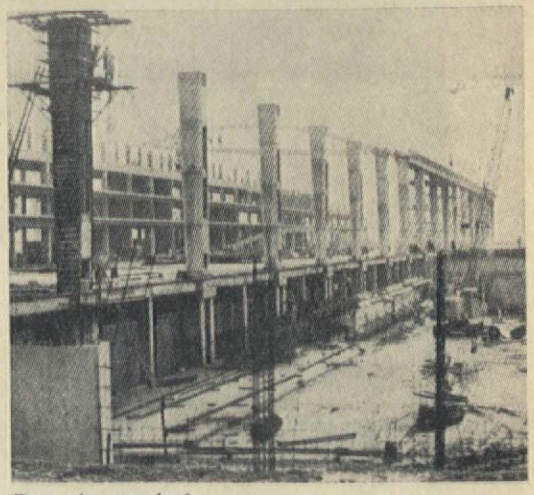
Disney World

Following the success of Disneyland—the amusement park in California which master planner James W. Rouse called 'the greatest piece of urban design in the U.S.", an area of activity that lifted its purpose to a standard so high in its performance, in its respect for people, in its functioning for people, that it really has become a brand new thing—comes Disney World. Forty-three square miles of land in central Florida have been purchased for the construction of another amusement park, golf courses, an industrial area, jet airport and above all an Experimental Prototype Community of Tomorrow (EPCOT) for 20,000 people. EPCOT will ditch the automobile and has thereby justified an unashamedly Radical Plan. At the centre will be a high rise hotel and convention centre surrounded by international shopping areas (Georgian square and oriental bazaar included) all 50 acres of it covered and climate controlled. Around this there will be offices and beyond them apartment blocks looking over a green belt containing low density dwellings, schools and churches. A ring road for residents encircles the whole, connected to the state highways. A six mile monorail links airport, visitors' entrance complex, industrial area, amusement part and EPCOT centre. Movement inside EPCOT is by 'Wedway' continuously moving electric overhead track cars arranged as spokes from the centre to the perimeter. This system ensures that all journeys will be via the centre—very crafty.

The industrial area will house sections of industry engaged in experiment and research, a showcase of factories, laboratories, automatic warehousing, computer centres, etc., which will feed back into the fabric of EPCOT (see Potteries Thinkbelt, *AD* October 1966). Disney World will be constantly renewing itself and adapting itself to technological advance—plenty of change, but what about growth?



Photos, Walt Disney Productions

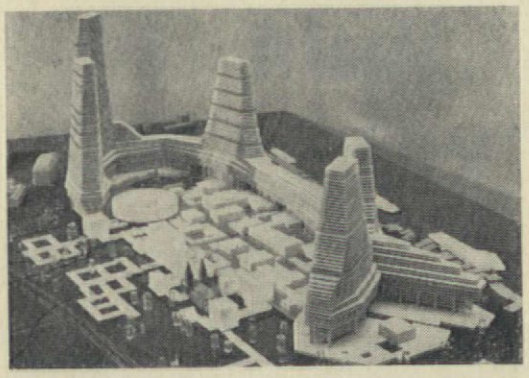


Rungis market

A mammoth market is at present being built south of Paris, at Rungis, to replace both Les Halles (see p. 188) and the Entrepôt de Bercy (which means that the future of not only Baltard's but also Lheureux's buildings are jeopardized). This spectacular feat of organization is not likely to ease Paris traffic problems appreciably, lorries and vans will still bring the produce in and deliver it throughout Paris, but from one rather than two focal points.
France Actuelle, XVI no. 4, 1967

Hamburg high

'Neue Heimat' has made a monster proposal to the Hamburg city council for the redevelopment of the run-down St George district which borders the Alster river and mainline railway station. Their scheme, presented as a model, is not intended to be a solution, just a bulldozer exercise to encourage big thinking. The designers believe that in a large city urban nodel points need to be established and the St George site could be one, a series of tapering point blocks rising to 63 storeys and visible for miles, with business, culture and car parking below below below. For despite its professed non-ambition the model makes definite statements about orientation, open space, high rise flats, shops, offices, workshops, schools and entertainment. Each is conventionally zoned in the planners' layer cake. A brain storming scheme should offer more in the way of original concept or at least describe the kind of movement and activity that such a large development will generate. When the city organizes the intended international competition to prepare other redevelopment plans this negative scheme will not be an influence.
Baumeister, October 1966

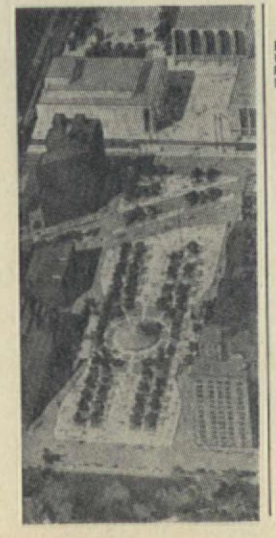


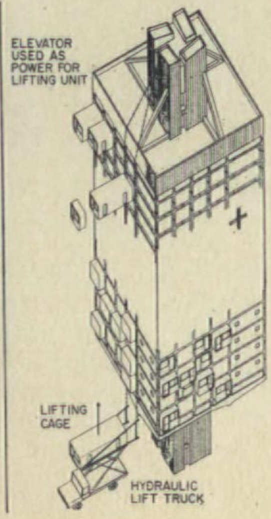
3000 +

AD reached *2000+* in the February 1967 issue.
But the *UNESCO Courier*'s February issue looks ahead to *3000+* with the alarming forecast by Jean Fourastie that if the world's population continues to grow at the present rate, there will be no more than 15·5 sq. in (*less than 4in × 4in*) of land available for every 15 people.

Slashed symmetry

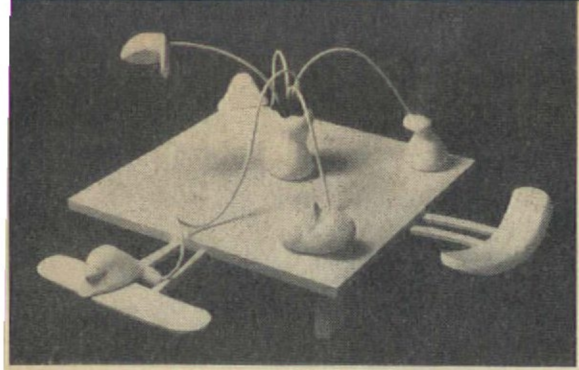
The rigid, insentient system of planning that we now fob off as Beaux Arts, was once a firm but subtle system of organization, able to provide not only an air of dignity, but a positive sense of freedom and expansiveness. Since the eighteenth century it has become stiff and nasty. The great grotesque of modern times though is the Lincoln Centre in New York. A plan has now been submitted to the city authorities to extend it and link it to Central Park with a giant formal mall. The geometry of the mall is unavoidably marred by a diagonal road cutting through it, but this seems in no way to have lessened the determination of the planners (anonymous) to have their parallel line of trees. The sheer futility and unabashed ignorance of the design are, to say the least, disarming.
Forum, Jan./Feb. 1967





Australian eclectic

John Andrews, the young Australian architect of Scarborough College (see p. 178), is a designer in the most eclectic romantic (albeit modern) tradition. His layout for the African Place at Expo '67, is of the studied, haphazard variety, using a standard joint and a standard geometric shape; his housing complex for Guelph University is of the many faceted, but regular symmetrical Louis Kahn type. The Bellmere school at Scarborough that he has now completed and the projected Red Coach Inn at Mandeville, Jamaica, fall between these two. But he has other modes of expression—a design for a dwelling tower, commissioned by a steel manufacturer, has a rough boarded concrete structure with steel inserts in capsule form—a rather oddly assorted combination of the moulded artefact and the precision, factory-made unit. The equivocal nature of his designing will probably fade as he settles into the simple romantic style of Scarborough that he clearly finds more congenial.
Architectural Record, September 1966; *Architecture Canada*, 1/67.



Flowering table by Michael Harvey

Ventures

Jasia Reichardt

During the sixties a great deal has been said about those art forms which could be described as hybrid and which fail to relate themselves to the conventional art idioms of sculpture and painting. A Belgian critic pointed out recently that the only way to ascertain the nature of activities of any person involved with the visual arts is to ask them: Are you a painter, a sculptor, or an artist? The 'artist', the creative man whose pursuits fit into neither the category of painting nor that of sculpture, uses licence to employ all materials and all methods. London has witnessed exhibitions of soap bubbles, smoke sculpture, constructions composed of the debris on road surfaces, compositions of books, reconstructions of furniture, junk robots, fabric collage and various other permanent or impermanent items which quite clearly depart from all conventional types of art. If this trend has a common characteristic, then this characteristic has something quite clearly to do with the element of sensationalism. Yet, sensationalism does not always play an important role in those works where the content of the work demands technical innovations, demands departures from traditional art materials and even new ways of looking at the work of art. Such is the case with a travelling Arts Council exhibition entitled *Ventures*.

The exhibition consists of objects, painted sculpture, machines, blinds, assemblages and collages by Clive Barker, Mark Boyle, Barry Flanagan, Peter Green, Michael Harvey, Colin Lanceley, John Latham and Richard Loncraine. The works are adventurous in conception and are executed with a craftsman-like meticulous approach which contributes a measure of discipline and a unifying element. The individual contributions are extremely varied. The painted wood constructions by Peter Green combine an exacting structure with an irrational element which is provided by the paint being poured onto the work instead of being applied with a brush. The paint drips in an irregular pattern onto steps which lead nowhere. Entitled 'Drip House' it is a disquietening object where the irregularly congealed paint assumes the traces of an inexplicable calamity. Green chooses to make objects which associate themselves with architecture, e.g. verandahs, mills, escape hatches, and subjects them to the sort of fate one associates with people rather than things. Michael Harvey makes what might almost be described as assisted ready-mades, or furniture out of furniture. John Latham has made roller blinds which can be used for windows, with the image unfolding on the turning roller; Clive Barker uses zips as focal points in pictures covered with leather; Loncraine has made a cast rubber baluster which turns eccentrically on a pedestal.

What these works have in common are the contradictions between the elements that are employed and the new uses to which they are put. They deal with the essence of what art is about—the transformation of reality into a new poetic entity. That is the premise behind the placing of any element out of context. In order to be able to appreciate this transformation one must be familiar with the everyday status of those objects and ideas that are used. Thus what may seem to us a superbly ironical confrontation in the form of a zip which joins two pieces of black leather and when opened reveals nothing, may be meaningless to someone from a totally different culture. However, universal the context of a work of art, which is very relevant to the *Ventures* exhibits, it can only be understood and appreciated by those familiar with the language used and the inventory of the current symbolic devices.

Newel post by Richard Loncraine

The function of a table*

Denise Scott-Brown

What is the function of a table? I may eat off it, write at it; at a party, dance on it, or drink myself under it. A child may throw a cloth over it to make a house or turn it on end to make a boat. I am lord at its head, serf at its foot, equal if it is round, a humble supplicant if I kneel before it. What, then, is the meaning of the phrase 'form follows function'?

It seems that the functions of so simple and general an object as a table may be many and various, related at one end to the most prosaic of activities and at the other to the unmeasurable, symbolic and religious needs of man. They may change with time—breakfast for four in the morning, navigation for two in the afternoon, and, with extensions, dinner for ten in the evening; and two hundred years later, a museum piece. It would not be possible to list all the functions which could be served by a simple table.

In addition, it should be noted that some of the functions discussed above were not considered in the making of the table; but rather, the form of the table itself, through its own visible possibilities, evoked them. The functions, then, ascribed to a form lie in the mind of the user and are based on his needs—table is 'eating place', 'working place', 'praying place', 'ship'. Are all objects as unmeasurably multifunctioning as a table, or are the forms of some objects more adaptable to different uses than others? What of a comb? a toilet? a staircase? a super-highway? Are the ranges of interpretive choice of function as great for these? Can their functions change with time? What of West Philadelphia? Do the houses designed for large rich families of the nineteenth century serve very well for the apartments of graduate students today? When one considers the many complex and often contradictory functions of the city, is there much meaning to Matthew Nowicki's statement, 'form and function are one'?

* An extract from a forthcoming book an environmental planning.

Sequence

Warren Chalk

Controversy rages on, as to whether we preserve the car and learn to live with it, or whether we alter our mode of transport and banish the wretched thing from our cities for ever. In spite of the claims and novelty value, rapid mass-transit rail systems are a restricting limited alternative. Even if eventually modified into an electronic bubble for use within urban limits, the car remains the most adaptable mobile extension of man yet dreamed up. The point is less the car itself than the design of the strips it runs about on. According to the January issue of *Traffic Engineering Control*, roads are at present overloaded to the point of carrying 90 per cent of all passenger traffic and 60 per cent of our freight traffic. The last official survey in 1965 showed the number of private cars in this country to be 8·9 million—roughly one car for every other household. And this points to the necessity for a higher capacity, more pertinent road network, a realistic car parking policy (including terminal parking garages and peripheral city interchange car parks) but, above all, a comprehensive transport policy, embracing private cars, public transport and freight traffic, which would include traffic surveillance and control systems. The Institute of Civil Engineers Symposium on Area Traffic Control (February 20–21) was intended to promote free discussion centred mainly round the west London experiment, the Glasgow experimental co-ordinated control area, and the Toronto signal system. All of which, basically, are concerned with the use of the computer and its peripheral equipment and the firm electronic grip it may soon get on our traffic problem. The logic of scientific control would appear to be the ability to herd traffic through our cities at a uniform speed, riding on what is called in the jargon a 'green wave', or all-systems-go situation. In our existing maze of streets various surveillance devices, such as closed circuit TV, would check traffic junctions, relay information back to a central control computer which would hunt in its memory bank for facts about adjoining street capacity and would feed back instructions to optimize traffic light timing and re-route vehicles so that a more efficient flow was established. Traffic automation is in its infancy, and the primary concern with alleviating existing problems of congestion and recording traffic behaviour patterns is an understandable result, as is also the attraction and addiction to the hardware itself, but eventually it is not so much the system of hardware used that will decide its overall success and efficiency but the way the system is put to use. The equipment should be seen as a total planning device, not only as a tonic for traffic handling but a surgical operation to establish a balanced performance between efficiency in the existing pattern and programmed adaptability for future road network and urban fabric improvement. The current issue of *Design Quarterly* 66/67, published by the Walker Art Center, Minneapolis, includes an article by Marvin Manheim that explores the function of the computer in aiding research into highway interchanges and transportation planning. The complex interaction thrown up by the man-machine interface may eventually provide clues in the puzzle that has a complex variety of alternative options that are neither well defined nor completely understood. A permissive adaptable matrix allowing for variables to be absorbed readily into the system would seem the only feasible solution. Designers will have to stop hiding beneath the security of the familiar and learn to adapt the new methods or risk a computer specialist take-over. It is up to us to grab a piece of the action.

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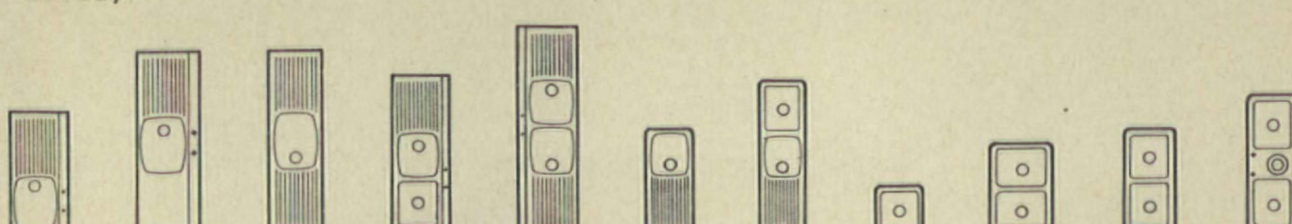

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AD 4/67

A very serious pact

Robin Middleton

Neo-classicism—a word that conjures up stiff-backed chairs, flawless marble figures by Canova or inert, colonnaded buildings. This is the dull, doctrinaire Neo-classicism of the post-revolutionary years—post-revolutionary in all senses; by 1789 the revolutionary period of Neo-classicism was over in France. It was the French who invented the form and the formulae of Neo-classicism. J. N. L. Durand, a pupil of Boullée, a teacher at the École Polytechnique, codified them. But the Durand style did not triumph in France. Bernard Poyet added a giant portico to the Chambre des Deputés between 1806 and 1808; directly opposite, that monumental platitude, the Madeleine, was started by P. A. Vignon in 1807. In the following year A. T Brongniart erected a rectangular peripteral temple to serve as a Bourse and, of course, Percier and Fontaine initiated a number of large-scale, severe and symmetrical structures. But the more adventurous French Neo-classicists expressed themselves rather on paper. England evolved her own variant of Neo-classicism—though Dance and Soane were indebted to French teachings, and the dullness of Sir Robert Smirke's architecture was probably largely due to the doctrines of Durand. In the rest of Europe these were sedulously interpreted. The Hansen brothers were active not only in their native Denmark but in Vienna and even in Athens itself. In Germany propagators of the style were legion—Karl Friedrich von Schinkel and his pupil F. A. Stürler in Berlin; Karl von Fischer, Leo von Klenze and Friedrich von Gärtner in Munich; Gottfried Semper in Hamburg and Friedrich Weinbrenner in Karlsruhe—these are only some of the names. In Italy the active exponents of Neo-classicism are less well known—Antonio Mollari in Trieste, Antonio Selva and Guiseppe Japelli in the Veneto; Simone Cantoni, Luigi Cagnola and Carlo Amati in Milan; Carlo Barabino in Genoa; Michelangelo Simonetti, Raffaello Stern and Guiseppe Valadier in Rome; Antonio Niccolini and Pietro Bianchi in Naples —but there is no doubt that they too took their cue from France. This is not to suggest that they had nothing themselves to offer, but that it was a style that the French first fashioned and used, exploited even, long before the Italians took it up. This salient factor is, oddly, altogether ignored in *Italian Architecture 1750–1914** by the late Professor Carroll Meeks. This book has been long in coming, anyone even mildly interested in 18th and 19th century architecture will have to buy it; it is an earnest and scholarly compilation, containing a useful array of facts—in particular an appendix listing architectural publications from 1700 to 1800, which is, unfortunately 'illustrative and selective rather than comprehensive', and another, naming the important 18th century visitors to Italy. Yet the book is a disaster, especially depressing because it is of the kind that will daunt future scholars. The chapter headings apart, there is no clear indication of what the architectural forces and currents were, no sense of how ideas were formulated and styles evolved. *Italian Architecture 1750–1914* is not a mere catalogue—one will still have to consult Emilio Lavagnino's *l'Arte Moderna* for added information—it is a selective history. The examples chosen seem to have been picked almost at random, their relationship one to another is not made clear. There is no sharpness of focus. The triumphal arch and the Pantheon as a paradigm are singled out for study, but they are not used to give point and real meaning to the general concepts of the period. Nor are the architects treated as sentient, enquiring individuals who might have been influenced by other designers and buildings. Virtually no biographical information is provided. This is not because Professor Meeks prefers to concentrate on architecture. The buildings are inadequately discussed and presented. The illustrations (266 of them) are limited, in the main, to extant buildings—which is admirable. But there are no more than two dozen plans (insignificant ones for the most part) and six sections. Buildings that have not been photographed or that are mere projects tend to be overlooked (though Professor Meeks does display an obsession with 19th century competition entries). The myriad sketches in the Cooper Union Museum attributed to Guiseppe Valadier, are not discussed. Architecture emerges as an affair of façade treatment and applied detail—

*Yale University Press 1966. £9.

E. Petitot, Triumphal bridge, c. 1746

L. J. Le Lorrain, Festa della Chinea, 1746

which might, of course, be regarded as an inherent defect in the architecture of the period.

Neo-classicism in Italy for Professor Meeks's readers starts, so to speak, in a vacuum. Nothing could be further from the truth. The turmoil and intrigue in Rome in the middle years of the 18th century largely conditioned the form of international Neo-classicism. The programme of reform was initiated in France, in the circle around Claude Perrault and the Abbé J. L. de Cordumoy in particular, but their ideas were tested and zealously purified during the first half of the century in Italy, in Venice, the most libertine and light-hearted of cities in Europe. If everyone there was not having a ball, it seemed that they were. The Savonarola who rose to preach of an architecture of rigour and honest expression was the Abbé Carlo Lodoli (about whom little is known and nothing new offered by Professor Meeks). In the rest of Italy there was a short but brilliant flowering of the late Baroque—in Piedmont Filippo Juvarra and Bernardo Antonio Vittoni were busy, in Rome those monuments were being built that still give that pleasure without alloy, the Spanish Staircase (1723–5), the Piazza S. Ignazio (1727–8) and the Fontana Trevi (1732–62). But in the middle of the century this heady architectural splurge suddenly ceased. Activity continued—Fuga and Vanvitelli erected some of the largest schemes ever devised for the Bourbons in Naples—but inspiration was weak. Architecture in Italy entered the doldrums. Even the Venetians were unable to give convincing form to their theories; though a significant line of descent from master to pupil can be traced in Venice—from Andrea Tirali and G. Antonio Scalfarotto, designers respectively of San Nicolò dei Tolentini (1706–14) and San Simeone Piccolo (c. 1718–30) [to both of which were attached a version of an antique temple front], through to Scalfarotto's pupil Tommaso Temanza, author of S. Maria Maddalena (1748), on to his pupil G. Antonio Selva, architect of the Teatro La Fenice (1790–92), and finally to Guiseppe Japelli, famous for the Café Pedrocchi (1816–42) and a stern Doric meat market (1821), both in Padua. These men all impinge upon international Neo-classicism, even if they did not influence it greatly. But Venice did produce a powerful and prolific genius—Giambattista Piranesi. He seems to have trained under Scalfarotto, then, in 1740, he left Venice for Rome. There, as Emil Kaufmann first suggested and as John Harris has recently upheld†, he came under the influence of another perfervid prodigy, the French Grand Prix winner Jean Laurent Le Geay. Piranesi was inspired to produce sheafs of etchings of the most brilliant and daring kind—his *Carceri* (1745) were the most shocking, but the views of Paestum done just before his death in 1778 are scarcely less raw and idiosyncratic. Despite the activities of Pococke, Soufflot, Le Roy and Stuart and Revett, it was Piranesi who opened Europe's eyes to the primitive splendour of Doric. He set the mood for Neo-classicism. He did not himself provide the vital visual form for the Neo-classical ideal—his few executed works are a facet only of those interminable archaeological squabbles which, like his tourist trade, threatened to weaken his talent. Other Italians had nothing to contribute. The new architectural style was formulated first by the French *pensionnaires*. In 1746 and 1747 Louis Joseph Le Lorrain set up two temporary structures, outside the

†'Le Geay, Piranesi and international Neo-classicism in Rome, 1740-1750' in *Essays in honour of R. Wittkower*, Phaidon Press.

Palazzo Colonna, for the *Festa della Chinea*, that might be said to mark the inception of Neo-classical architecture. Other Frenchmen arrived equally abruptly at a fully fledged Neo-classical style. P. L. Moreau-Desproux, N. H. Jardin, C. L. Clérisseau, M. J. Peyre, C. de Wailly, Victor Louis, J. F. T. Chalgrin and Jacques Gondoin were all bold and original enough in their designing during the 1740's and 1750's to determine the course of international Neo-classicism. William Chambers, Robert Adam and George Dance sailed home to success on the innovations that these men launched. Rome was an education. Though, as Professor Meeks notes, some of the most vigorous of French Neo-classicists never set foot there—E. L. Boullée and C. N. Ledoux and those lesser genii, F. L. Bélanger and A. T. Brongniart and, perhaps not altogether surprisingly, J. N. L. Durand.

Professor Meeks shows little interest in this French cataclysm. Le Lorrain is not even mentioned nor is the work of de Wailly in Genoa or of Ennemond Petitot, a pupil of Soufflot, who built actively and enterprisingly at Parma from 1753 until his death in 1801. Yet the French provided not only the ideas and the examples, but also the authority and power. They were invaders. The Italians turned late to Neo-classicism. Michelangelo Simonetti's interiors at the Vatican were started only in 1776; the Neo-classical palaces and villas in and around Milan are even later, and they were heavily indebted to French architecture. In Sicily the break with Baroque was made by a Frenchman, Léon Dufourny, who built the Ginnasio at Palermo between 1789 and 1792 (a building, incidentally, that was commemorated by Thomas Hope at Deepdene in Surrey). Only when they were powerfully supported by the enterprise and enlightenment of their invaders did the Italians really recover from their architectural exhaustion. Guiseppe Valadier's Roman masterpieces were started under the aegis of Napoleon; Antonio Niccolini's Teatro San Carlo and Pietro Bianchi's San Francesco di Paola in Naples were begun by Joachim Murat. French innovations long proved irresistible. Pasquale Poccianti's Cisternone (1829–42) and the Cisternino (not listed) at Leghorn, though late, are almost as brooding and rugged as a *barrière* by Ledoux. Luigi Cagnola indulged, during the first third of the 19th century, in a mania for colonnaded architecture that is equalled only by Boullée's, unless it be by that of the rabid styliphiliac Alessandro Antonelli. Almost until the moment of unification in 1870 the Italians sustained themselves on the formulae and the pieties of Neo-classicism. There was a mild Gothic intrusion. Pietro Estense Selvatico was inspired by Ruskin to suggest a Venetian Gothic Revival, but no one in Italy, least of all in Venice, could manipulate that style with the vigour of an Englishman. Camillo Boito in Milan, taught by Friedrich von Schmidt, who in turn had been trained at Cologne, took up the moral and structural credo of Viollet-le-Duc, but Italy was in no way prepared to accept either his stiff and awkward architecture, or his homilies. Architects were interested in a well-mannered style, not technical advance. To judge from Professor Meeks' history of architecture, sanitation was not improved in 150 years. Low-cost housing was of no account—there is only one short paragraph on the subject. Even the railways came late to Italy. The Italians were not interested in change. They were determined to change neither

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'M'-section column covers on Winchester House—in 'Silver Fox' stainless steel

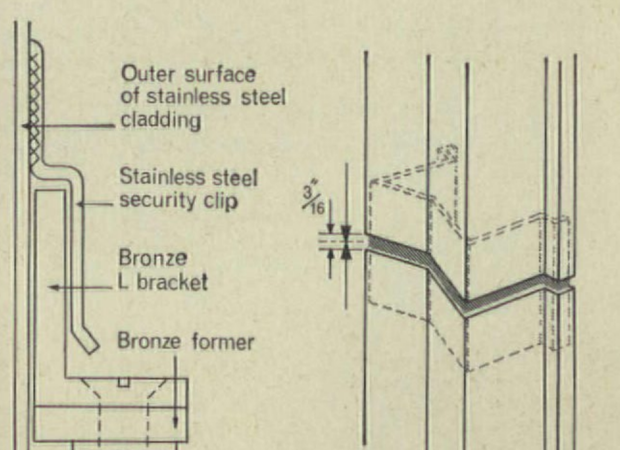
The latest application for "Silver Fox" stainless steel can be seen on the recently completed Winchester House in the City of London, where it is used to clad the eight 20-storey high, two feet wide, structural columns on each of the main elevations above the podium.

"Silver Fox" stainless steel enhances the aesthetic feeling of the building and provides the architect with a material of strength and durability, with minimum maintenance—a quick wash down will bring it up like new.

Winchester House, London. Owners: St. Martins Property Corporation Ltd. Architects: Gunton & Gunton. Contractors: Trollope & Colls Ltd. Stainless Steel fabrication: Culford Art Metal Ltd.

Manufactured as an inverted "M" section in 11′ 8″ storey-height lengths from a single 14G sheet, the dull-polished stainless steel covers produce differences in light reflection to provide a clean and slender appearance to the heavy structural columns.

The stainless steel covers are secured by connecting cleats, spot welded to bronze angles and tees, which are in turn bolted to the concrete columns.



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SKETCH OF CLADDING SHOWING SLEEVED JOINTS

If you would like to know more about "Silver Fox" stainless steel in action write for our recently published book, "Stainless Steel in Architectural Design."

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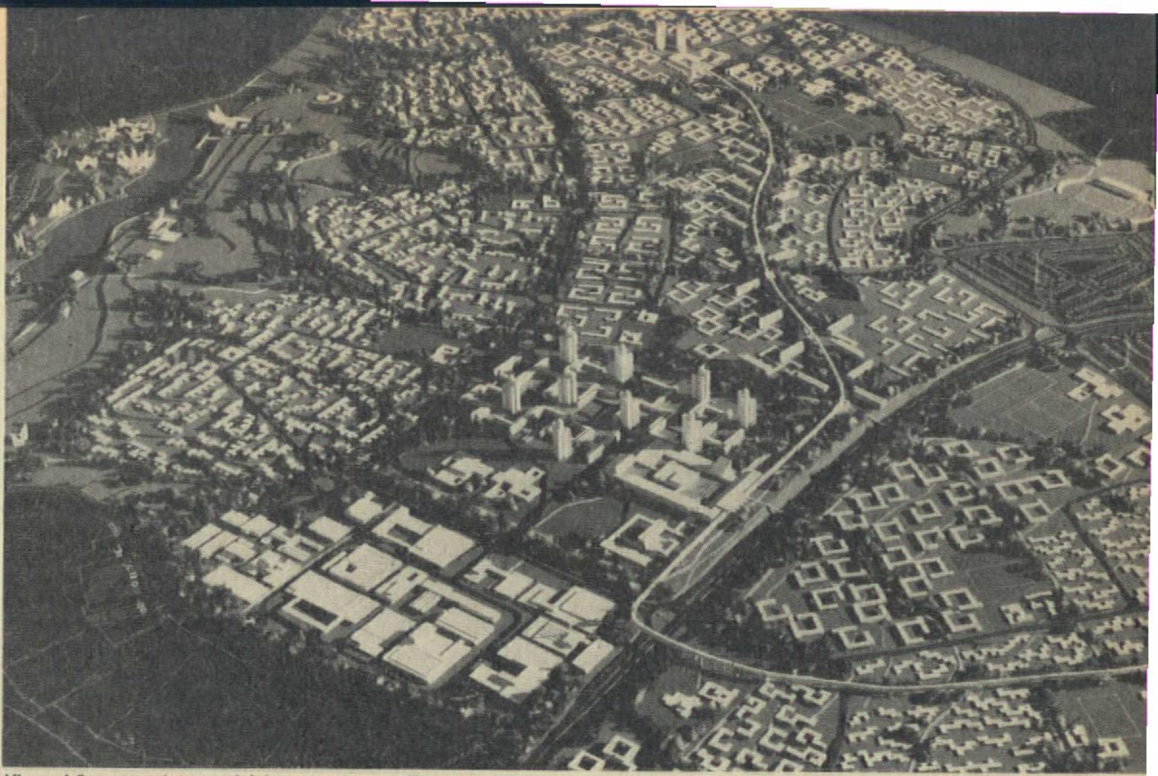
their style in any radical way nor their values—these remained, as Boito sharply reminded them, economic and banking values. But the economy was weak. With dogged inadequacy they pursued their classical course throughout the 19th century and even beyond. Classicism—and not necessarily late Neo-classicism but even neo-Palladianism—was so firmly upheld that it is often difficult to determine whether buildings are of 17th or 19th century construction. Neither the most cankerous buildings of the Stile Umberto nor the most lush examples of the Stile Floreale (known to us as Liberty) seriously disrupt the gutless niceties of classical street architecture. G. E. Street's two Gothic churches in Rome do that more effectively. Though it is fair to add that when Italian architects were tactless they were monstrously so; the architects of the Victor Emmanuel monument and the Palazzo di Giustizia in Rome permitted themselves displays of architectural bombast of which no one has since been proud. The Italians have preferred a very serious pact. They have earnestly insisted on the virtues of dabbling only in nuances of style, style and more style. They have allowed themselves no dangerous fields of enquiry. The Futurists let out a scream of boredom at all this platitudinous pact—how one feels for them—but they were decimated in the First World War. The promise of the Italian Rationalist school has since proved false. The dogged inadequate stylists have held sway. In one way or another, as even Professor Meeks makes clear, Italian architecture has sustained itself for over 200 years on some stylistic niceties—taken most often from France.

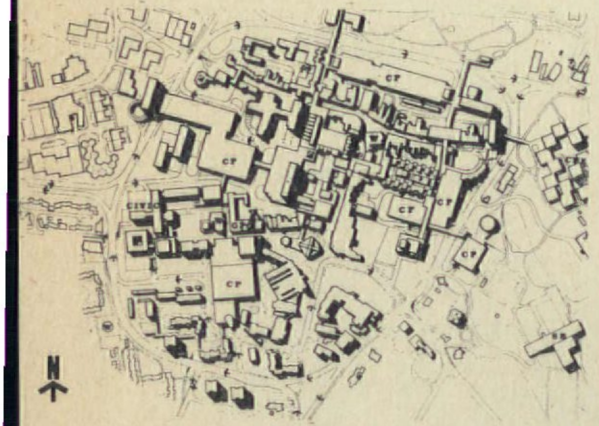


View of Beaumont Leys model from south-west. The industrial area is in the foreground; the district centres are visually pinpointed by high blocks; the lake and recreation area lie to the west.

Real planning at Leicester

Among the depressing welter of unfulfilled regional studies, confidence in *some* members of the planning profession returns with the publication of the plan and overall model for a 1950 acre extension on the north-west of Leicester for Beaumont Leys, which the City Council has just approved, and where work will shortly start on what is virtually a new town for 40,000 people, complete with two district centres, each linked to the proposed Leicester monorail system, and 60 acres of industrial development. The layout is simple, designed around a system of linked open spaces having a pedestrian promenade and cycleway, and into which feed other pedestrian ways along green wedges. Densities vary from 30 to 120 p.p.a., the average being 54. The whole area has a completely separate traffic and pedestrian circulation system, and even if the monorail never materializes, public service vehicles could operate along its route. Konrad Smigielski and his team are to be congratulated.

Planning



Droitwich town centre report

By the Droitwich Development Committee

The central area proposals for Droitwich—a town planned to expand over the next 15 years from 8000 to 30,000—show a concern to create a new centre which will satisfy the needs of future citizens in a thoroughly modern way, yet will conserve the unique flavour of the existing centre, much of which stems in one way or another from the old salt industry of the town.

A three-lane one-way ring road encircles the centre, giving easy access to service areas and large, well-sited car parks, from which people can quickly reach the shopping and other facilities provided within the centre.

Pedestrian circulation within the partly-enclosed shopping area follows a 'figure of eight' pattern, which takes advantage of changes in level to link Old High Street into the new development.

The care with which the requirements of traffic, parking, shopping, etc., have been assessed, and the obvious desire of the design team to produce a development in scale and sympathy with the total scale of the town suggests that there will be a satisfactory blend of new and old in Droitwich.

J. T. Perry

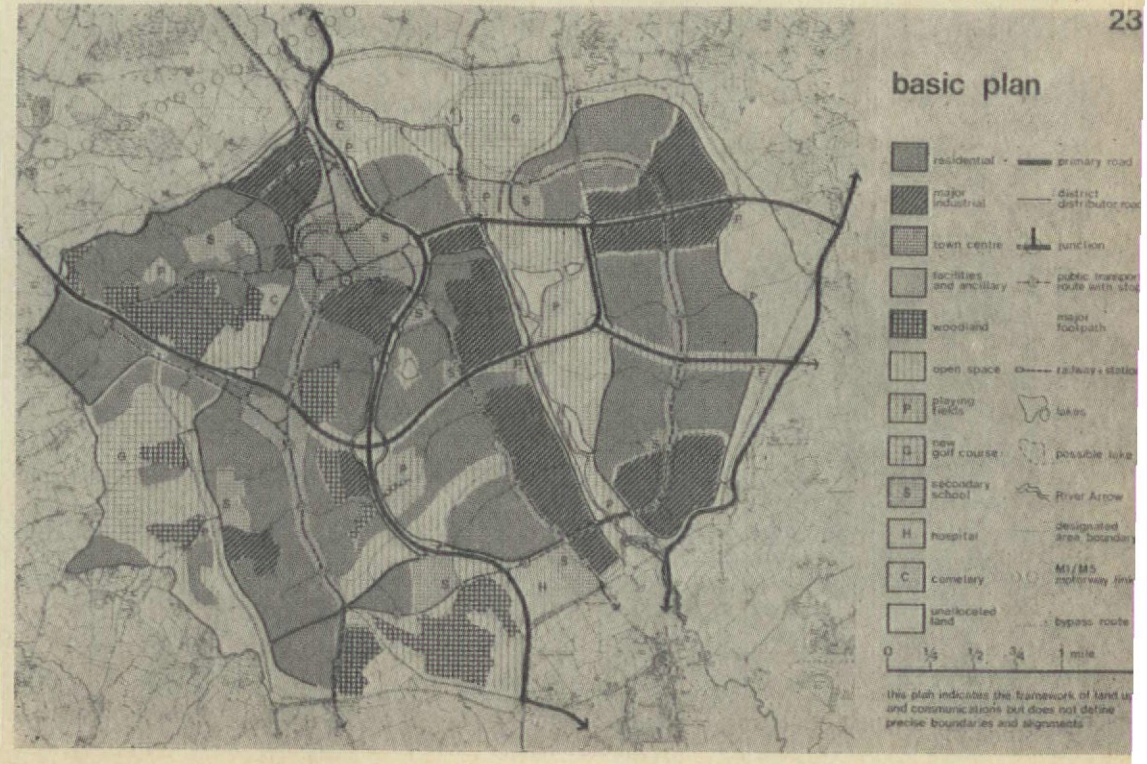
Redditch New Town

Report on planning proposals by Hugh Wilson & Lewis Womersley in association with Michael Brown.

Redditch is a town with 30,000 people already; it is planned to grow to 70,000 and thence to 90,000. Birmingham centre is 14 miles north.

The report is a thorough document unusual in the welcome attention paid to the landscape and climate. The plan grows from the site, features being the retention of the existing town centre, the creation of new lakes in a major valley open space, dispersed industrial sites, and residential areas mostly arranged along a public transport route (buses) which is mainly an all-purpose route but partly reserved for buses alone to encourage quicker access by bus. At the same time the road system is designed to cater for 100 per cent car movement. This, combined with lowish residential densities, involving walks of up to 10 minutes to public transport stops leave doubt as to the use of the buses. The attention paid to landscape and housing requirements suggests that if the deed is as good as the word a high quality environment will be created.

J. C. Holliday



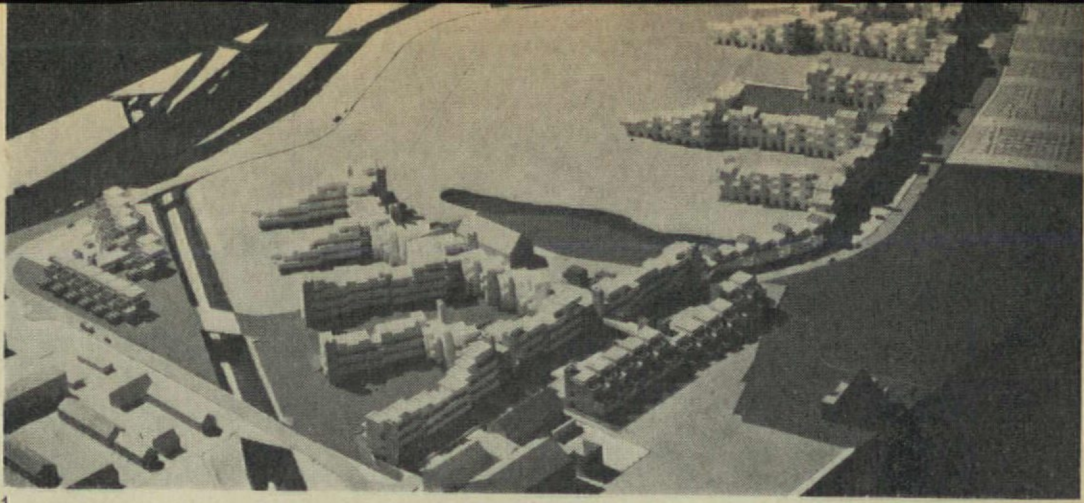
Changing the grain of Manchester

Dennis Sharp

Manchester's housing needs are immense. At last, after years of indecision, the city authorities are taking action on an unprecedented scale to finally clear the 50,000 slum properties that choke the inner ring of Manchester. It promises to be one of the most exciting developments in comprehensive planning and architectural form to emerge in this country since Park Hill, Sheffield. The immediate programme is to build 5000 new homes a year, 3000 of which will be situated in the slum clearance areas within the city boundaries. Forty or more renewal schemes over the next seven years will account for the use of 4000 acres of land and the provision of 21,000 homes. Instead of dealing with these schemes separately in small sections the aim is to think big and plan comprehensively, creating simultaneously a new inner section to the city. At the very least this means that planners and designers will be deterred from building miniature Cumbernauld-town-centre-type schemes in each area and from treating sites in isolation. In fact, the Housing Development Group in the Town Hall which is responsible for creating the framework of renewal has been given the widest possible brief and the opportunity to reconsider the whole philosophy of housing and redevelopment. The Group, working with Manchester's Director of Housing, has already proved to be a catalyst, interpreting the Planning Department's proposals for the master map and creating from this a comprehensive structure for the development of the major renewal areas. This has led to the evaluation of the city as a whole and to that vital new criterion in city form-giving that Kevin Lynch refers to as 'imageability'.

After analysing the existing character of the housing areas in Manchester, the Group established a theoretical framework of precepts and determinants for the design work. The form determinants which have had a direct influence on the actual buildings include such factors as: *gateways*—points of entry to development areas; *city scale*—a resultant arising from the spacing and height of buildings in groups; *centre*—existing organization of shopping and other activities; *nodes*—focal points of activity; *paths*—through-routes and directions; *parkland*—leisure activity generators; *barriers*—buildings on site edges to act as noise shields; *orientation time*—the constructional period; and so on. The Group soon recognized an important factor inherent in the structure of the city. This they have called the *grain*. By accepting the permanent elements within the inner sector of the city—including the hierarchy of existing and proposed transport systems and the effective sizes and shapes of individual areas—the Group has been able to reorganize the granular texture on a vast scale with 30-acre blocks related to 300-acre elements in the city landscape.

For some time now the architect/planner has been urged to study this aspect of grain theory in detail. The Manchester Group have done so, and, as Diana Rowntree wrote recently in the *Guardian*, it looks as though they have discovered the missing link between planning and architecture. Richard Llewelyn-Davies observed in the October 1966 issue of the *Town Planning Review* that '*grain* size will profoundly affect every aspect of the town—functional, social and aesthetic', and he defines *grain* in terms of 'the block bounded by streets, itself sub-divided into individual building lots'. The Development Group have broadened the definition (*TPR*, January 1967) to include the 'ordering space between the main structural elements of the city, i.e. between the major activity locations and their lines of communication'. By taking an area of mixed uses, the directional quality of the grain can be observed and reorganized for redevelopment. Instead of the mono-grid pattern imposed by rows of industrial terraces and existing roads, it is possible to outline a grid over a very large area that generates its own pattern on the site leaving irregular pockets (or feathers) **2** of land. These irregular pieces can be used for pedestrian systems within the development, as 'green lungs', or as sites for schools or other amenity buildings. The strength of this approach to large scale planning is in the way it becomes possible to consider redevelopment



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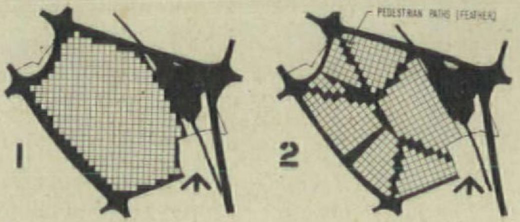

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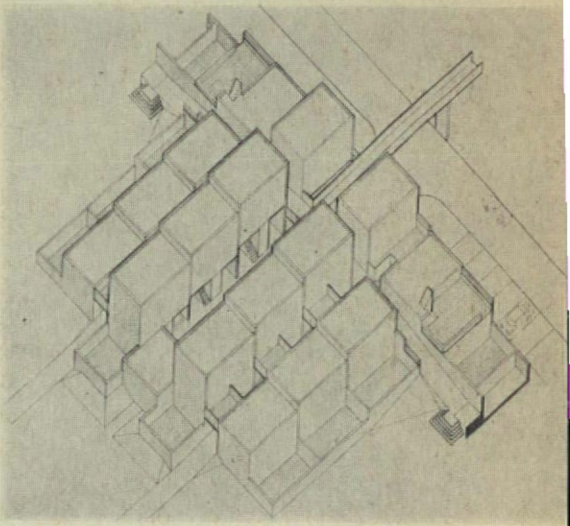
in its totality with every part (even the edges to the sites) related to a comprehensive overall structure.

In practical building terms the Group have produced three major central redevelopment area schemes, for Longsight **3** (430 acres), Beswick **4** (300 acres) and Harpurhey **1** (1000 acres). These areas, all of which are located within two miles of the centre of Manchester, have clearly defined boundaries but they will be renewed simultaneously. Although each scheme will have deck access maisonettes running in linear form over the sites, the detail will differ according to the physical nature of the sites and in the variety of density and individual identity of the units. Other factors such as orientation, the extent and use of the 'feathers', the proximity of motorways and throughways, and the ideas that are emerging for 'ramp' and 'spur' buildings, give further opportunities for variations in layout and architectural treatment.

For each of the three areas the Group have set out at the beginning of their written report the social and form determinants that have influenced their design decisions. Taking the example at Beswick as being typical, the designers devised a system of barrier housing to eliminate noise to the units themselves, and the feather areas, from the adjacent motorway. They accepted that all housing should have a southerly or westerly aspect and that all upper level living units should be provided with play spaces and social facilities on the same floor. These and other precepts generated ideas for the design which takes the form of



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a continuous block of four- and six-storey deck access maisonettes and small clusters of low-rise ground access houses. At Beswick, which is being constructed on a modified version of a proprietary system, the overall density comes out at 157 persons per acre. In this scheme a further building type was developed called a 'ramp' block 5 which is designed around a bridge crossing the motorway. The object of this is to funnel pedestrians through a grouped cluster of buildings which act as an identifiable point in the environment. The success of this whole project cannot be assessed until the theoretical suppositions can be tested on the site. Until then the Corporation and the Housing Group should be given all the documentary support and backing possible, as the work so far suggests that this effort will prove as important to the city as Barry Parker's plans for Wythenshawe in the years before the last war. Its wider implications are obvious.

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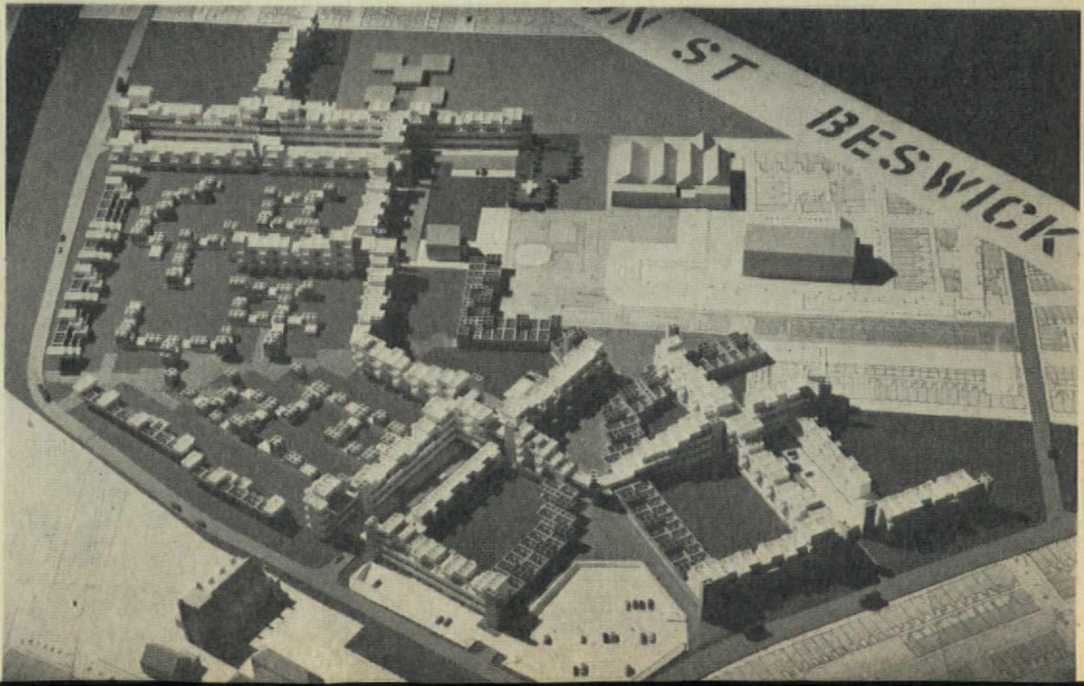

Annual Report January 1984

Ideal Building Corporation

As this is the tenth anniversary of the merger that formed the present corporation it has been considered appropriate to include some of the historical information that led to such a successful move.

John Eal and Son had been for many decades producing a modest line of caravans until it was acquired by our founder and diversified into the manufacture of lightweight temporary homes. These were to cope with the emergency housing requirements that arose in the latter '60s with the economic upheaval, and the government's measures to displace large sections of the population into different occupations. The diversification proved successful, but was ultimately limited in its progress by the availability of land. It was for this reason that the company linked up with Industrial Developments (I.D. Ltd) a firm specializing mainly in automation equipment but with a land development subsidiary that it had acquired whilst advising a firm of Estate Agents on the use of computers. The combined company that emerged was called the IDEAL Construction Co, Ltd. By 1974 IDEAL had captured the lion's share of building in the UK and was manufacturing components that resulted in upwards of a quarter of a million houses per year, 30 per cent of hospital, university, and school buildings, and 85 per cent of factory and office building. It might well be worth at this point summarizing the factors that led to this success.

Firstly IDEAL had by removing much of the building operation from the site to the factory, where it was largely mechanized and automated, managed to peg the rising prices due to the increasing cost of labour. Secondly IDEAL had never been bound by traditional building habits and restrictive practices and was therefore able to harness much of the available technology to producing lightweight units of far higher performance specification. Thirdly IDEAL eliminated many of its overheads by subcontracting the actual sitework to local builders although they were bound by their contractual terms to employ the organizational methods and mechanized equipment that IDEAL had established as essential for productivity. The building unions had not at first shown any concern as the original company had been mainly concerned with emergency housing, and anyway labour was scarce. But as automation made redundant the unskilled labour force in other industries, and as these sections moved into the building industry, the labour market became plentiful, and the Unions restless. IDEAL had all along maintained close liaison with both the Unions and the Government and had succeeded in avoiding many of the troubles that befell its competitors. Its rapid growth and high profitability had ensured higher and higher wages; and with much of the work performed in factories rather than site the conditions of work and the related benefits were continually improved. Pensionable age was continually reduced, and a scheme of retraining established. Indeed the expansion was such that despite all the mechanization and automation staff requirements were actually increased.

Fourthly much of IDEAL's success was due to its land policy in which partnerships were formed with the owners of development land. This incentive maintained a continuous source of land and even though most of this was in small lots (90 per cent in less than three acre lots) the light weight and ease of mobility of the IDEAL units permitted infill and sporadic development without the overheads associated with more heavy construction. Furthermore as the units were prefinished, and foundations had been eliminated for small buildings, the financial return on the land was fast, and this in turn was another inducement for land to be made available.

Lastly we cannot discount the effect that the Selective Employment Tax had on the building industry in general at the time, and the advantage enjoyed by IDEAL inasmuch as it was essentially a manufacturing industry.

Back to 1967 however where the then Labour Government having initiated a major depression found itself in the embarrassing situation of having to account for a reduction in building rather than its promised increase. The step it took was to convert the National Building Agency, an organization that itself was facing a certain amount of unpopularity, into the National Building Corporation. In effect a nationalized building company with the specific task of increasing productivity in the public sector of building by industrialized methods. Although at the time this produced a considerable amount of controversy, it was the logical development to a number of trends in public building, such as direct labour, the Local Authorities acting as main contractors, and the increasing clauses placed on the expenditure of public money. The NBC was initially an enormous success, its experience with Systems building, its relationship to Local Authorities, its high quality of design, and its access to the order of capital investment that was, and still is, so vital to building through the government. Its success was matched by rapid expansion into all aspects of building, and by 1974 had almost a monopoly of public buildings.

We had therefore in the short period of some seven years seen the rapid deterioration of the previous building structure composed of thousands of small and inefficient concerns, many manned by only a few people, indeed often father and son. The deterioration occurred because the existing structure was unable to cope with the productivity required, particularly in housebuilding, and the firms that were not rendered bankrupt by SET (very few) were swallowed up by the giant concerns of which we must include the NBC and IDEAL. The traditional structure was not entirely extinguished however; it concentrated on renovation, maintenance, repairs and many other individual activities where art, skill, and local experience count. This section as we now know has not only survived until today, but has actually expanded to almost the size of the labour force that constituted the building trades of two decades ago.

By 1974 most of the early giants who had based their skill on heavy construction techniques had been losing ground to the NBC and IDEAL and had diversified into civil engineering and road works. In house building they had become cumbersome and had been outpackaged. Their material and transport costs had become uncompetitive and their dues on foreign licences were accumulating. At the same time IDEAL had saturated its market and was on the verge of stagnation. The NBC although it had fulfilled its need had proved all along to be a financial liability on the public purse; it had become inefficient through bureaucracy, red tape, and ministerial interference.

We shall not dwell at any length on the political events that led up to the merger—boom—failure to enter Europe—slump again—European and US economic acceleration—disarray—coalition.

With the coalition the threat of nationalization that hung over IDEAL and was in part cause of its very stagnation was removed, and it was decided to merge the two largest construction firms. Such a merger provided the stability and strength to enter Europe competitively which was to be the next major political move. Thus out of the NBC and IDEAL Construction Co Ltd was formed the Ideal Building Corporation (IBC). This arrangement was not merely political. The NBC benefited from the more extensive experience and acumen of IDEAL, and IDEAL benefited by its access to the public housing side and the resources of the Land Commission.

The development of the corporation to its present level is common knowledge, with its large working capital it rates as one of the top twenty industrial/employment organizations in Europe. The policy of continual centralization has led to the main assembly complex at the centre of MI Linear City.

Construction and materials

One of the great advantages of the development of the Corporation has been its independence from any particular material, a factor that had invariably inhibited or prejudiced manufacturers in the past. However to achieve nation-wide distribution of our product from a centralized source, often by helicopter or airfreight, has meant an emphasis on weight, and consequently on performance. Ever since the government directed a higher priority for the use of timber in the chemical industry (for the extraction of hydrocarbons and resins valuable to the plastics industries), we have relied for the main on man-made materials in conjunction with aluminium and steel. The predictable nature of these materials has enabled us to achieve the fine tolerances and the high quality of product for which we are known. Our R & D department (formerly the Building Research Station) has produced a continuous range of new permutations of known materials to meet our particular requirements and has successfully appraised developments in other fields. Techniques that they have developed for structural analysis, based on plastic theory and the use of computers, has led to the successful exploitation of indeterminate and tensegrity structures, so necessary to meet the variety of conditions from transport and handling to site. In the field of services, although equipment has been available to meet every form of comfort requirement for over a decade a considerable amount of progress has been made in miniaturization and cost reduction. The controversy that has raged between the use of autonomous units and units relying on centralized systems is beginning to settle with the more expensive items such as computers and refuse disposal being centralized in high density areas whilst power and waste disposal remain local. The wide range of audio-visual and recreational equipment remains as standard, negative optional, in most of our units.

Market

At our MI plant 15 assembly lines operating around the clock have reached a record output of the equivalent in units of 15,000 dwellings per week. In addition we are maintaining our output of systems for schools, universities, hospitals, offices, laboratories, and factories.

In the housing field 30 per cent goes to public housing erected by Local Authorities, 30 per cent goes to the private sector erected either by our own retailers or independent organizations, 20 per cent goes in export, and 10 per cent is sold direct to the public in the 'do it yourself' sector.

The popular myth that housing was a market economy in which the consumer was sovereign and was able to exercise his taste, which had resulted in the appalling standards of postwar building design has now completely disappeared. During the early years of our operation the level of scarcity was such that almost anything went. The user of the buildings had no say on its design other than through the sporadic use of social surveys, most of which were coloured by previous experiences and prejudices of the interviewee. Later as our corporation gained in size it became evident, despite the fact that scarcity was gone, that we remained in the position of determining and influencing the User taste and choice. How did this come about and how was it that the User never rose in riot or complained of exploitation? The main reason was our size. The very nature of a complex assembly line had necessitated very advanced pre-planning of every detail of our product. Because each component was to be repeated millions of times over it was necessary to eliminate all error and it was possible to invest more design skill than any building component had hitherto known. Because this skill relied heavily on a wide variety of specialized knowledge, all design decisions that were made were group decisions, and were therefore not only safer, and more balanced, but were immunized from the capricious whim of the individual that had for so long harmed building design. Thus with such advanced planning, such a foolproof method of decision making, and such a size of organization we were at all times able to offer not only products, but entire systems, and even buildings, that where in advance of what they were replacing. Advanced in quality, performance, and style.

With much of our labour force released by automation we were able to adequately staff the biggest bottleneck in our organization, namely marketing and sales. This and our consistently high standard of advertising (two examples are illustrated)* which has emphasized the functional aspects of our products rather than the stylistic and rather nebulous status aspects, have also been responsible for our success.

Although almost every aspect of social inequity has been removed, we cannot entirely overlook the problems that have arisen in regard to status. On the basis that most income groups tend to look upwards for

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**With apologies to Gropius, Le Corbusier, Breuer and Volkswagen.*

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status guidance we have maintained our policy of marketing our products to the highest echelons of our meritocracy, and although the small numbers that this involves, and the more frequent use of one-off components has not exactly been a profitable move, the pay-off from articles in the popular press has been immeasurable.

In general however we feel that our success must ultimately hang on design and it is to this that we now turn.

Design

By design we refer to the decisions that control the nature of our products. Decisions are involved at several different levels of the production process, the shaping of materials into components, the assembly of components into complex components, the assembly of these into systems and box units, and the erection of these into buildings. At each point highly specialized decisions, but at the same time decisions that have required not only a knowledge of all the parts, but ultimately the end product, and even more important the consequences of the end product in urban, local, and landscape situations. It was this last skill that posed initially the greatest problem. At first our organization was dependent entirely on architects and industrial designers who were largely self-trained. Although it was the training of architects that nearest approximated our requirements, much of their training period was occupied in the accumulation of information totally irrelevant to the production process. It was not desirable to entirely alter this situation as a large proportion of particularly the architectural profession was, and still is, destined to conventional work on the large legacy of pre-industrialized buildings that still remain. In addition a large proportion has successfully maintained its professional independence by acting on behalf of the client and designing his buildings, albeit entirely with our products. As the country increases in affluence this section of the profession may well increase; availing itself to the most of the flexibility of our dimensionally coordinated components and Systems.

As it became evident that we ourselves were going to be the largest employers of designers we were able to bring a certain amount of pressure on the schools to adapt streams of students to our requirements. In addition to periods of practical apprenticeship, on the factory floor the major modifications to their programme was in the appreciation of User problems and preferences. Thus whilst all decision processes within the corporation are group ones it has been the role of the Designer to control these groups at every level of the production, assembly, and erection stages.

Although the increase in quality of our products was an inevitable consequence of the scale of industrialization, it has been in the designers appraisal and continuous reappraisal of User comfort requirements that great progress has been made. Everything from the controls of the hydraulic systems to the changes of air in the Utility rooms have been evaluated by comfort criteria, to the extent that our components surpass in sophistication those manufactured for most luxury transit craft. Whilst we can boast our functional and qualitative achievements we should not neglect the progress we have made in the visual field. Ever since the beginning of the industrial revolution taste had been divided. What was considered as the paragon of good design could rarely, and then by default, find a mass market. Objects that flourished in the popular mass markets rarely found their way to the design centres. On the one hand were the puritan/functionalist designs, often very unfunctional, and on the other hand were the vulgar artifacts of nostalgia and affluence, always unfunctional and usually shoddy. Intensive research studies were however made, and elements were discovered that were common both to the standards of educated taste and to the mass market. Such factors as colour, suitability, identity, originality, reliability, and many others, were of immense importance. It was these factors, at the expense of all previous stylistic notions, that formed the basis of our visual design policy.

In the light of such a glowing report we may now turn to our prospects as a corporation.

Prospects

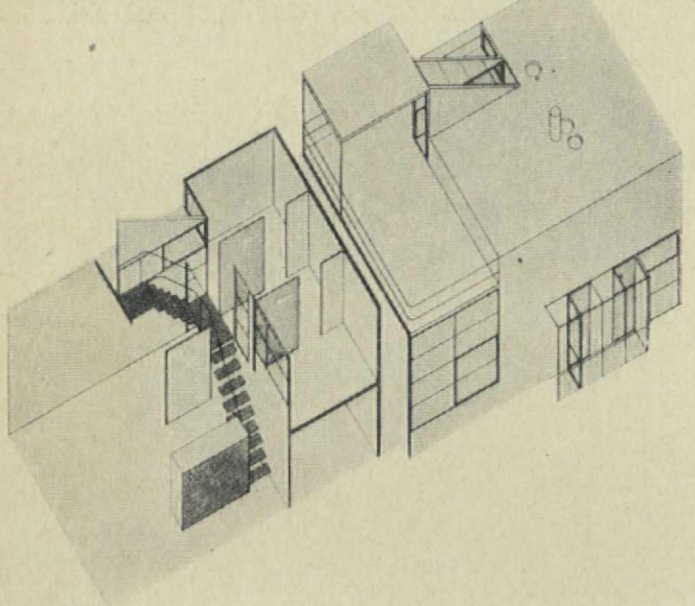
Ever since our entry into Europe, and the subsequent abandonment of our artificial agricultural policies, the problem of land availability has been eased, and we are now in conjunction with Government and regional planning authorities developing and redeveloping large urban and suburban areas, in particular the South East Megalopolis. Despite the generous allocation of parks and nature reserves there seems no likelihood of any land shortage in the median future.

Technically we shall maintain our policy of mechanization and automation which we are integrating with our phased holiday extensions, working week reduction, retirement age reduction, and training period extension. In addition staff is continually moved from manufacturing into the service departments of our organization, which are forever expanding.

Our policy has always been to diversify our products and services where these are in some way related to our initial purpose. We have acquired interest in various transit systems, and mobile home manufacturers. We have inaugurated a system of emergency shelters to meet any global hazard. These can be rapidly airtransited to site.

Finally, and the figures bear this out, the most rapidly growing outlets for our products and the ones that we shall vigorously pursue are 'shelter for export' and 'do it yourself'. By simplifying erection tasks, and minimizing erection equipment, it is not unforeseeable that we should obtain a world market in which the least skilled will have the opportunity to design and build their own porch or palace.

Raymond Wilson



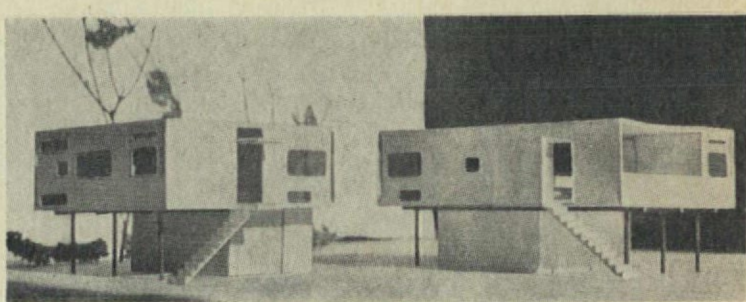
Ugly is only skin-deep

It may not be much to look at. But beneath that humble exterior beats a sophisticated environmental control system. It will never let you down and it's discreet. It will cost you less than 90 Eurodollars a year to run.

After a while you get to like so much about this house, you even get to like what it looks like.

You find there's enough space for almost anybody. Even cousin Edna and all her children visiting. Snug-fitting carpets. Doors that close so well you can hardly close them (they're so airtight, its better to open the window a crack first.)

The ugliness doesn't add a thing to the cost of the house. That's the beauty of it.



Do you earn too much to afford one?

For many people this house would be an ideal house. Expect for one thing. It doesn't cost enough.

They're afraid nobody will know they have any money, if it doesn't show in their house. In other words, they buy their house for other people. Not themselves.

Then there are those who earn enough to buy a much better house. But they don't. Because they can't find one.

For them the best house is one that simply works. Comfortably and economically. One they don't have to worry about. That doesn't leak, freeze up. And rarely needs repairs.

A house where maintenance doesn't cost much.

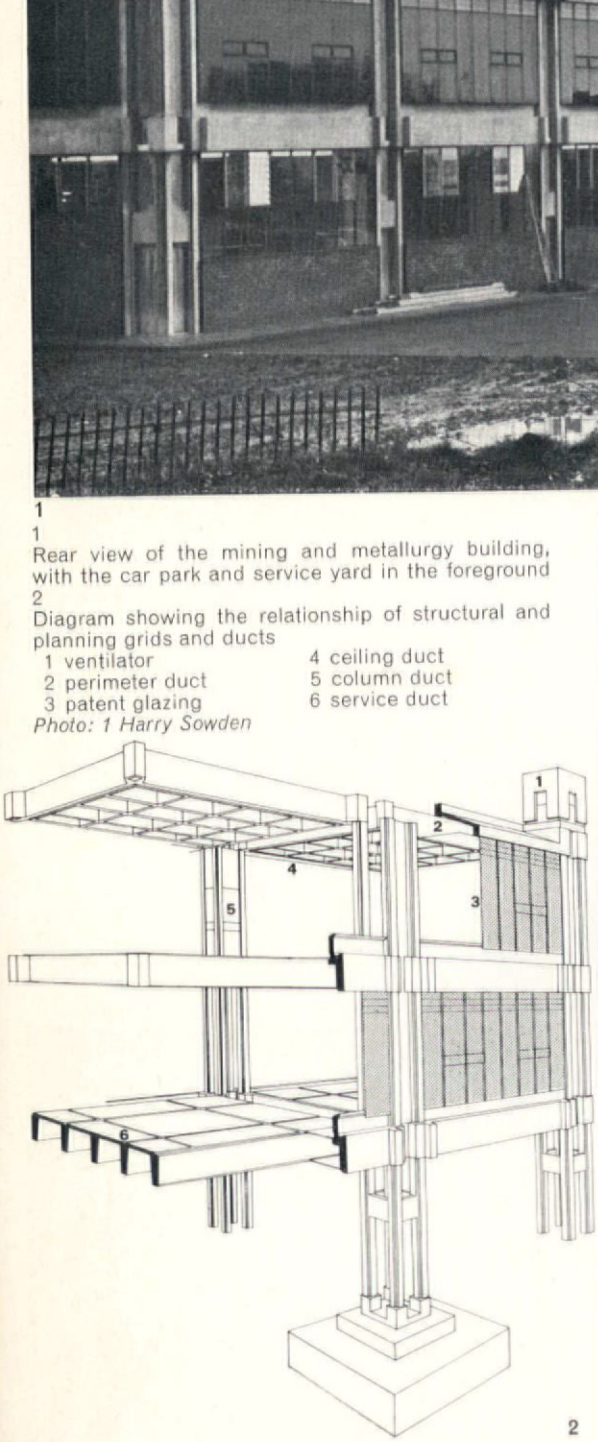
A house where the house doesn't cost much.

They feel they can afford to save money with this house.

Now next time you see someone living in one don't feel sorry for him. Who knows? Some day the Building Society might be using his money to give you a new home loan.

1

1
Rear view of the mining and metallurgy building, with the car park and service yard in the foreground
2
Diagram showing the relationship of structural and planning grids and ducts
1 ventilator
2 perimeter duct
3 patent glazing
4 ceiling duct
5 column duct
6 service duct
Photo: 1 Harry Sowden



2

Building for Science

Philip Dowson

University of Birmingham
Mining and Metallurgy building

Arup Associates, architects and engineers

Birmingham Mining and Metallurgy Building, completed in 1966, is the forerunner of three further science complexes: the New Museums laboratories, Cambridge, now under construction, Loughborough University of Technology and the Addenbrooke's Development for Biological Sciences, Cambridge, both in the design stage. Embodied in the design of these laboratories are ideas which have been considered over a period of years, as a result of experience in the design of science buildings and the problems of adaptability and servicing which are involved. The Mining and Metallurgy building is used here as the basis for discussion and comparison.

Birmingham University has a pedestrian 'green' which (excepting Pritchatt's Road, planned ultimately to be closed) extends from the centre of the University to the residential areas without interruption.

The development plan for the Mining and Metallurgy laboratories proposed five link pavilions sited to form a perimeter wall to this part of the site. A colonnade edges the green as part of a future covered way system planned for the University as a whole. Service access and parking is at the rear.

The aim has been an architecture that is 'space defining' rather than an 'object'—presenting a calm and continuous frontage to the campus, reflecting the role of a peripheral group.

The first phase provided one pavilion for each of the two departments. The exact size of the future increments was at this stage unknown, and the junctions between them were cut to a minimum to restrict as little as possible the shape and size of future extensions, while still taking advantage of the contiguity and the sharing of certain facilities that this arrangement provided.

The ideas of growth and change implicit in the design were put severely to the test while the first phase was still under construction. The Robbins Report was published, and the architects were asked to proceed immediately with the construction of the second phase—doubling the size of the scheme—before a programme had been determined. Surprisingly, this presented few real difficulties. The detail planning, which ran parallel with the construction stage, established the flexibility of the system. The main difficulties arose from the inclusion after the completion of the building of a third department (Psychology) which was a biological rather than a physical science, and which required animal houses and services of a rather different nature and at a greater concentration. This department was accommodated in space which had intentionally been left unallocated.

Birmingham proved that it was possible, even
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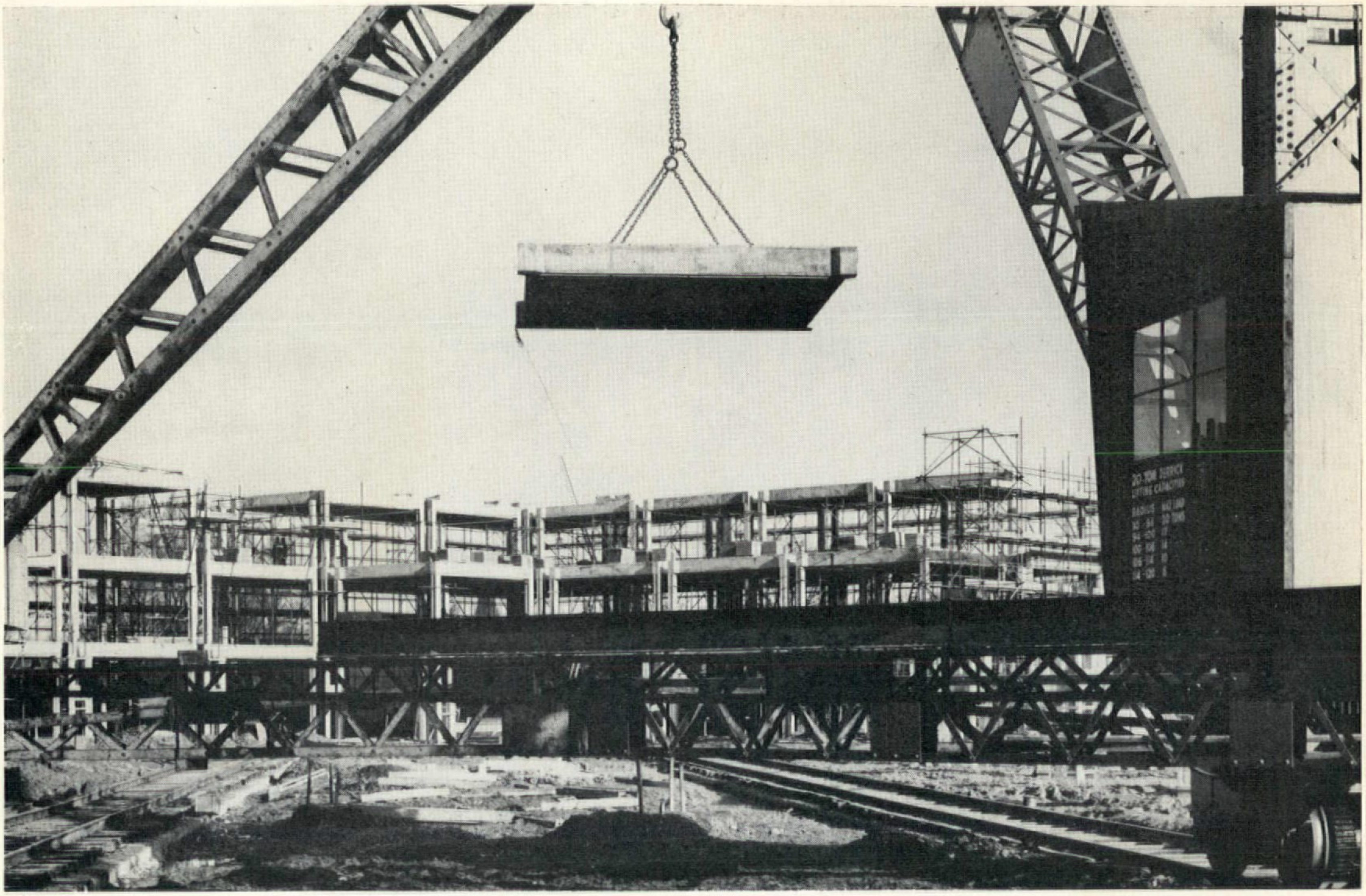
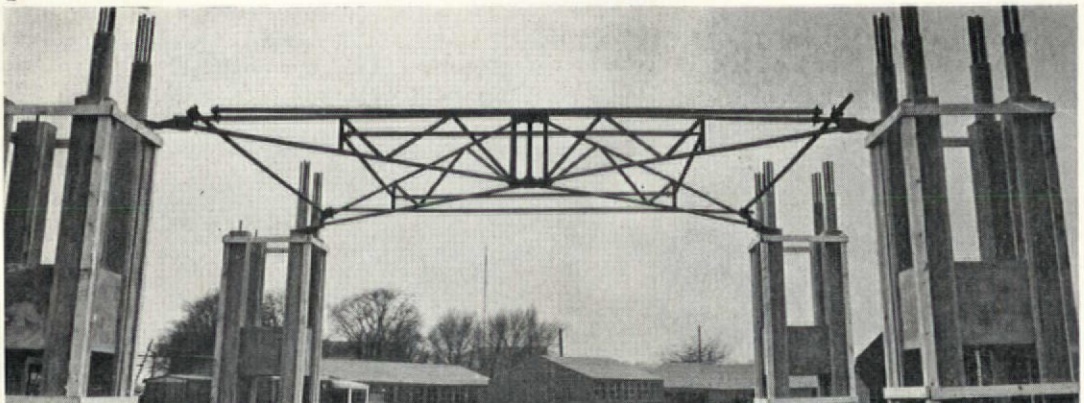


1

1
17-ton floor slab unit being lifted into position. Slabs were the only units precast on site. All other units were made in a precast yard near Leicester. In exploiting a repetition relevant to present construction methods, advantage is taken of the variations that a diverse use of similar elements can provide
2
Steel jig for positioning column groups. This ensured accuracy and eased dimensional problems of follow-up trades
3
Study model
4 & 5
Second and ground floor plans (the fifth, unbuilt, pavilion is shown dotted)
Photo: 1 John Laing

Key to plans
1 lecture theatres
2 workshop
3 heavy equipment laboratories
4 sub-station
5 museum
6 cleaner's cupboard
7 dark room
8 radioactive laboratory
9 fellows', readers' and lecturers' rooms
10 special equipment room
11 research laboratory
12 post-graduate laboratory
13 service laboratory
14 writing room
15 library
16 research workshop
17 research
18 metallography research
19 store
20 boiler room
21 courtyard
22 chemical analysis
23 physical
24 small particle
25 general coal
26 coal, fuel, gas, mine dust
27 microscope room
28 balance room
29 electron screen
30 common room
31 seminar room
32 wet extract and hydro
33 high temperature furnace
34 ore analysis
35 sample preparation
36 furnace room
37 lecture theatre
38 office
39 constant temperature room
40 cold room
41 spare room
42 chromatography
43 coal constitution
44 coal science
45 hydrometallurgical chemistry
46 ceramics
47 spectophotometry
48 thermal mineral processing
49 micro-biology
50 drawing office

2



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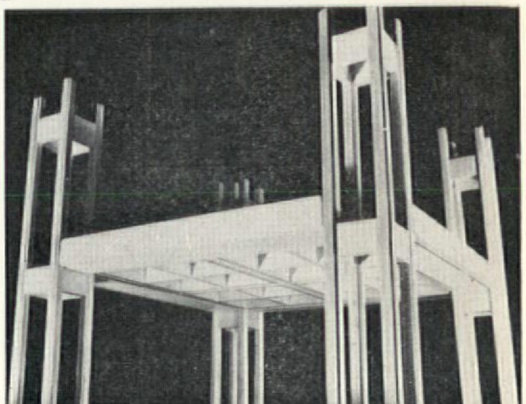

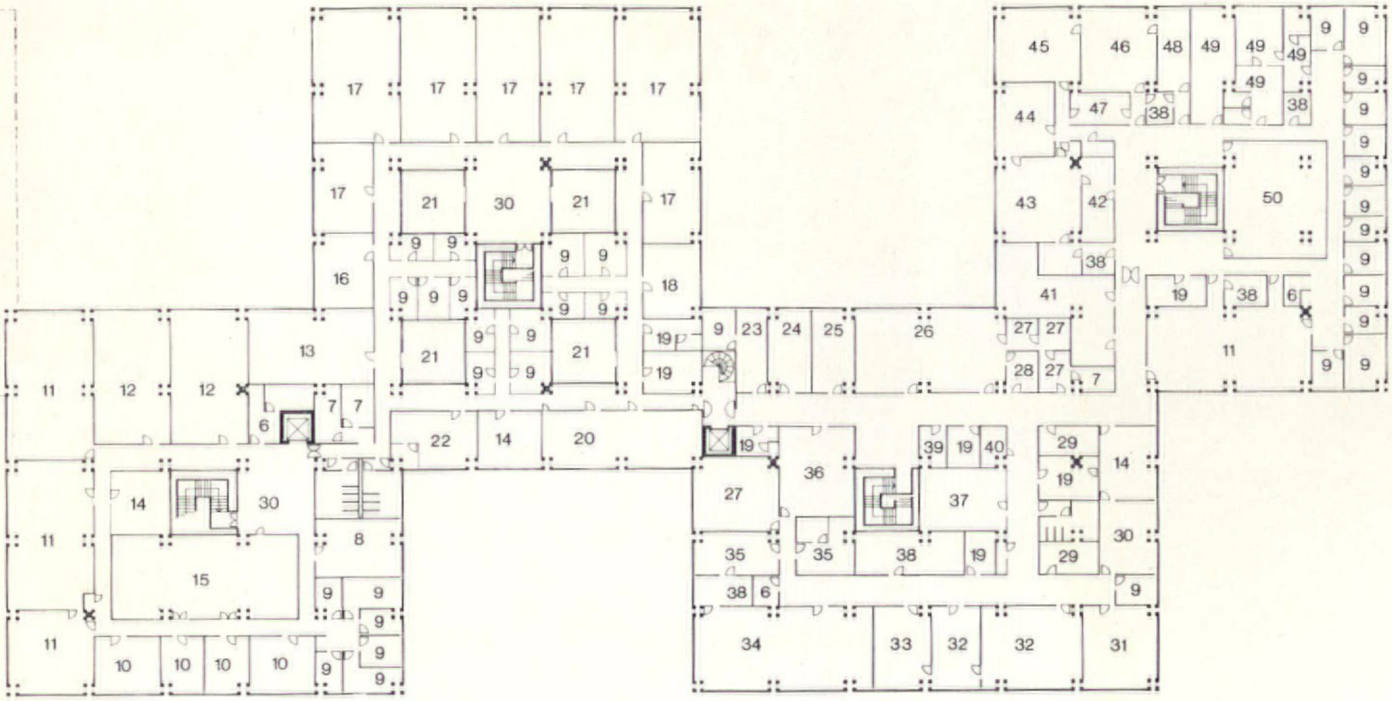
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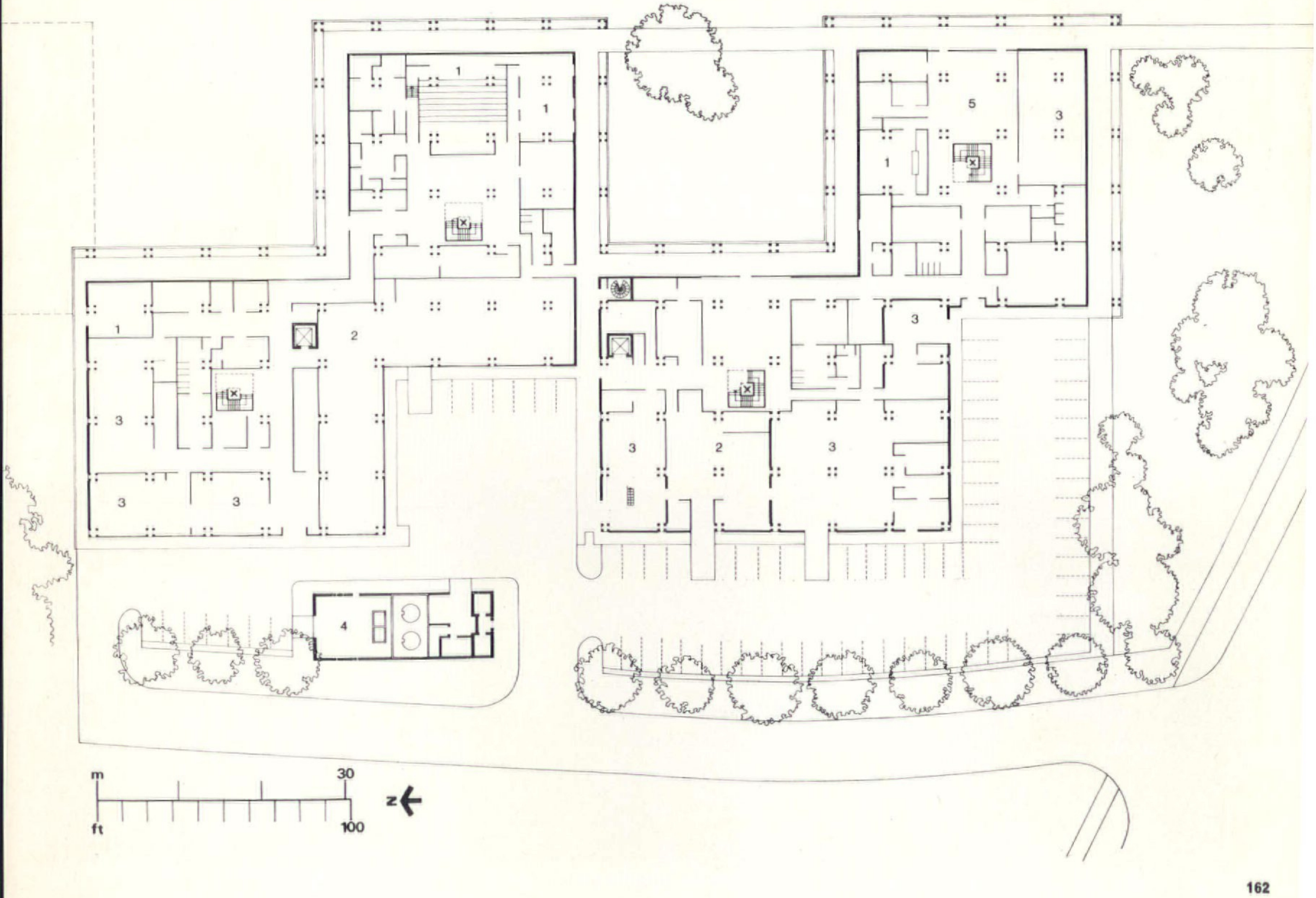
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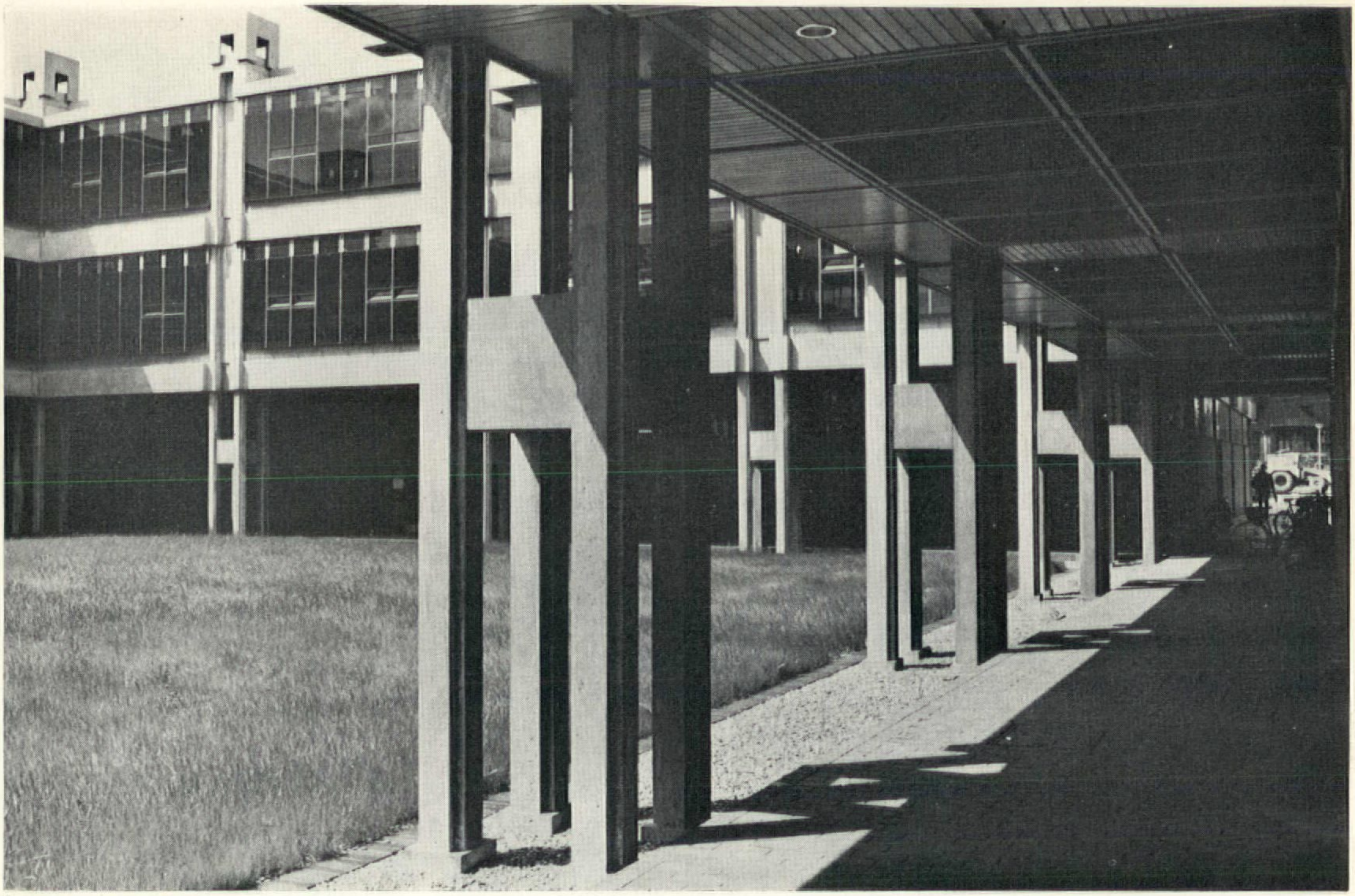

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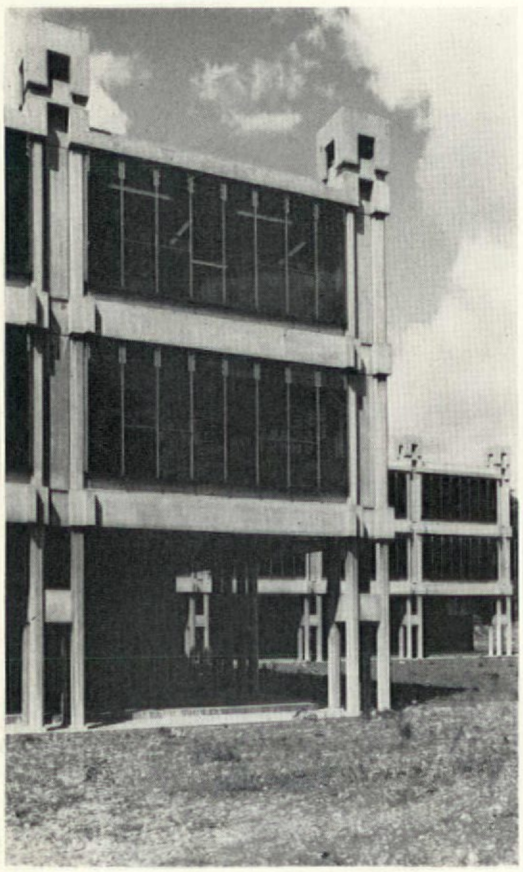

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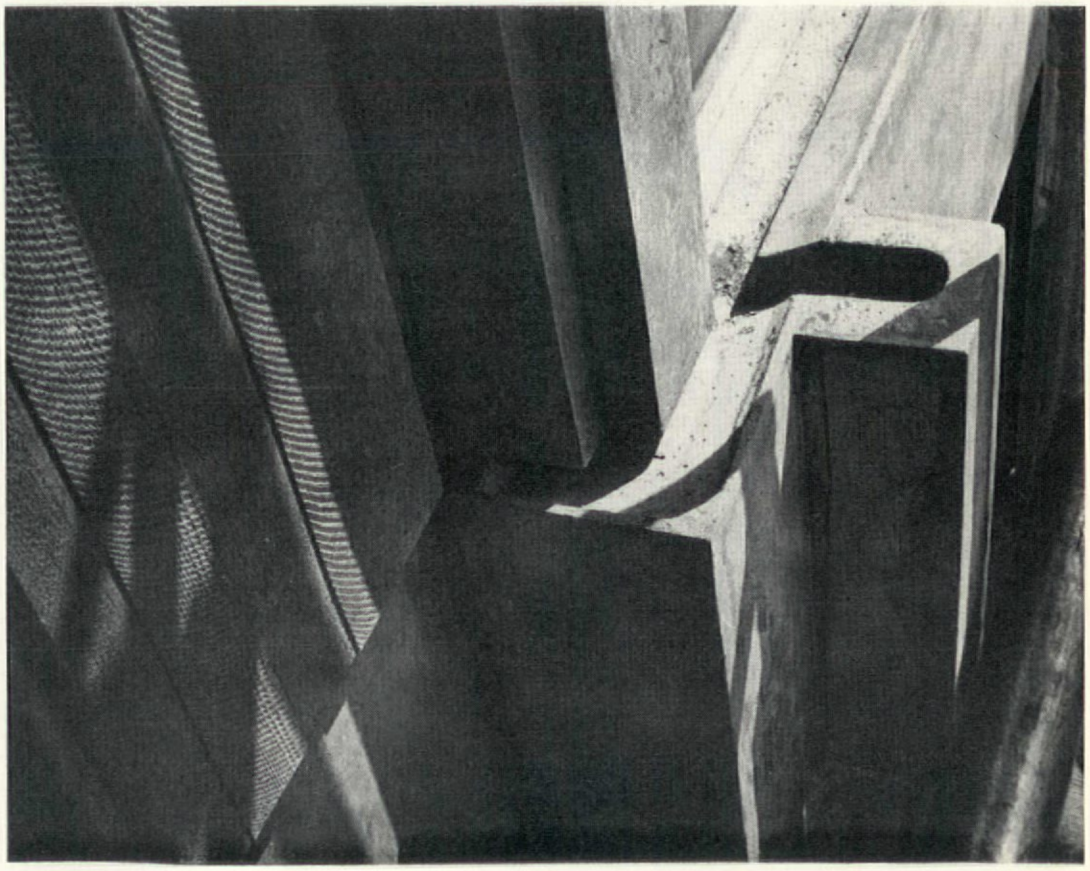

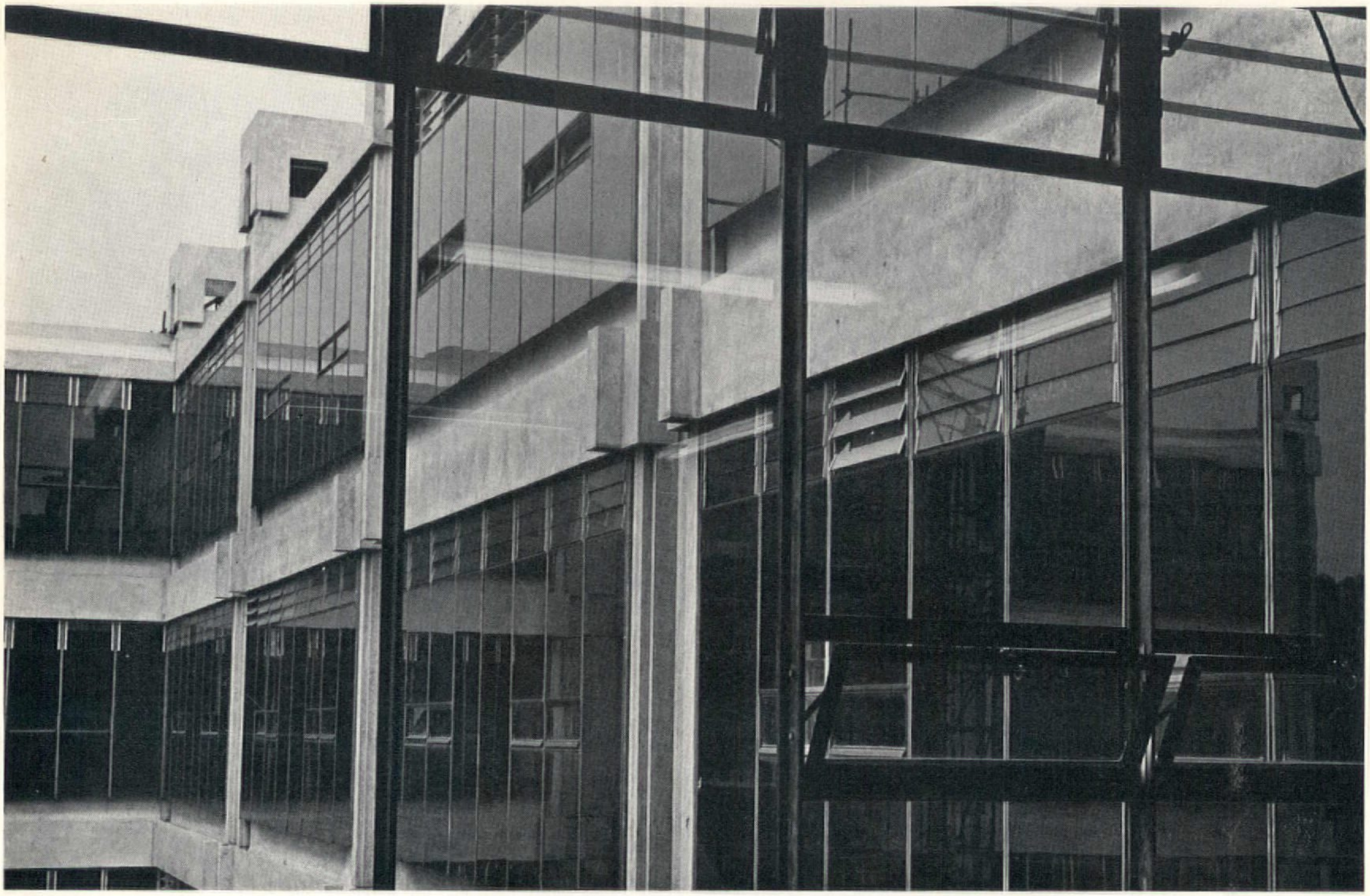

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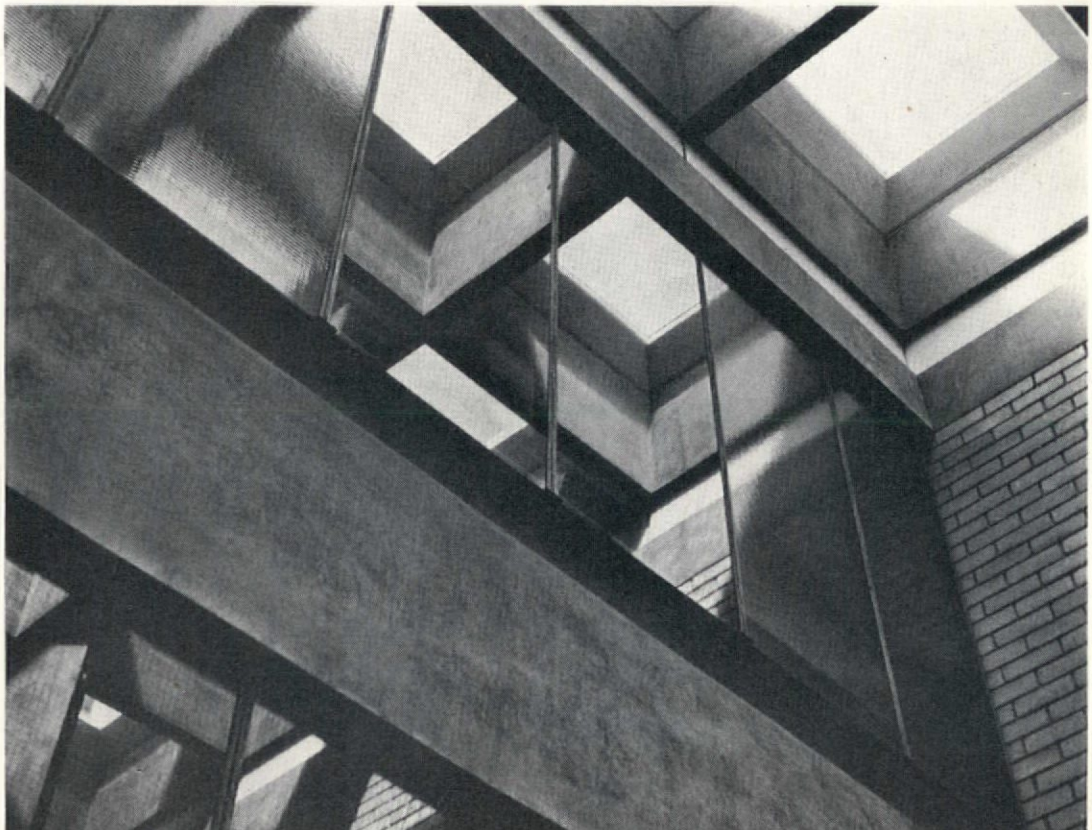
◁160

with a first stage costing less than half a million pounds, to design a special system for a complex building on a particular site, using semi-industrialized methods, and still be well below the UGC cost limit. The construction method, based on an assembly of separate 17-ton, 20ft. square, precast concrete tables, was a departure from anything the architects had done before. With no precedents, normal cost plan methods were of little use. The difficulty is that established methods, however inappropriate, are more easily costed, so outside these there are costing problems. The decision to use an entirely precast construction was justified also by the standard of finish achieved, and in addition by the speed of the erection, in that

▷166

1
Colonnade with access to rear between pavilions. Grey glass prevents inlook, obscures the partition positions and emphasizes the elemental nature of the buildings
2
Stepped relationship of the pavilions facing the campus, with covered way. Roof caps enclose fume cupboard fans and services vents
3
Precast edge beam/column junction. Gutter and outlet formed in precast concrete prevents staining from glass above. All joints are designed to be self-draining
4
Patent glazing of lead clothed bars, with a minimum of metal on the exterior of the building. Grey glass provides privacy across internal corners
5
Internal junctions: brick, concrete and glass
Photos: 1 & 2 John Donat; 5 Harry Sowden



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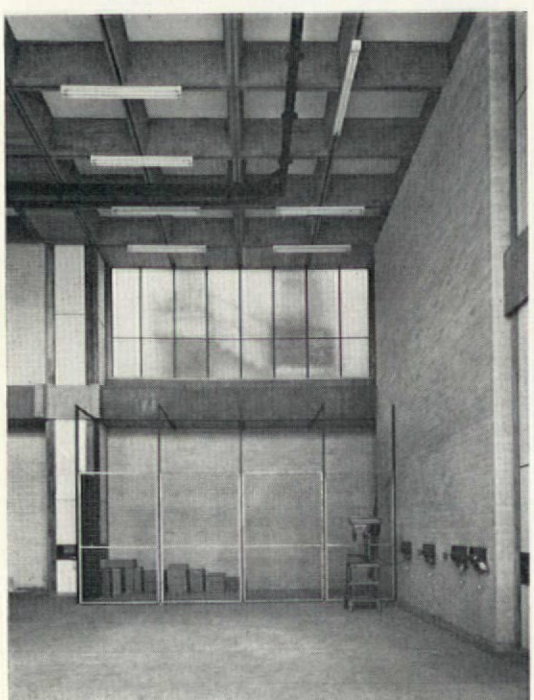

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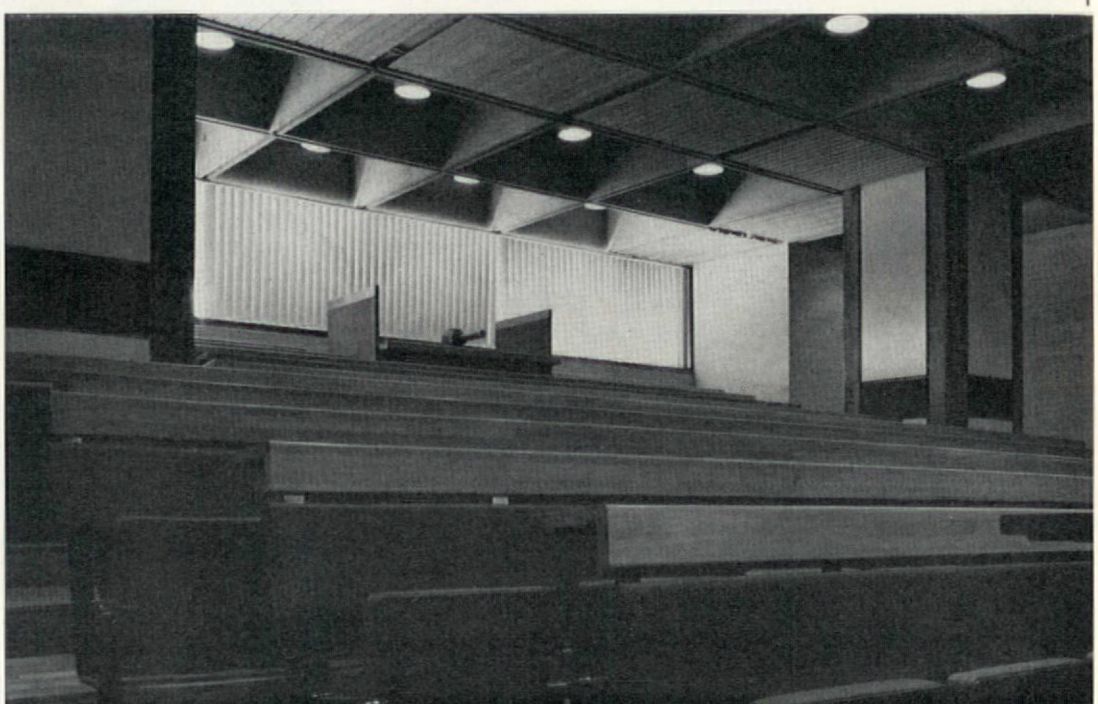

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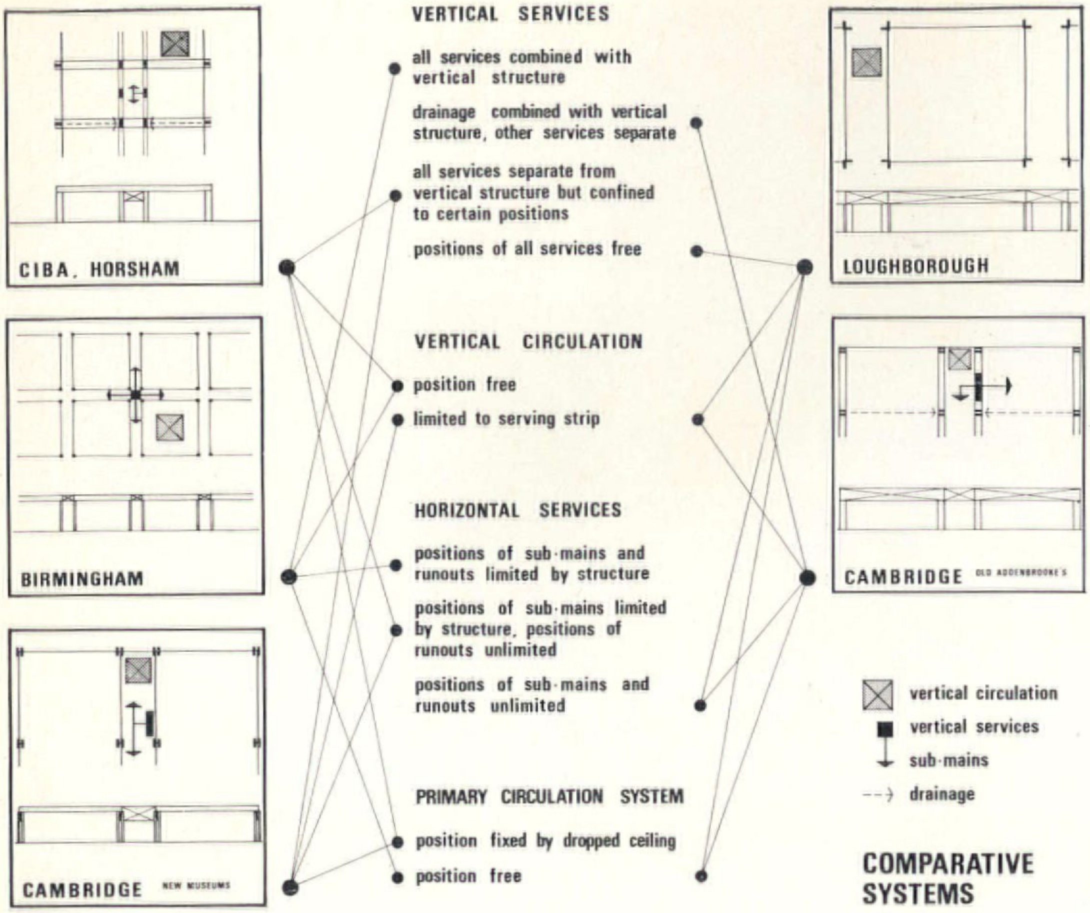

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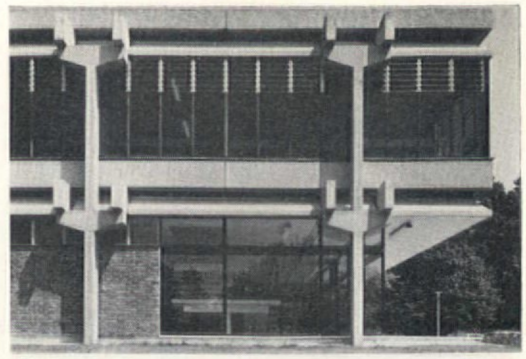

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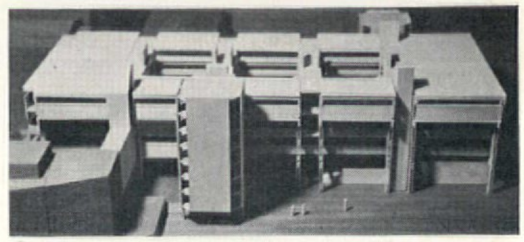

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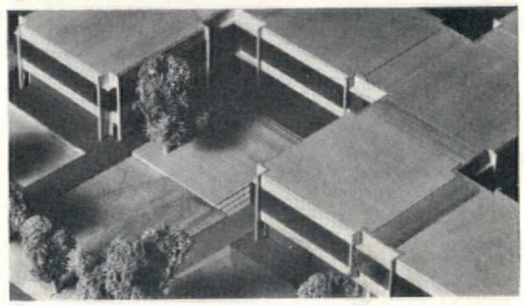

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◁164

both first and second stages, amounting to some 152,000sq. ft were structurally erected and waterproofed in little over five months. The principles underlying the design of all three related science buildings are derived from the relationship: Planning discipline/services network/construction.

The diagrammatic anatomy of each of these schemes is shown with a typical linear laboratory for comparison. Growth and adaptability are the central problems in the design of any science building where—with research particularly—there is no way of forecasting in detail what the needs of the occupants will be in the immediate future. At one end of the scale adaptability has to be provided within rooms by ensuring that benches and services can be simply re-arranged. The more exacting requirement is that the floors themselves can be replanned, for changed needs or a different science, to allow for planning flexibility and future adaptability. Planning disciplines have been chosen which are based upon a geometry of multiple grids, which are related but not coincident, and cover planning, services, structure, partition thickness, and so on.

The 'molecular' organization of two of these buildings allows for expansion in both directions and thus for 'deep planning', with internal service rooms serving laboratories on the exterior of the building where daylight is a requirement. This concept of 'deep serviced floor space' is important. There are advantages to be gained in both initial planning flexibility as well as future adaptability over the linear type plan. The deep plan is further justified in view of the increasing requirement in most laboratories for artificial ventilation.

The services networks have their own set of criteria and limiting dimensions and these networks must mesh with the planning modules. Services can account for more than 50 per cent of the total cost of this type of building which in turn can be more than double the cost of the structure.

A laboratory building can therefore be considered as 'packaged services' with the structure totally subordinate to their requirements. Rather than thinking of 'ducts', the aim has been to ensure that the construction method provides a continuous horizontal and vertical network of spaces; a network of structural discontinuity. Further, the aim has been to reflect the differing nature of building trades in the design of the 'construction sequences' so that the various parts of the buildings can be put together sensibly, and in their natural order.

A workable 'planning discipline/services network/construction' relationship is essential if heavily serviced buildings with variable requirements are to be adaptable, and allow for the planning flexibility necessary to fulfil these demands.

These building solutions reflect the indeterminacy of the problems; they are able to absorb changes of programme without either invalidating the basic concepts or becoming prematurely obsolete.

In Birmingham, specialized research rooms, based on current departmental activities, have been minimized, giving the largest possible area to general laboratories. These have the minimum amount of fixed benching and the maximum amount of services, distributed over the whole working space by arranging for the services outlets to be fed from services 'booms' suspended from the ceiling, and with floor wastes placed in standard grooves cast in the floor slabs.

As no great quantity of air handling was required it was possible to combine vertical structure and vertical services. The vertical circulation was then organized within the normal space unit in the centre of the building, resulting in a continuous free floor area, but with columns at regular intervals on a square grid. The size of the space unit, some 23ft, was sufficiently small to allow horizontal service ducts, formed by setting adjacent floor slabs apart, to reach any desired point for run-outs. The soffit of the slabs was thus left free from services and a false ceiling was unnecessary.

▷168

1
The stair well designed to bring light into centre of building and to act as focus of internal circulation. Well is formed by omission of floor slab units, and staircase is self-supporting

2
Double-height workshop provided by omission of floor slab units

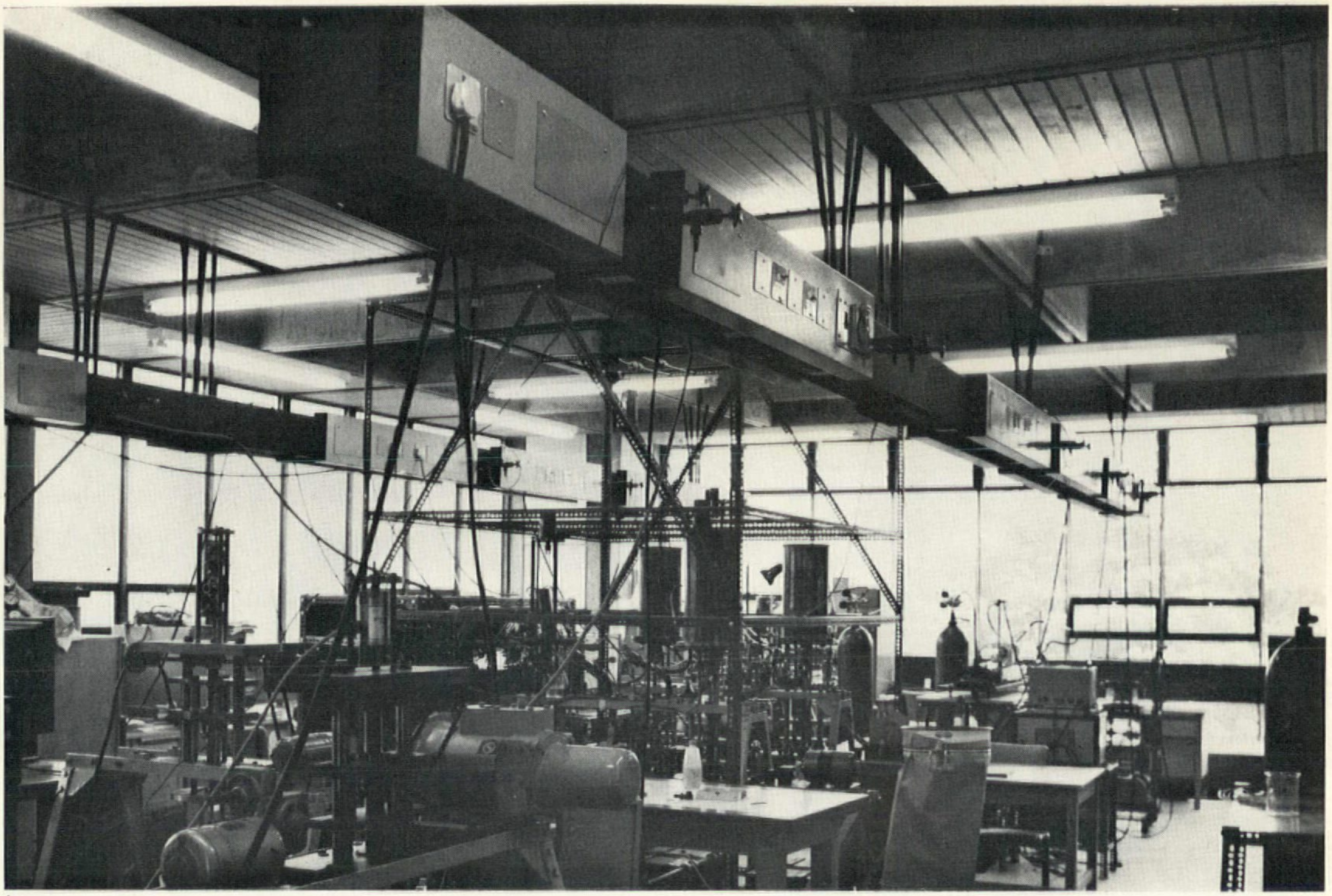
3
Lecture theatre for 150

4
Diagram illustrating the various systems devised by Arup Associates for science buildings

5
CIBA Horsham. 50ft wide linear laboratory with horizontal ducts at 20ft centres. Air intake and mechanical ventilation is provided above false ceiling level. Extension is possible in one direction only

6
New Museums, Cambridge. Deep laboratory 110ft wide. Major bays serviced by minor bays, with vertical circulation and office towers plugged into the perimeter

7
Loughborough University of Technology. 50ft square major bay with vertical circulation within minor bay
Photos: 1, 2 & 5 Colin Westwood; 3 & 7 John Donat; 6 Harry Sowden



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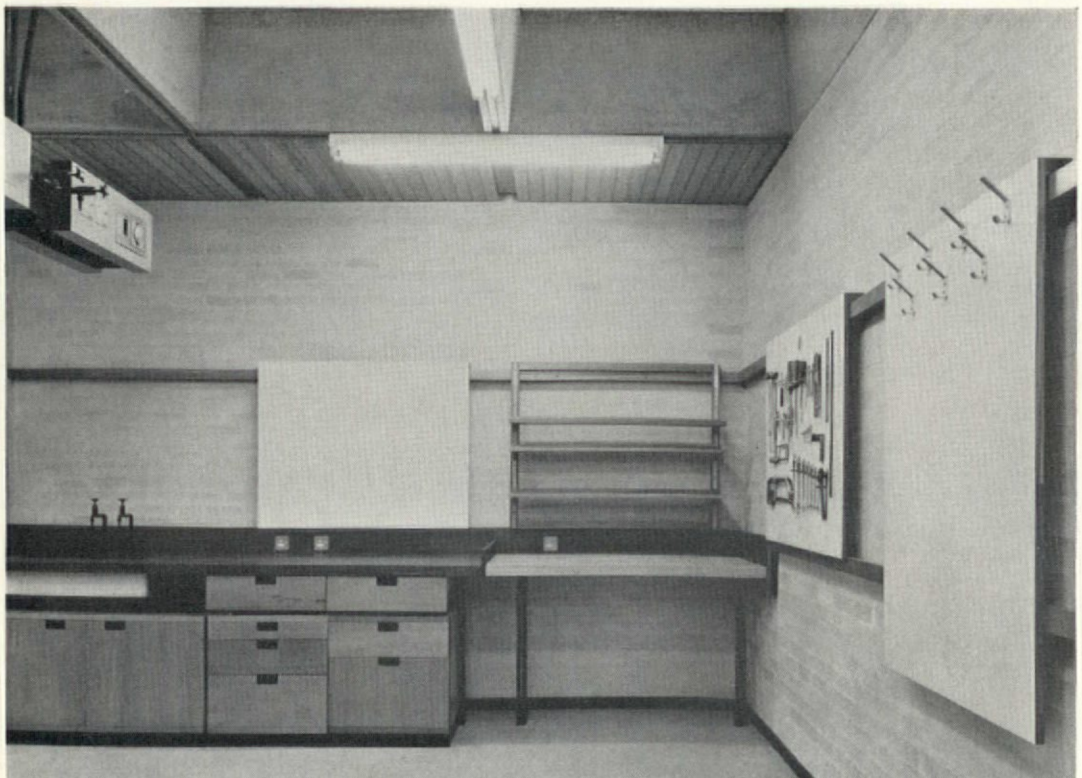

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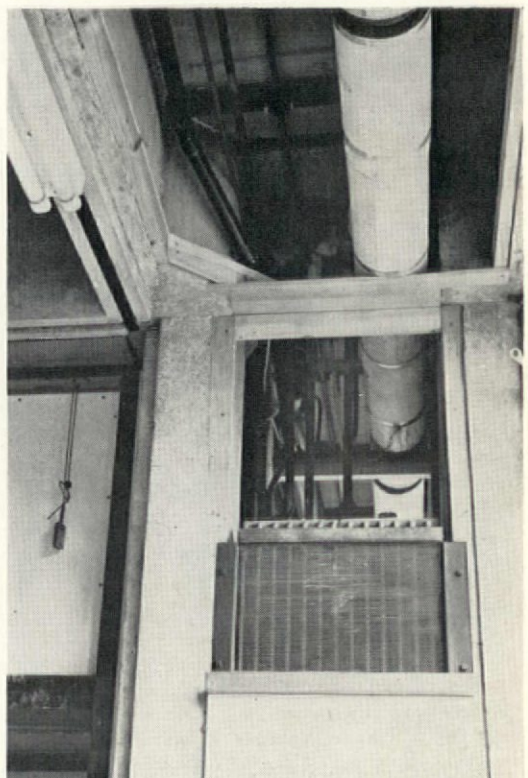

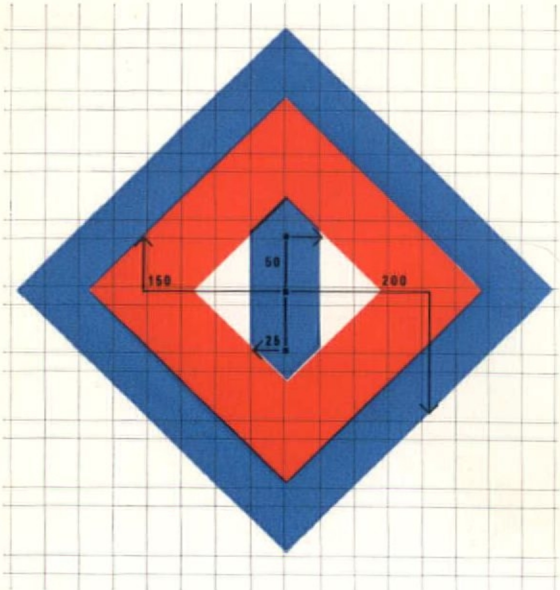

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Run-outs were carried on service rails on the partitions in the smaller rooms, but where possible they were carried in service booms about 7ft above floor level from which the required services could be fed. The laboratory benches and walls were thus free of services and therefore extremely easy to adapt. It is a limitation of this system that the air handling must be small, the building low, and the spans limited. A high level of air conditioning for example, would force the vertical ducts and hence columns, to be much larger so that they would interfere too much with planning. In a building based on this system it is not possible to provide large lecture theatres since the columns interrupt the sight lines. On the other hand the absence of vertical ducts frees the floor area and makes the building highly adaptable.

Large spans invalidate the principle of setting adjacent solid floor slabs apart to provide ducts, because the distances involved would inevitably require services across the soffits of the slab. The scheme designed for Loughborough increases the column spacing and includes a floor depth which enables a high level of services to be carried horizontally. This larger volume of services cannot be carried vertically in conjunction with the relatively infrequent columns so a space is specially assigned to them, together with lifts and stairs, which results in a major and minor bay.

▷169

1
Free floor research laboratory with overhead service 'booms' and a minimum of fixed benching. Booms allow free arrangement of Dexion rigs. Waste outlets are in predetermined points in the floor. Booms have standard 'blank-offs' to adapt to changed demands

2
Interchangeable modular furniture. Wall rails support a variety of units and cupboards. The ability to slide them horizontally to adapt wall use has proved an advantage

3
Services cross-over junction with ceiling cover removed during construction. Note lighting trunking passes clear of columns. Heater grilles are fixed between columns. Note head of fume cupboard unit on the left

4
Diagram showing the maximum intervals for vertical services and stairs on grid intended for the Department of Biochemistry for the University of Cambridge. The principle of organization, however, is the same as that used for the Birmingham Mining and Metallurgy Building

200ft dry riser
150ft staircases, lift, water, gas, electricity
75ft air supply and extract
50ft drainage

5
Diagram showing the anatomy of structure, planning and service layout in the Birmingham Mining and Metallurgy Building

Key
- major structural bay
- planning grid
- vertical duct space
- horizontal service zone
- main services
- ventilation
- G gas
- H-CW hot and cold water

Photos: 1 John Donat; 2 Colin Westwood

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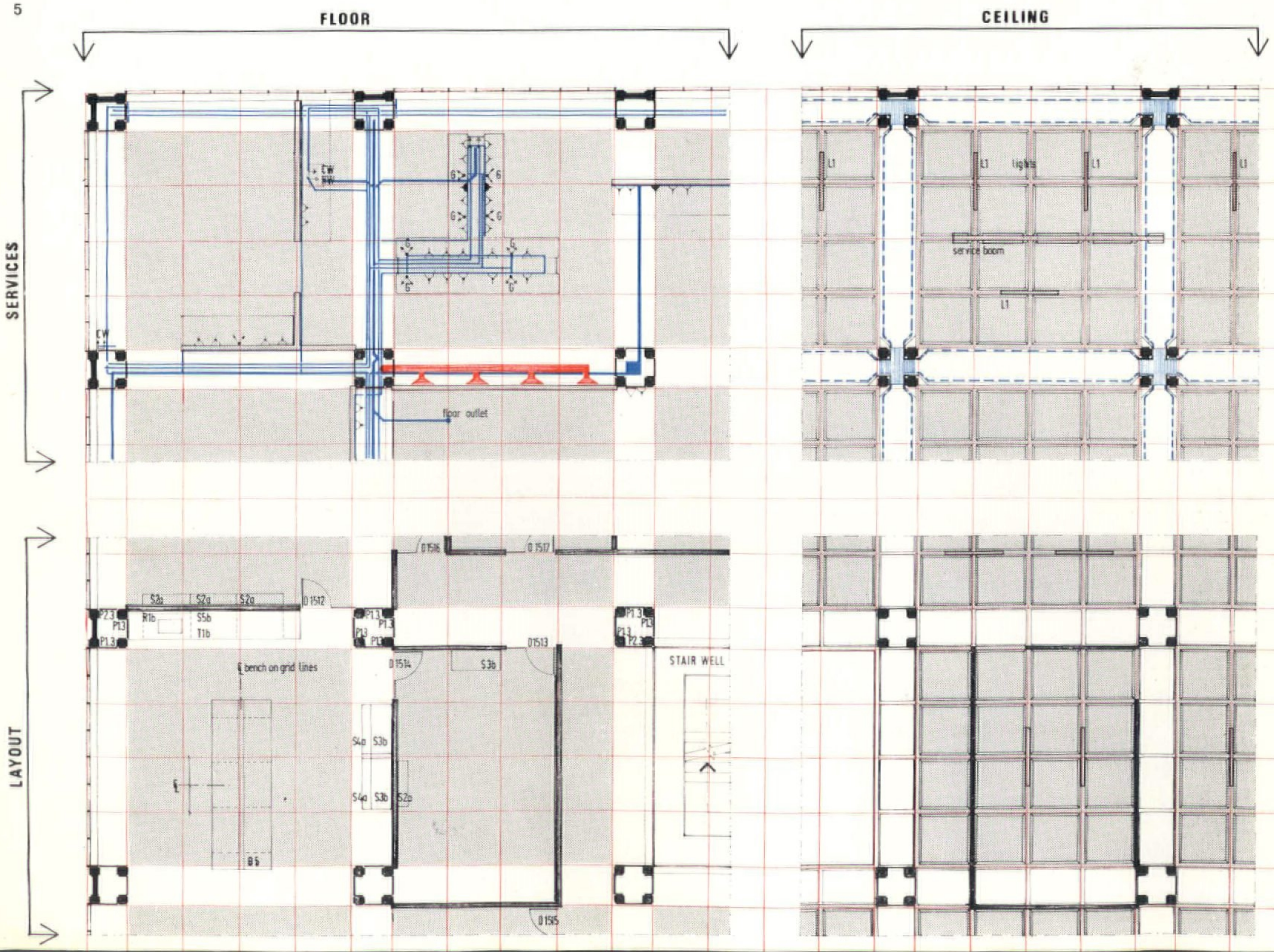

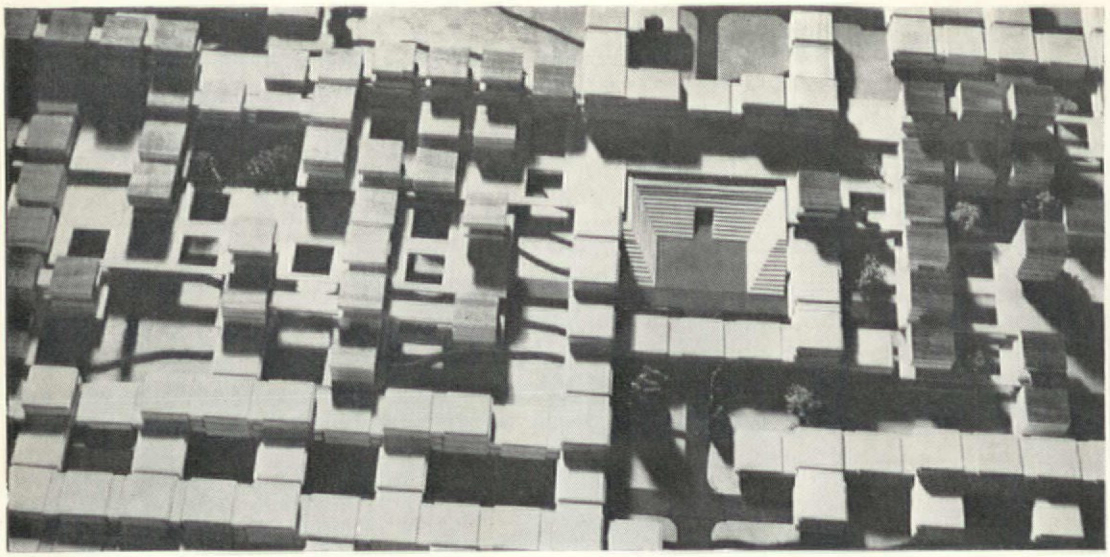

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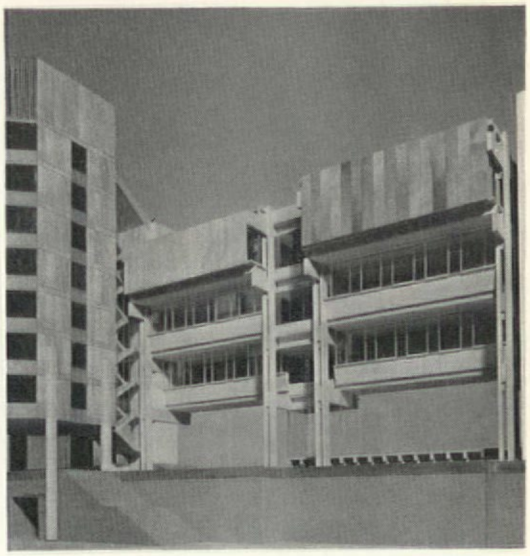

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In this floor, the horizontal services are carried through the structure in both directions, and therefore good sound insulation cannot be achieved by building partitions to the soffits of beams since the sound can travel over the partition and through the ceiling. There is therefore the need for a heavy ceiling where sound insulation is necessary. This is not easy to remove, so access is limited to special points from which there must be sufficient crawl space to work within the floor depth.

The major grid is again square allowing the possibility of extension equally in both directions the major bay being about 50ft and the minor 15ft.

The Cambridge New Museums scheme is, as far as fixed vertical elements are concerned, a linear version of the Loughborough principle. The vertical circulation and services are confined to a minor bay which acts, as at Loughborough, as the serving space for the completely free major bay. It does, however, differ in its horizontal distribution of services which are organized according to a strict primary and secondary system, which is used to minimize the floor to floor height.

The primary horizontal service runs, requiring more depth, are organized directly above the corridors where the headroom clearance need only be about 8ft. This has an influence on the planning of the floors, though in practice it has not proved much of a limitation.

The proposals in the Addenbrooke's development plan for the Biological Sciences combines

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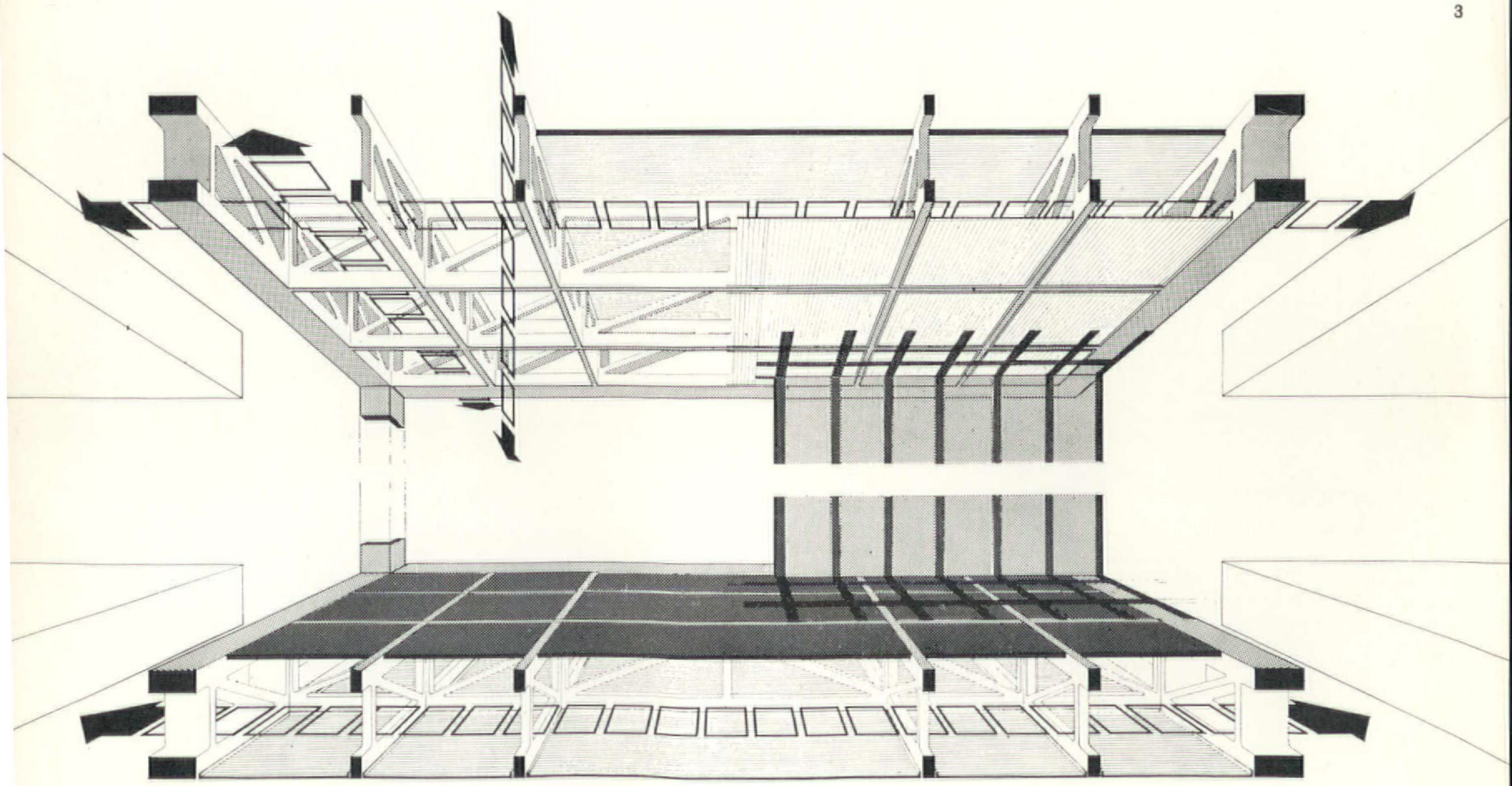

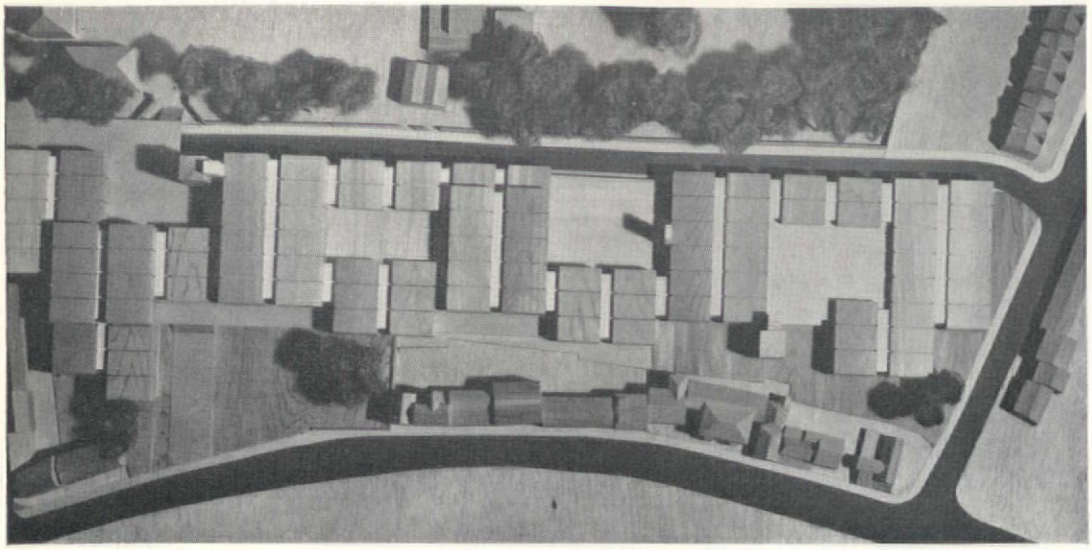

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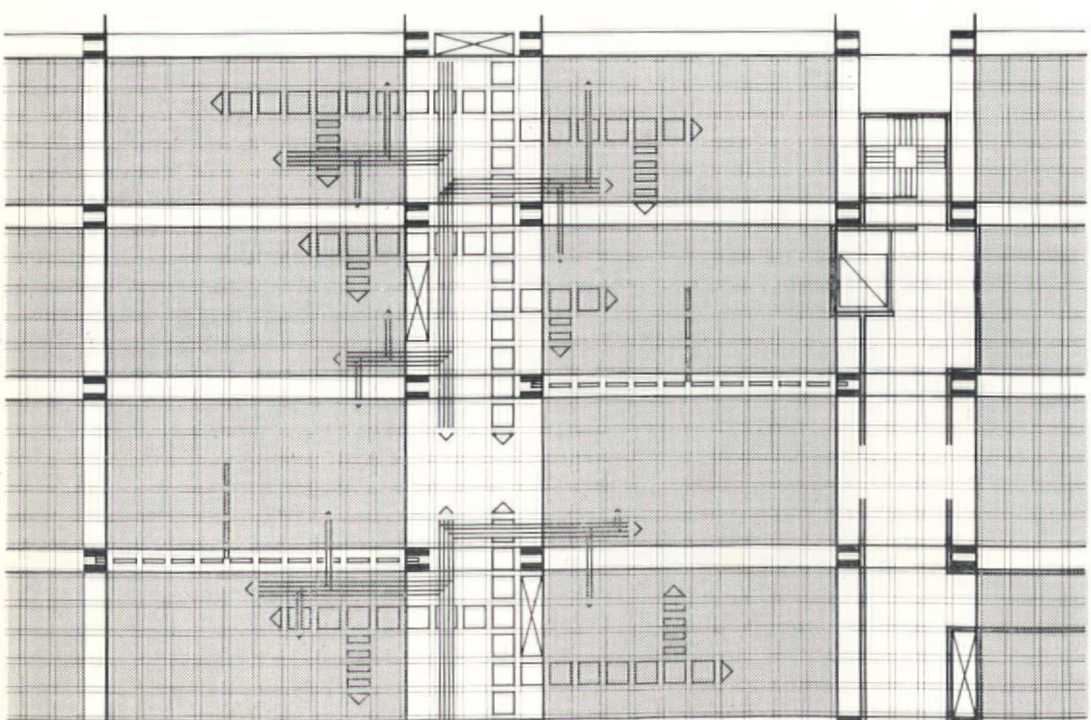
aspects of Loughborough and New Museums. The heavy air-conditioning demand had led to a separation of the services into three categories—ducted services, piped services and drainage. The limiting dimensions between verticals of this 'services net' are shown in **5**. In this case drainage is combined always with vertical structure. The rectangular grid (40ft × 20ft) can react efficiently to the limits of this narrow site which in this instance had considerable effect on the choice of the major and minor grid dimensions.

The plans of all these developments are based upon geometries within which a degree of randomness can exist to meet the requirements of flexibility. It has also been the aim, where possible, to exploit a repetition relevant to present construction methods, and to take advantage of the variations that a diverse use of similar elements can provide, with the purpose of creating an active relationship between 'work' and an appropriate environment.



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1
Model of Loughborough University of Techno ogy prepared by Arup Associates

2
Model of Science building on the New Museums site, designed by Arup Associates for the University of Cambridge

3
Exploded section through the 'space unit'—50ft square major bay—designed for Loughborough University

4
Old Addenbrooke's development plan, Cambridge. Major bays serviced by minor bays, with main vertical circulation planned on the perimeter. The plan is based upon a geometry within which a randomness can exist. The aim—in reflecting the indeterminacy of the problem to absorb changes of programme without invalidating the basic concepts

5
Building anatomy of the 'space unit' of the Department of Biochemistry, Cambridge

structural grid
duct services
piped services
drainage
major bay of grid
vertical ducts

1

Expo 67 stadium, Montreal

Victor Prus

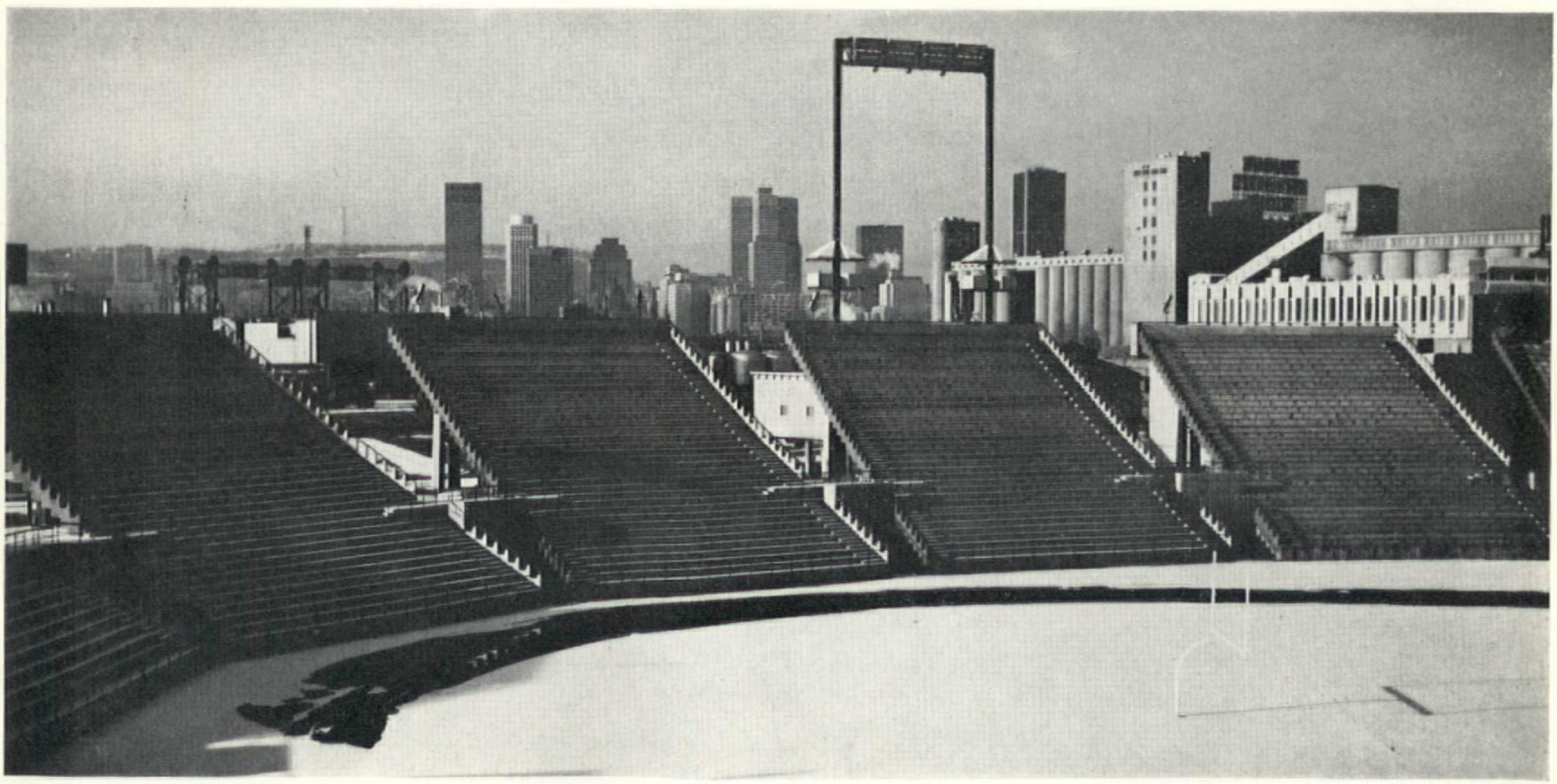
Structural engineers: Martineau, Samson & Associates J. C. Valiquette

The Canadian Corporation for Expo 67 commissioned this stadium to hold 25,000 spectators. Athletic events, celebrations, tattoos and spectacles will be held here. Three design possibilities were considered:

A permanent stadium with a sunken arena and earth mound seating banks—rejected because of the high water table.

A temporary stadium made of scaffolding planks—rejected because it would cause anxiety to spectators and also incur foundation problems.

A permanent stadium with seats on a concrete superstructure—accepted with the added directive that it should be demountable and transportable.



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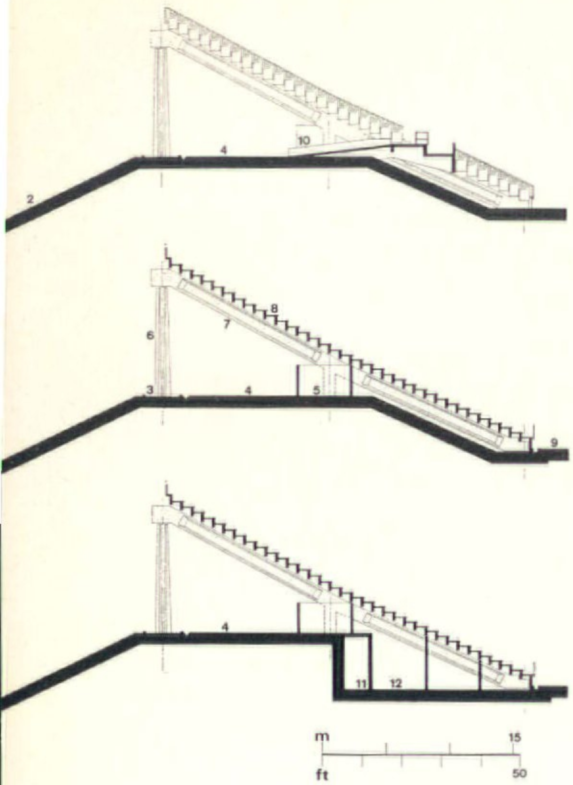

The final solution is an assembly of large rectangular seating banks tilted at 1 : 2 slope. Their width is determined by regulations allowing no more than 40 seats per row. Gaps between segments serve as vomitoria. Structurally they consist of three prefabricated elements: columns, pre-stressed beams 40–45ft long and pre-stressed seat rows 75ft long cantilevering 15ft–18ft 6in beyond the beams. Spans are as long as possible to minimize the number of foundation caissons.

Beneath the seating there is a continuous concourse which holds concessions and public facilities. These were to be impermanent transportable booths, but the clients demanded more permanent constructions. The north-east end of the concourse links to the entrance platform which itself runs through from under University Street. This platform can pass 20,000 spectators through box office and turnstile controls in 15 minutes. A ditch and a fence encircles the stadium and separates it from the car park.

Completed: August 1966.

Cost: $(Canadian)3,000,000.

3

4

1

Aerial view from the south-east, with the stadium in the foreground, Habitat 67 to the left and, across the St Lawrence river, the islands of St Helen and Notre Dame, the main site of Expo 67.

2

Looking west over the stadium to the buildings of Montreal downtown

3

Sections through the stadium

1 ditch	7 prestressed beams
2 earth	8 seats
3 gravel bed	9 field
4 concourse	10 vomitorium
5 rest room	11 corridor
6 precast columns	12 field facilities

4

Plan of stadium and car park

Photos: 1 CCWE, 2 Michel Proulx

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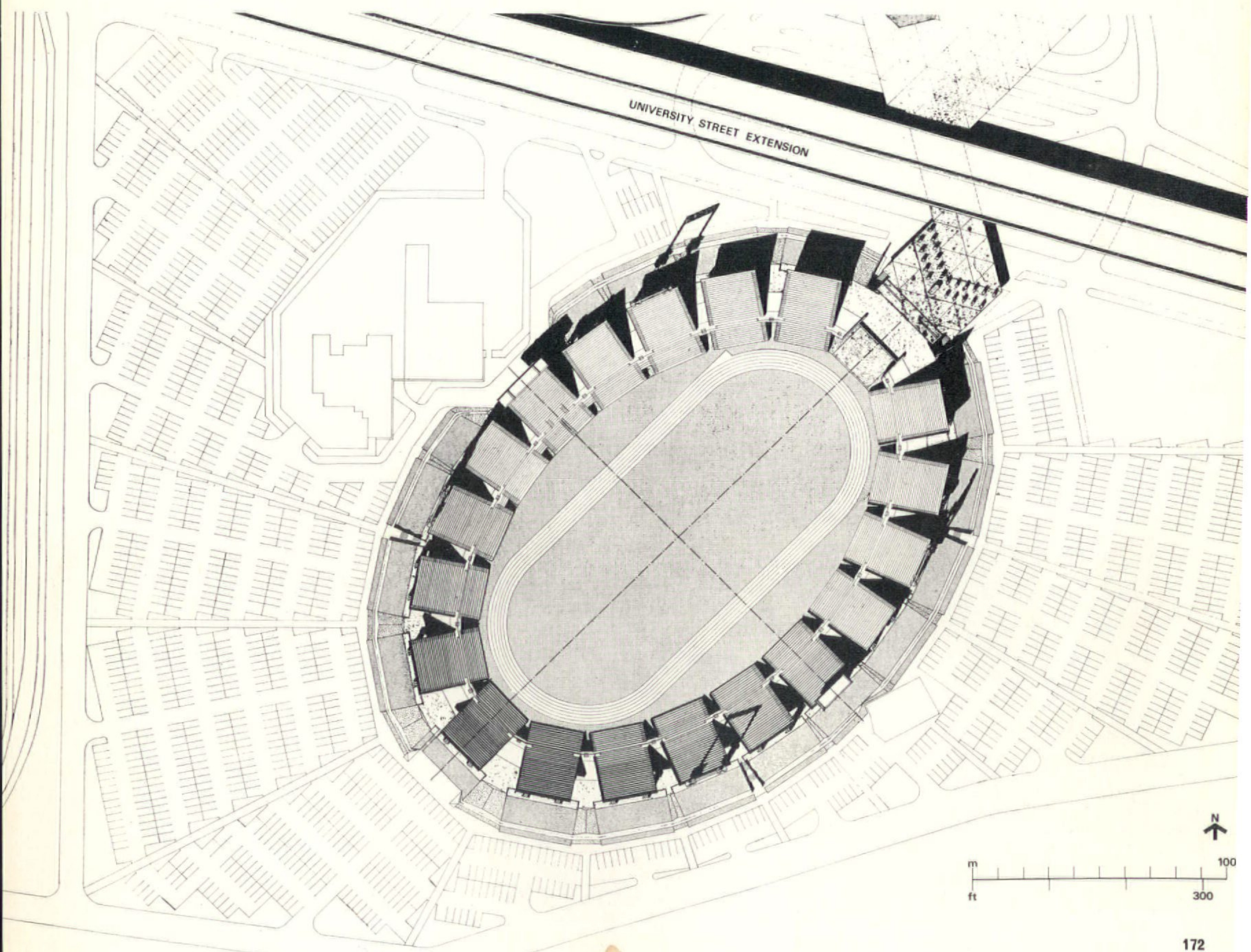
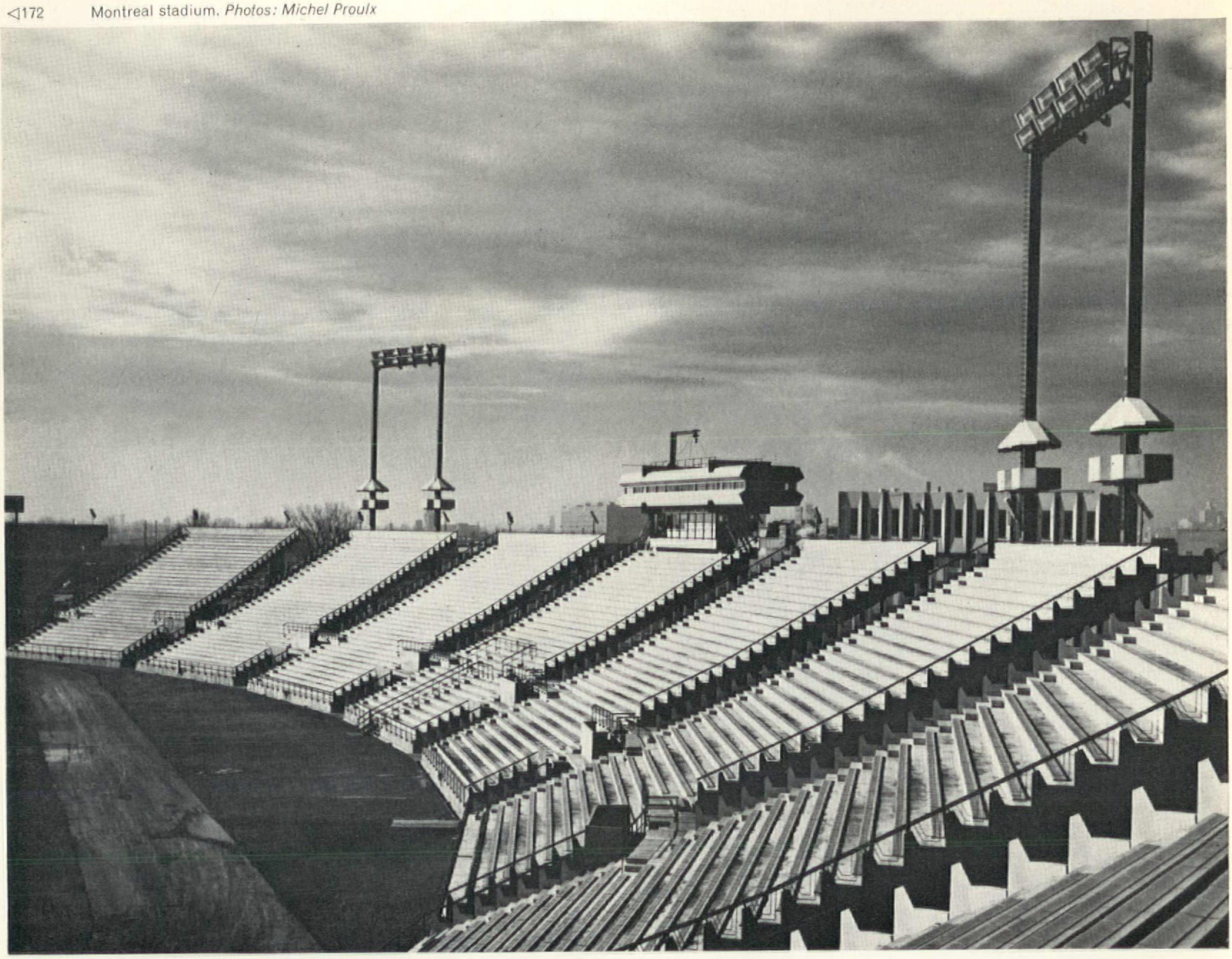
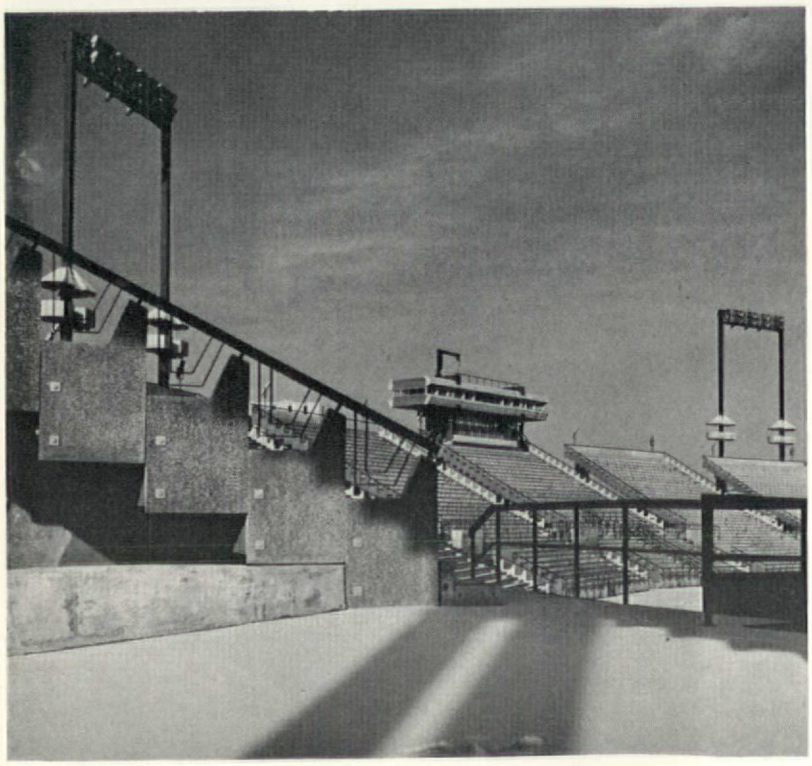


◁172 Montreal stadium. *Photos: Michel Proulx*





Frank Lloyd Wright as environmentalist*

Reyner Banham

You may hear, or even read, that Frank Lloyd Wright built the world's first air-conditioned office-block, or even the world's first air-conditioned building of any sort. Mr Wright himself knew better, and when he wrote of the building in question, the Larkin Administration Building in Buffalo, he had the grace to put quotation marks around the words 'air-conditioned'—at least in his *Autobiography*. And well he might, for neither air-conditioning nor the words to describe it existed in 1904. The basic patents of Willis Carrier do indeed date from 1902, but the crucial ones on humidity-control date from 1904 to 1906, while the first public use of the words 'air-conditioning', is in a patent filed by Stuart Cramer in April 1906, and reiterated by him the next month in a lecture in which he also formulated a short definition of air-conditioning which would still be hard to better: 'I have used the term "air-conditioning" to include humidifying and air-cleaning and heating and ventilation.' Carrier, too, insisted that the control of the moisture content of the air was crucial, but there is no evidence that such control was applied to the air which ventilated the Larkin building.

But that air lacked few other controls: the site of the building adjoined railway yards which generated smoke and smuts. The main office-space was therefore sealed against the external environment and had no opening windows. Fresh air drawn from the level of the roof was filtered, heated or cooled according to the season and circulated throughout the interior. This in itself was a far-sighted and sophisticated provision for the date, though the Kroeschell carbon-dioxide refrigerator which gives the Larkin building its place among the technical pioneers of modern air-control was not installed until 1909. But even more farsighted and sophisticated in many ways was the architectural provision made for environmental control. We know, from the *Autobiography* and some small reproductions of drawings published by Grant Manson, that the design of the building had proceeded as far as an elaborate plaster model without the final master-concept emerging. The central well and the corridors were already there, but the corner towers were not, the staircases being accommodated in the central well, and the end elevations were relatively flat and un-modelled. Then inspiration struck and Wright set to work—successfully—to persuade the Larkin Company to accept a design which was conspicuously more expensive, but which produced the first building to make a masterpiece of its mechanical services. The inspiration was to remove the stairs from the central well and to house them in four blind brick boxes, symmetrically disposed, two at either end, on the short elevations. The design at once acquired a masterly architectural articulation, of which Wright was justifiably proud forever after. But, equally impressive, is the way in which at the same time room enough and more was created for the vertical passage of fresh, tempered and foul air and for piping and wiring.

The downdraft duct for fresh-air intake found a natural place in the flank wall of the stair-towers; the distributive ducts for tempered air, and the exhaust ducts for foul air each occupied a third of the hollow brick panel immediately adjoining each stair-tower on the long façades, while the remaining volume in each slab accommodated utilities and et ceteras such as broom closets. The solution is architecturally convincing because the problem of providing for these services has been neither buried nor flaunted, but has been resolved in the total resolution of a design which is one of the best integrated to come from anybody's drawing board in the present century—even the filing cabinets have been designed into the whole, and every item of office furniture is by Wright as well.

The Larkin building was demolished in 1950, but the surviving records are more than sufficient to establish the magnitude of Wright's achievement there, to justify his pride—and to make the more inexcusable the misunderstandings of historians. Against those who overestimate its technical originality, there are too many who fail to notice it. Lewis Mumford, for instance, discusses its windows as if they were openable; Vincent Scully in his monograph on Wright does not discuss its environmental machinery at all, and this only a paragraph later than his discussion of the heating panels of the Martin house; and Peter Collins, having cited the Larkin building to demonstrate concepts of space-manipulation, still insists that the first building to fully integrate mechanical services into its structure was Auguste Perret's Musée des Travaux Publiques, of 1938.

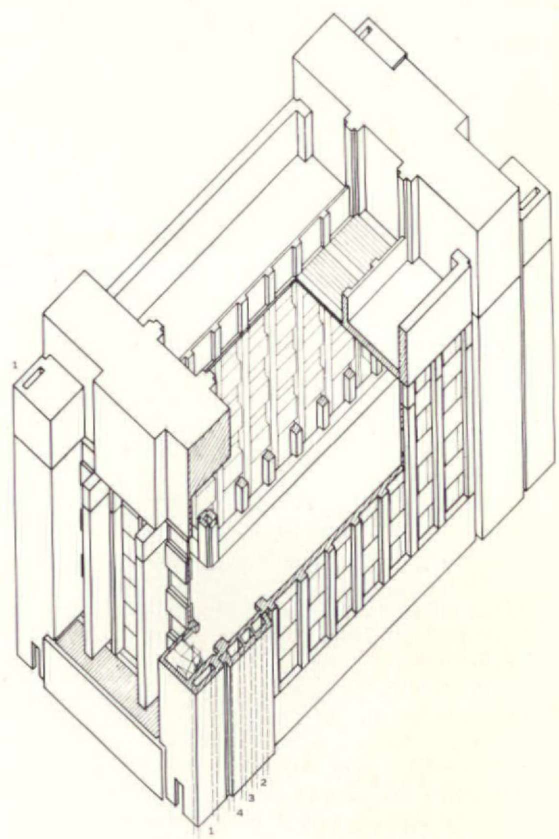
I make no claim to originality in knowing better than these distinguished men, for fellow-historians of my own generation in the US are well acquainted with the facts, and know, for instance, that the building with the best claim to be the first air-conditioned office block is the Milam building in San Antonio, Texas, designed by George Willis with M. L. Diver as his engineer. Its date was January 1929, and although it delivered the conditioned air to the rooms through ducts concealed above false ceilings in the corridors, the return ducts for exhaust were the corridors themselves, which I take to be structural integration of a sort. My reason for rehearsing the details of the Larkin building is to show what confusions can exist even when an environmental innovation depends upon conspicuous mechanical novelties (or gross physical provision that is easily readable on plan) and thus to indicate how easy it might be to miss other innovations which do not produce effects that show up immediately in the printed record.

What I have in mind particularly are the environmental innovations which Wright appears to have introduced in his domestic architecture of the Prairie house period (1900–10), which seem never to have been discussed in the literature and are only likely to be discovered by direct observation, preferably residential, of the houses themselves. If, therefore, my next few sentences are largely autobiographical, it is not out of vainglory, but because it is the easiest way to introduce the subject.

My own stumbling on the topic began with a typically odd social evening in Chicago—a large party which assembled to sing, unrehearsed, the Bach B-minor Mass. The venue for this distinguished and unlikely gathering was the large living room of the Baker house in Wilmette, one of Wright's less well known and less well-built Prairie houses; the room a huge one-and-a-half storey space with a diminutive gallery over the fireplace. As a non-singer I was parked among the basses at the back of the room, next to the fireplace. Suddenly it struck me that the conductor, who was standing on the window seat in the bay window some 30ft from the fire, was perspiring far more freely than the *Kyrie* would seem to justify. But, looking down at the fireplace, I saw that the fire was not even lit.

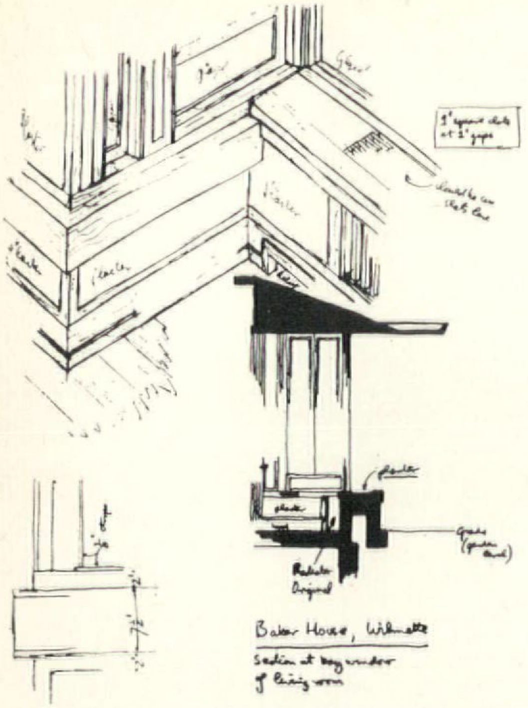
It has been put to me that only a visitor from an underdeveloped country like Britain could be so naïve as to suppose that rooms are heated by fireplaces. But my naïve surprise started me on a systematic investigation of the way this, and other, Prairie houses were heated. I discovered that the main heat-source for the Baker house living room was a large hot water radiator, beautifully detailed into the window seat on which our conductor had been standing. It was not an afterthought, the carpentry of the window-seat, and of the grilles for the hot air, is conspicuously of the same material, style and time as the rest of the window structure, and as integral with the design as the large plant-box outside.

The complete assembly, indoors and out, can be regarded as a single environmental device, controlling heat, light, view, ventilation and (with the help of the overhang of the roof) shade as well. Not only are the parts unified as a structure, they work together as well, and this it appeared to me could be an epitome of the way the parts of the whole house worked. For instance—and it is a very crucial instance—the hot water for this radiator reaches it through pipes in the wainscot (there being no cellar) so that the living room was to some extent heated all round its three exposed sides. In the bitter Chicago winter—there were 20 inches of fresh

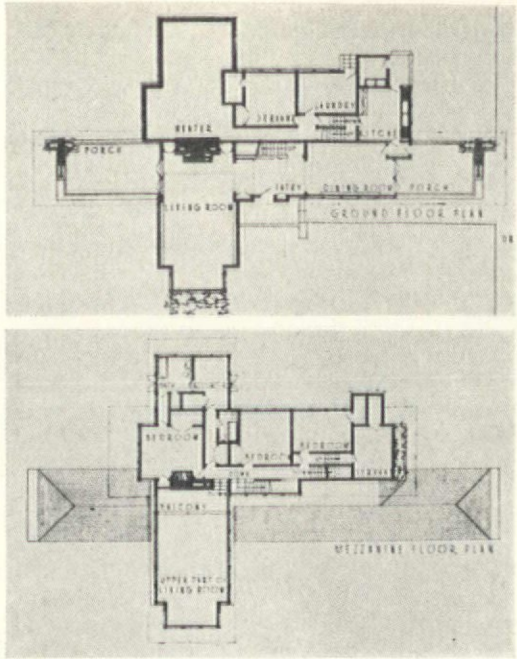


Larkin Company administration building, Buffalo, NY, 1906—cut-away isometric showing the vertical ducts
1 fresh-air down draught in-take duct
2 fresh air riser duct to outlets in office area
3 foul air exhaust duct
4 piping, wiring and general utility spaces
Drawing by Mary Reyner Banham

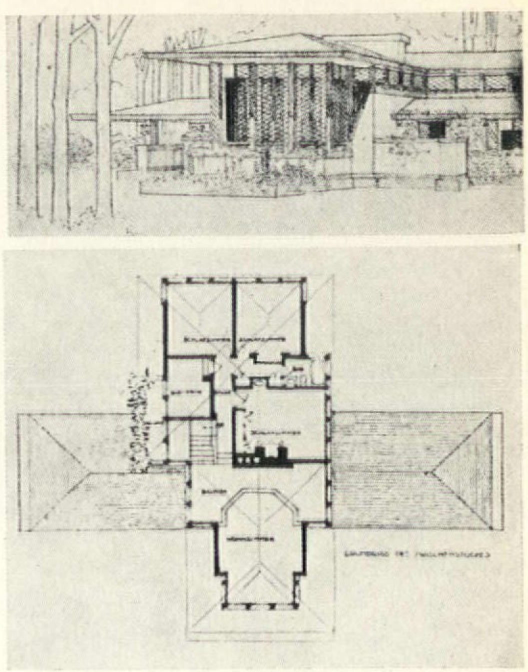
*Republished by courtesy of *Arts and Architecture*



Sketch by Reyner Banham of window and radiator in the Baker house



Baker home, ground and mezzanine plans



Baker home exterior and Isabel Roberts house, River Forest, Ill. 1907—mezzanine floor plan

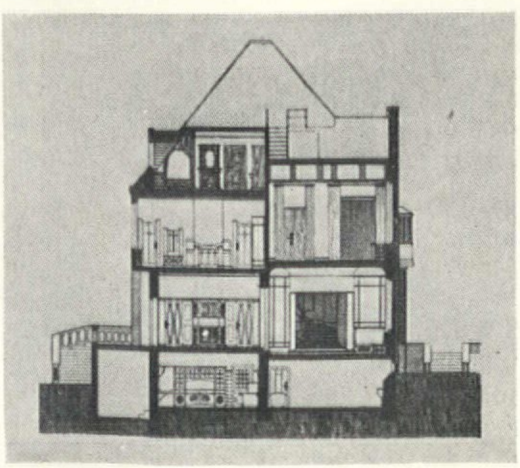
snow in the garden on the night of the sing-party—such perimeter heating seems an eminently reasonable proposition.

But hardly an economical proposition in a room with so much exposed exterior wall made of lightweight materials, a continuous clerestorey at cornice level, and a roof too skimpy to provide much thermal insulation. Now, I know that heat losses of an order intolerable in Europe might not be of much account in the US, which is traditionally a cheap fuel economy, where hard heating of lightweight structures is customary, and where Mr Wright's clients are supposed to have accepted that they were buying exquisite works of art, not efficient machines for living in. But, against this, I must point out that the legend of Wright as a giant temperament careless of the comfort of the human race is a late accretion to his melodramatic biography. There is little sign of it in the Prairie house period before 1910, when his clients were mostly members of cultured, but practical-minded business clans, who would be unlikely to accept excessive fuel bills if there were no countervailing advantages to set against them.

My examination of the Baker house, and a knowledge of the Chicago climate, suggested a convincing-looking hypothesis about what the countervailing benefits might be: that a room with a triple exposure, and clerestorey ventilation high under the roof might be more or less self-ventilating and self-cooling in the heat of high summer, to an extent that a more easily-heated room buried in the mass of the house could never be without air-conditioning—which was not to exist in domestic sized installations until the Baker house was practically 30 years old. This hypothesis had the advantage of being doubly testable: by revisiting it in the height of the summer and by examining the literature to see if anything like this was among Wright's announced intentions.

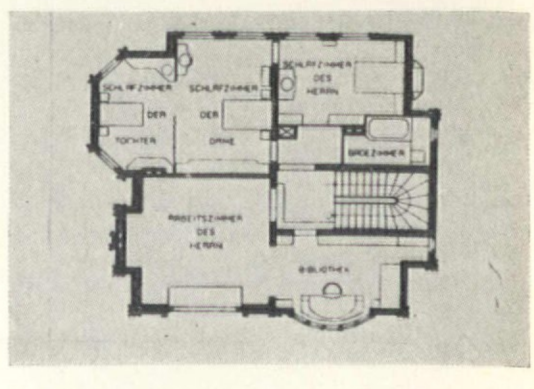
On the first point, I was gratified to discover that the house is habitable throughout the year without recourse to air-conditioning, and I would like to add that it was not only comfortably habitable, but pleasurably so. Some south facing parts did begin to warm up towards the end of the afternoon on Midsummer Day, but the sun goes off them soon after, and the lightweight structure then rapidly sheds any excess heat. I also noted that, without any prompting or even enquiry from myself, the opening lights in the clerestorey were, in fact, opened early in the day, so that cross-draft could prevent any accumulation of heated air under the shallow roof.

I also noted that the only access to these lights to open them was from the gallery over the fireplace: far from being simply a spatial *jeu d'esprit*, or the stage-set for that classic tableau of American sentimentality where pyjama clad infants peer shyly down on their parents resplendent in full formal party rig, the gallery is an integral part of the working of the house as an environmental machine. The same appears to be true of the gallery in the nearly-contemporary miniature house that Wright designed for his erstwhile secretary, Isabel Roberts, in River Forest. Neither gallery gives access to rooms, neither appears strong enough to support even a small social gathering, but both do provide access to the only openable windows in their respective clerestoreys.

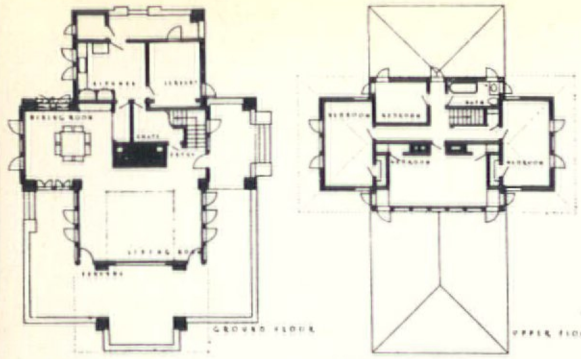


Thus, I think one can safely take the Baker house bay window as an epitome of the way the whole house works—and not only the Baker House, but the Isabel Roberts house and, in varying degrees, most of the other Prairie houses. What happens is that plan form, section, heating plant, windows, roof-form, all work together in varying combinations as the seasons vary to maintain a pleasant and equable climate within the house throughout the year. And let me emphasize that no spectacular mechanical novelty was involved in this—piped heating in domestic interiors had been in use for over a century since Matthew Murray built Steam Hall in Leeds. The real mastery of environmental design exhibited by Wright in these houses lies in achieving conspicuously improved performance by taking thought about the rearrangement of known and familiar architectural elements.

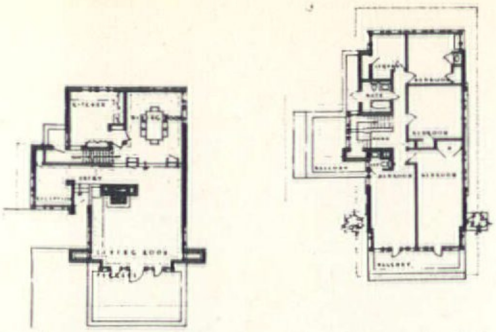
One measure of that mastery is that the Baker House is still working well with the original radiators still in their original locations almost 60 years later; another measure would be to compare Wright's work with some of his distinguished European contemporaries. The spartan régime of English domestic life leaves little point in comparing him with say Voysey, but the more humane standards prevailing on the



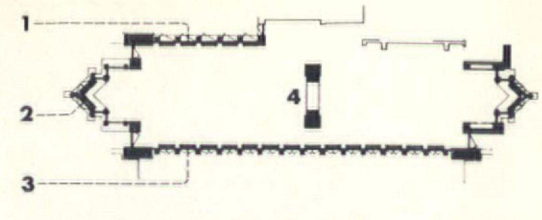
Section and upper floor plan, Behrens house, Darmstadt, Germany, 1902



Ground and upper floor plans, Charles S. Ross cottage, Delavan Lake, Wis., 1902



Ground and upper floor plan, Mrs Thomas H. Gale house, Oak Park, Ill, 1909

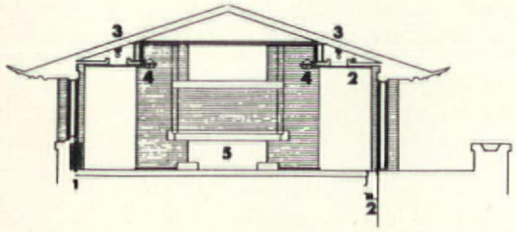


Heating plan and opening windows in living room, Frederick C. Robie House, Woodlawn and 58th Street, Chicago, Ill., 1909
1 boxed radiators under rear windows
2 hot pipes concealed behind cupboards
3 heaters under brass grilles in floor
4 central fireplace

Continent suggest a confrontation with his exact contemporary, Peter Behrens, most of whose domestic design in Germany dates from the Prairie house decade. The house he built for himself in Darmstadt in 1902 is comparable in scale (though vastly more pretentious) with Wright's Rose House at Delavan Lake, Wisconsin of the same year, so I think that comparisons are in order.
Furthermore, the published record of the Darmstadt house in its original condition gives us a good view of its heating provision, which proves to be quite as elaborate as Wright's ever were, and located in very similar positions under window-seats and so forth. But nothing has happened to the plan and section of the Behrens house as a consequence—for better or worse it remains a tight little cubic box, in the immemorial European manner, in spite of some odd picturesque asymmetries; whereas Wright has created a notably free and more original layout within the strict discipline of axial symmetry and a regular planning module. Well ahead of any European, Futurist or otherwise, Wright had answered Marinetti's as-yet-unvoiced demand for 'villas open to the view and breeze'.
But the fact that houses like the Ross cottage were designed for cross-ventilation, does not mean that they were designed solely in terms of that, or any other, environmental device. Simple-minded architectural exhibitionism of that sort was the speciality of the 20s, when new technologies were supposed to have determined the new forms of architecture, and architects were determined to make it look like that. Although structural determinism has been discredited by an increasing awareness of the amount of faking and plastering that was required to make the White Architecture of the 20s look like concrete, some historians still seem to nurse an obscure need to believe that something or other determines the forms of architecture, and environmental machinery seems to be a strong candidate for the role of architectural demi-urge at present. But, for Wright at least, environmental machinery was an aid not a determinant in the creation of form—as he himself makes clear in the only written statement that bears directly and in detail on his intentions in the Prairie Houses. This was the introduction he wrote for the German publication of his work in 1910; officially titled *Frank Lloyd Wright: Ausgefuhrte Bauten und Entwurfe,* but more commonly known in my corner of historiography as 'the first Wasmuth' after its publisher. This introduction to *Wasmuth I* is an infuriating affair, beginning as it does with a load of terrible corny old provincial jokes about the Renaissance, but in the last dozen paragraphs Wright, realizing that the buildings illustrated would be almost incomprehensible to European readers, sets out to explain the Prairie houses. He does so in a marvellously holistic manner, never letting one technical or architectural element override the others. For instance, in the passage that confirms my suspicions about the relationship of heating method to plan form, he manages to keep practically every other consequence and cause in view at the same time:
'Another modern opportunity is afforded by our effective system of hot water heating. By this means the forms of buildings may be more completely articulated, with light and air on several sides. By keeping the ceilings low, the walls may be opened with series of windows to the outer air, the flowers and trees, the prospects, and one may live as comfortably as before, less shut in . . . it is also possible to spread the buildings, which once—in our climate of extremes—were a compact box cut into compartments, into a more organic expression, making a house in the garden or in the country the delightful thing in relation to either or both that imagination would have it.'
This suggests, as the houses themselves also suggest, that environmental machinery had its place, but no more than its place, in Wright's mind. The perspective of 60 years suggests that it was a more crucial place than Wright himself may have realized, but the way he speaks of it suggests that acknowledging its importance does not displace or falsify earlier estimates of Wright from which it was omitted. That the Prairie houses were masterpieces of environmentalism does not make them any the less masterpieces of spatial organization, or picturesque composition, any less striking monuments to what may one day be recognized as one of the most cultured commercial communities since Florence.
But why, even so, does the environmentalism go unnoticed in the standard literature, or—if noticed—uncommented? One reason is that the available source material is inadequate or misleading. It suffers from editorial mistakes: the drawing of the Baker house has been published only in Arthur Drexler's presumably authoritative *Drawings of Frank Lloyd Wright,* but is described as a project for the Guthrie House at Sewanee, Tenn. The sources also suffer from Mr Wright himself: the plan of the Baker house was specially prepared for publication by Wright's office, but is wrong about the shape of the fireplace and its immediate surroundings. Ironically, there is now at the Baker house a copy of Hitchcock's *In the Nature of Materials,* with this inaccurate plan cheerfully autographed by the architect, and prints of some office working drawings which show a version of the fireplace idea much nearer to what was actually built. And this is interesting: they also show crossings out and revisions of the locations of the heating radiators.
Worst of all, however, the published record just does not contain the information needed for an environmental study. A drawing like the plan of the Ross House, with every opening window clearly shown, is almost unique between hard covers. Or take the case of the justifiably admired house for Mrs Gale in Oak Park. It has been highly praised for its mastery of abstract form and its anticipation of later European design in the way the projecting elements of the front are carried between the two flanking 'buttresses'. Examination of the plans will show that these buttresses are, in fact, hollow. But the plans don't show you that these hollow buttresses contain hot water radiators, concealed behind wooden grilles. Now these radiators are, of necessity in such spaces, endwise-on to the room, and I find it difficult to think of a more insensate manner of installing them, short of bricking them up entirely. I find it equally difficult to believe that Wright ever intended to put radiators there; what seems more likely is that the buttress-boxes are a kind of symbolic residue of an earlier version of the design in which they were (remembering the Larkin Building) riser ducts for a hot-air system, such as may be found against internal walls in the parish room of the Unity church. It is quite possible that some clues to problems of this sort could be found among the 7000-odd unpublished Wright drawings still surviving among the Taliesin papers, but we shan't know until someone can go through them in search of environmental information. But, for the moment, the absence of an environmental approach, and the absence of environmental information, are self-supporting and mutually perpetuating. When, for instance, the Robie House was finally recognized as a building of such quality as to have some claim on the national conscience of the United States, the Historic American Buildings Survey duly recorded it in a set of measured drawings. For which we thank them, but this was a perfect example of the revolutionary nature of a building being obscured by the pre-revolutionary means employed to record it. As is customary in the traditional practice of measured drawing, the Robie house has been measured only from visible surface to visible surface—but half the quality of the house lies behind the surfaces, above the ceiling and under the floor; for this, the last of the Prairie houses, was the one where Wright essayed his most radical experiments in perimeter heating, and effectively took control for the first time of electric lighting.
Conditions were set fair for a masterpiece; when Frederick C. Robie approached Wright in 1908, he was in good practice and peak form; he had done enough houses to know exactly what he was about, but there was no sign of sated interest or flagging invention. Robie was the perfect client, doing well in business, intelligent, shrewdly aware of his own needs and the depth of his pocket, enthusiastic and possessed of the services of a good contractor for the construction work. For this paragon of a patron, Wright set out to design a paragon of Chicago houses, and if I do not list and praise every one of its virtues here, it is because most of them have

been extolled elsewhere and because I have quite a lot to say about its environmental performance.

The house consists, substantially, of a long two-storey block parallel with 58th Street (east-west, that is) with a three-storey block tucked into its north side and looking over it into the street. The roof of the two-storey block overhangs impressively to east and west—at the east it provides a covered entry to the kitchen wing; at the west it provides shelter against the afternoon sun.



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Section through living room of the Robie House
1 boxed radiators
2 hot water pipes
3 concealed lights
4 glass light globes
5 central fireplace
Drawing by Mary Reyner Banham

To the south (and north too, for the sake of symmetry) the overhang is less impressive, but exactly deep enough, as I shall show later. At first floor-slab level on the south side, however, the balcony of the living room comes far enough forward to keep the ground floor fairly constantly in the shade. This is important because the ground floor and the small, almost sunless entrance court on the north side together act as a cold-air tank to keep the whole house cool in summer. On a sweltering June afternoon, it will be appreciably chilly in the entrance hall, pleasantly temperate in the first floor living room, and warm, but not intolerably so, in the master bedroom up under the roof—and this with every window shut.

With windows opened, however, the main living room may be ventilated in a number of ways: doors, windows may be opened at either end; the entire south front consists of glass doors giving on to the balcony, and the rear windows at the western end, overlooking the entrance court may also be opened, to exploit north-south breezes. All opening lights are protected by internal fly-screens, which are part of the original design. Effectively, the living room has exposure on, not three, but three-and-a-half sides, and for exactly that much of its perimeter it is heated. Under the opening windows of the north side there are dwarf radiators boxed into neat, gated enclosures; in the V-shaped ends of the room heat is supplied by hot pipes buried at the back of the built-in cupboards, slots being provided in the deep sills for the heated air to emerge; and all along the south side there are heating elements buried under the floor beneath a brass grille in front of each glass door.

Are buried? Or were buried? The cavity under each grille seems deep enough to accommodate radiators of the size used under the windows on the rear wall, which would have been both symmetrical and reasonable, but there do not appear to be any radiators there now, not under the grilles I was able to raise. All I could find was a large diameter pipe at the bottom of the well. Whether there ever were actual radiators there at any time, or whether they were later removed, is not clear. What is obvious is that later occupiers found the heating inadequate and installed free-standing radiators that all too patently are not part of Wright's design.

But the lighting arrangements patently are part of the original design. The glass globes in square japonnaiserie frames along the edge of the ceiling are familiar enough from photographs in the standard literature, but what such pictures rarely make plain enough is that the wooden slatted grilles let into the lower part of the ceiling, one to each bay like the brass grilles in the floor, have always had electric light bulbs mounted above them in the roof space. Thus, the direct luminescence in the central space of the room was supplemented by an outer band of more diffused light, dappled by the simple device of making abstract patterns with cubes of oak inserted between the slats of the grille.

Electric lighting was just over 20 years old in Chicago when Fred Robie commissioned the house; Wright was one of that uniquely fortunate generation of architects who were young enough to have worked their professional careers entirely in the electrical age, but were old enough to recall the environmental miseries of the gas age that preceded it. Not all that generation profited by this good fortune as crisply as Wright did. In the year of the Robie House, Behrens can be found still designing dangling fittings with naked bulbs and elaborately ineffective fabric draped shades. Wright was one of the first architects to appreciate the creative consequences of the fact that electric lighting involves no exposed flame, generates very little heat, needs no draught of air or oxygen to keep it going and produces no noxious fumes that have to be cleared away—and for all these reasons can be enclosed or concealed in spaces and places where no lighting could safely or usefully have gone before.

But even electric lights do produce some heat and thus generate convective currents of warmed air, which raises an intriguing possibility: that the wooden grilles and electric lights may be part of a system for exploiting the roof-space (to put it no higher) as a ventilating device. If the warmed air from the lamps, or from the pipe next to the grilles, wanted to convect away anywhere, there would be room for it to escape between the flange of the structural I-beam and the underside of the roof-covering, whose slope it could follow into the central roof-space. Where would it go then? The introduction to *Wasmuth I* makes a helpful suggestion again, on this topic too:

'The gently sloping roofs grateful to the prairie do not leave large air-spaces above the rooms, and so the chimney has grown in dimensions and importance and in hot weather ventilates the circulating air-spaces beneath the roofs, fresh air entering beneath the eaves through openings easily closed in winter.'

The Robie house certainly exemplifies these propositions: a square grille is let into the soffit of the long overhang at each end of the main roof, and the chimney has an added limb on its western side, clearly exhibiting the pattern of missing bricks which signals a ventilator in Wright's work of this period—it shows up in both the Larkin building and the Isabel Roberts house. Warm air spillage over the recessed lights could well have contributed to this ventilating process, even when the grilles under the eaves were closed in winter.

But the most intriguing question of this sort raised by the Robie house concerns, not the newest source of environmental power, but the oldest—sunlight. I have already mentioned the seemingly inadequate overhang of the southern eaves of the house, but it only seems inadequate because we forget how far south Chicago is: the same latitude as Istanbul or Rome. The sun stands high in summer; so high that at noon on Midsummer's Day the shadow of the eaves just kisses the woodwork at the bottom of the glass doors, leaving the glass in shadow and thus unheated. Give or take a quarter of an inch, for warping or shrinking of wood, it hits that woodwork line so exactly, so neatly, that it takes your breath away. It is difficult to believe that it is not deliberate, but equally difficult to believe that if Mr Wright had done it on purpose he would not have drawn attention to the fact somewhere in print.

This moment of mastery, accidental or otherwise, seems a good place to leave the Great Environmentalist and the historical questions he left behind. The last question to be raised is this: the historical significance of Wright's environmental innovations. The place of the Larkin building in the development of modern architecture seems clear enough; it performed one of those necessary delicate operations by which some major innovation of technical civilization was rendered architecturally and culturally acceptable by bringing it within the established canon of architectural forms. It did for environmental equipment what Behrens did for factories in his Turbinenfabrik, or Perret did for exposed concrete framing in the façade of the Garage Ponthieu—in each case the solution was to resolve the innovation into an abstract form of classicism.

The use of a basically similar vocabulary of forms in the Prairie houses, including axial symmetry in the parts and sometimes the whole, and a way of organizing even the simplest wall into plinth, shaft and some sort of cornice—in spite of all this the proposition is fundamentally different, and we are confronted with a radically new concept of shelter design. Unlike most previous (and too many subsequent) employments of environmental aids, they have not here been clipped on to a conventionally conceived structure to ameliorate its inadequate performance—as was the case even with the Larkin building. In the Prairie house the structure, its solids, voids and overhangs, and the mechanics, whether they consume coal, gas, kerosene or electricity, work together in a manner that deserves the favourite Wrightian epithet of 'organic'—and were conceived as working together in this way from the start. Nothing is merely an amelioration or corrective of something else; hardly any single element performs a single function; hardly any single function is performed by any one element alone, most are the working result of elements functioning together with the practised ingenuity and concealed craft normally found in vernaculars that have been a thousand years in the growing.

But nothing had been a thousand years growing in Chicago; the city had only been incorporated in 1837, and had been putting up what might decently be termed permanent buildings only for a half-century or so when Wright began his independent practice as an architect, and he invented his vernacular in the next ten years. Only it is not a vernacular cumulatively devised by generations barely aware of what they are creating; it is an invention, consciously made by a man acutely aware of himself and his innovations.

Scarborough college, Toronto, Ontario

John Andrews

Associates for stage one: Page and Steele
Planner: Michael Hugo Brunt
Engineers: Ewbank, Pillar and Associates
Landscape architect: Michael Hough

Scarborough College is located 20 miles from the centre of Toronto poised on a spectacular bluff overlooking a valley, heavily wooded with hemlock, pine and beech and screened by this mature growth from the sordid hinterland of suburban Toronto rapidly encroaching on every side. A journey by public transport from the centre of Toronto to Scarborough is an object lesson in the organizational inadequacies of the Toronto Region. The subway stops short of Scarborough by about 10 miles. Thereafter the multi-lane highways roll and the only access is by bus through a desert of gas stations, used car lots, supermarkets, high schools, and the usual dispersed plethora of American suburbia.

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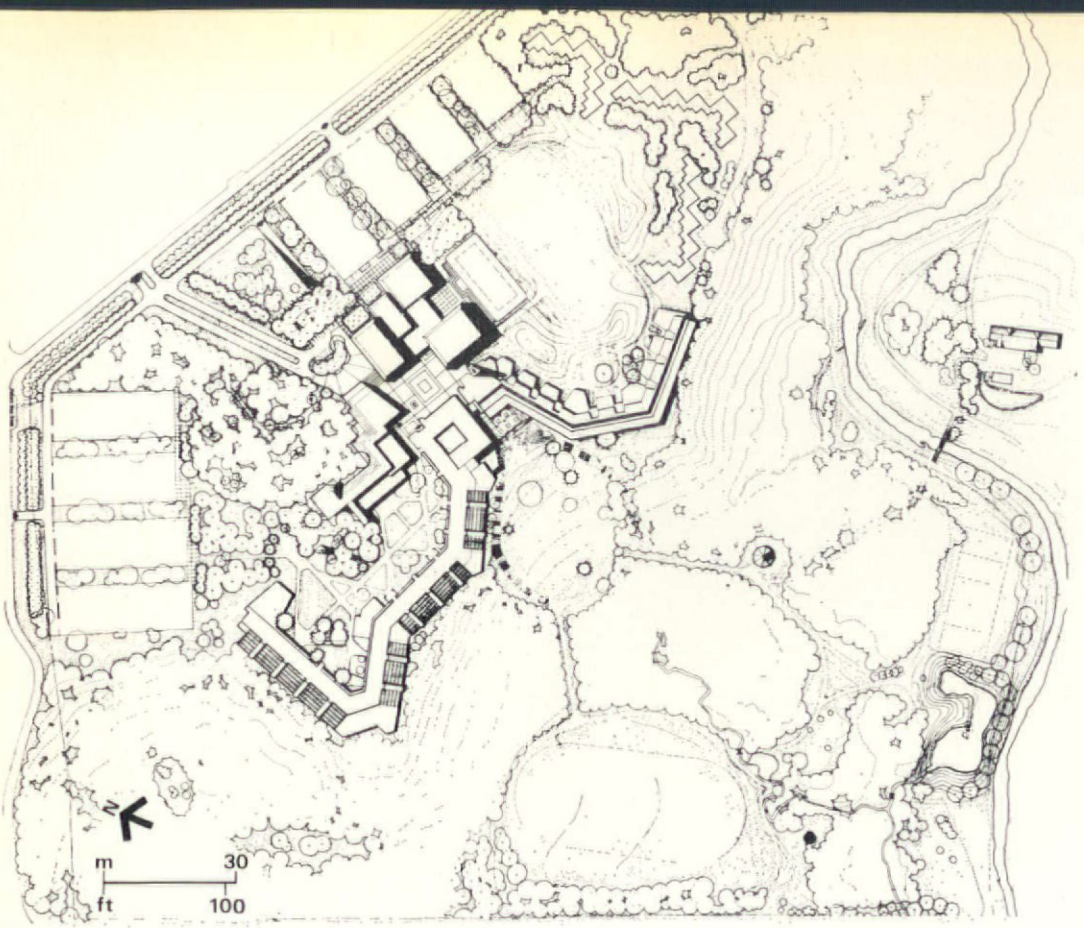
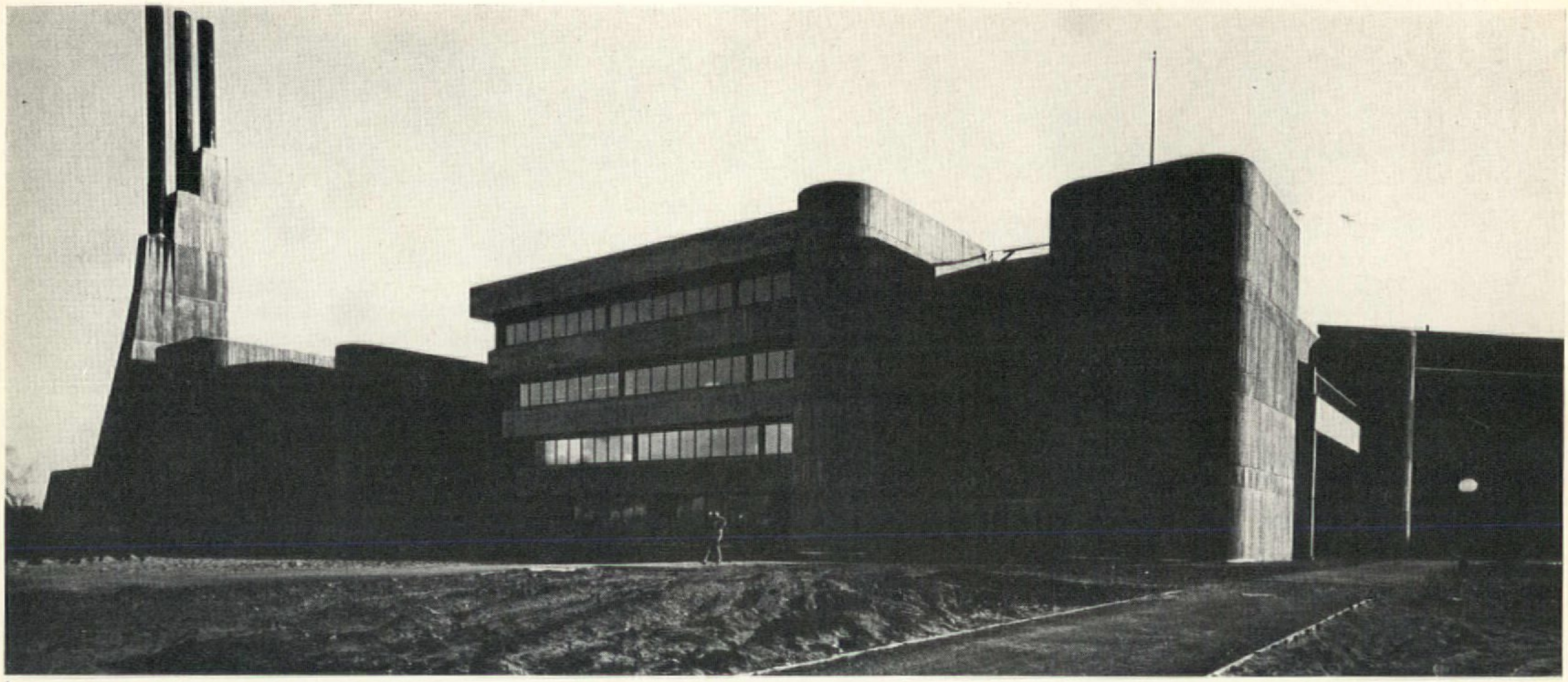


1
Site plan
2
Winter aerial view from the west
Photo: 2 Canadian Architect, *May 1966*



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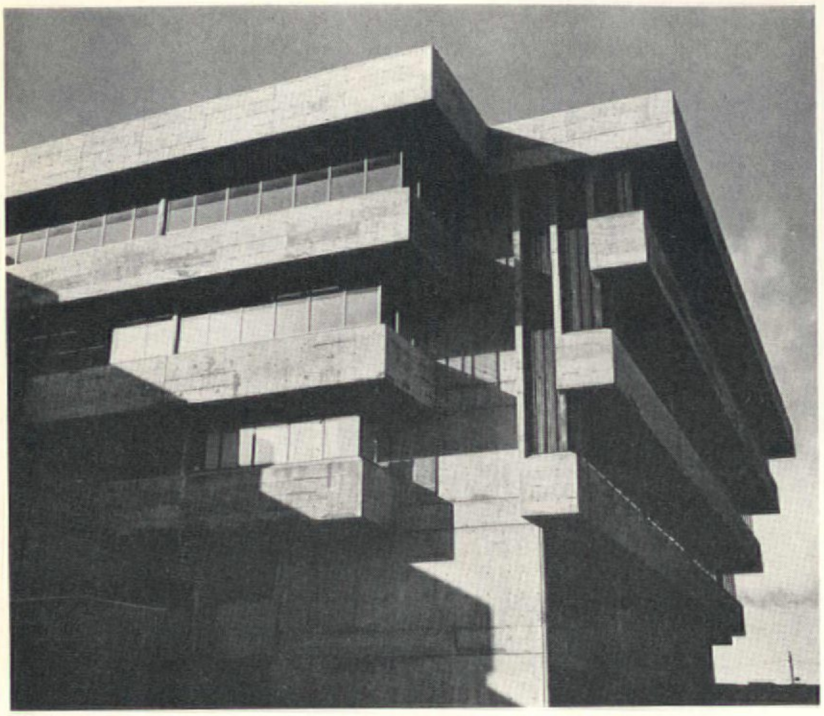

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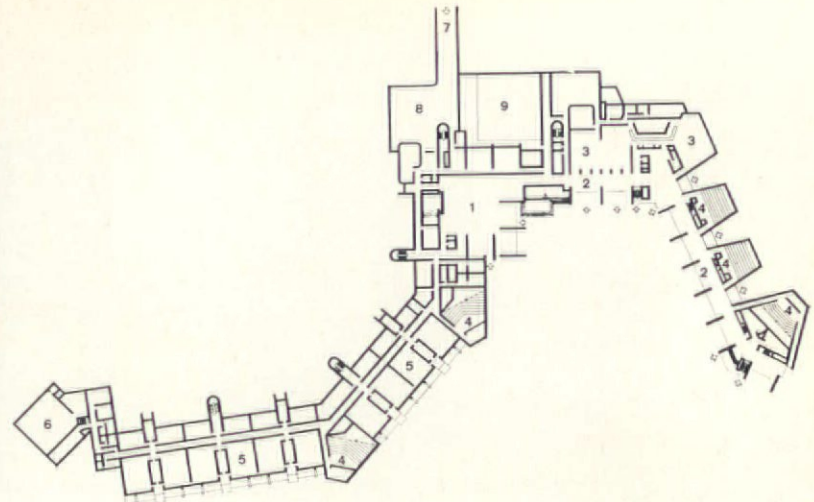

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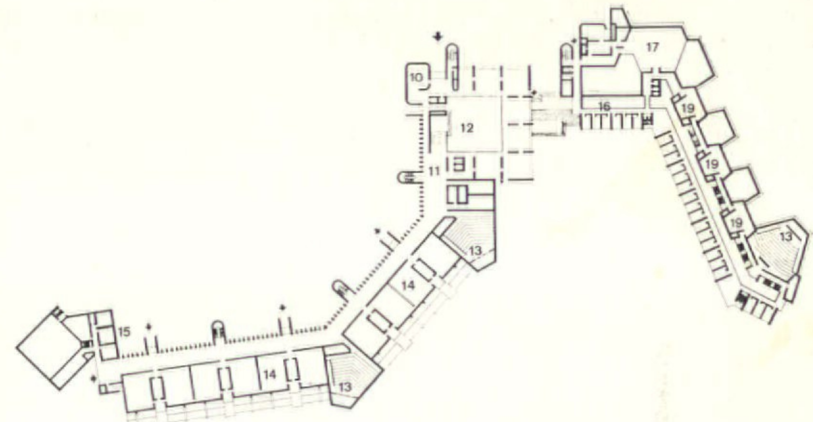

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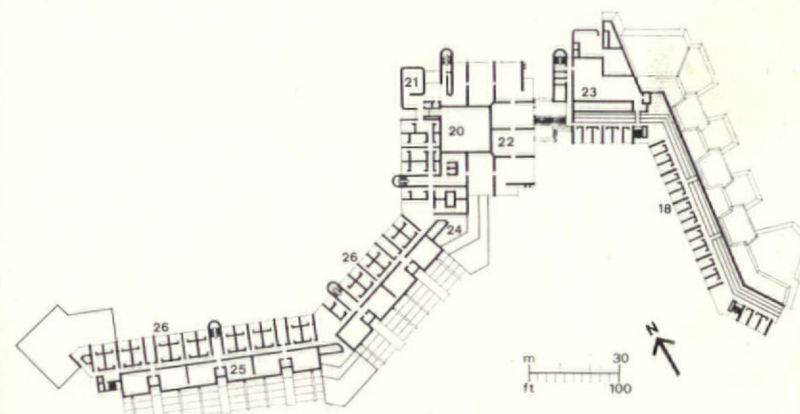

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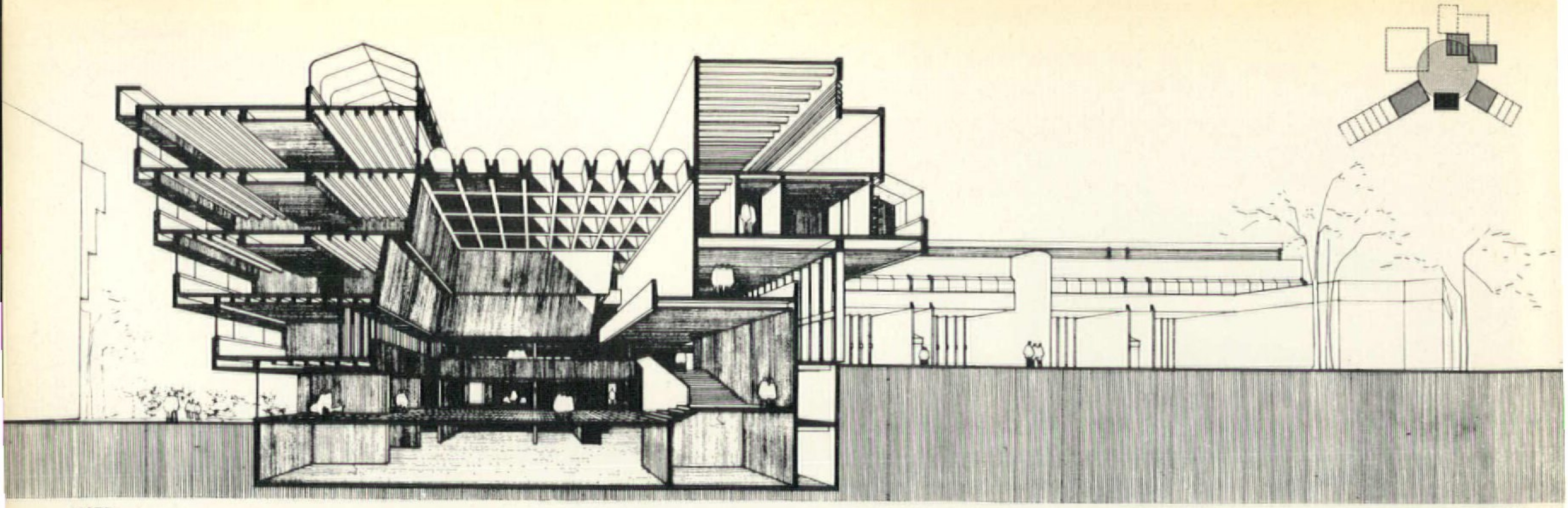
1
View from the main approach, looking south, across the future agora, to the administration block, with the boiler house stack on the left
2
View from the south, with the science wing on the left, the administration block in the centre and the humanities wing to the right
3
North-east corner of the administration block
4, 5 & 6
Plans at levels 2, 3 & 5
1 meeting place
2 pedestrian route (humanities)
3 cafeteria
4 lecture theatre
5 undergraduate laboratories
6 master television studio
7 lorry tunnel
8 service entrance
9 boiler room
10 main entrance
11 pedestrian street (science)
12 meeting place
13 lecture theatre (upper level)
14 undergraduate laboratories
15 television studios
16 pedestrian street (humanities)
17 dining room
18 faculty office
19 lecture theatre
20 meeting place (upper level)
21 council room
22 administration offices
23 mechanical
24 graduate student lounge
25 graduate laboratories
26 faculty laboratories and offices
Photos: 1–3 John Reeves



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Scarborough College is the lofty exception to the general environmental norm of panic and profit that surrounds it. It sits acropolis-like, in seclusion, surrounded by trees on a vast 200-acre site—a rather private and exclusive statement by a distinguished public body. The facts necessary to account for its existence in the wilderness of suburbia are not evident to the uninformed visitor. The siting of Scarborough can be explained only by the long-term plans of the University of Toronto together with the development of the Toronto region as a whole.

The ultimate intention is to relegate the downtown parent campus to graduate studies only, and to carry out all undergraduate programmes in campuses distributed throughout the region. Scarborough is one of the first two satellite campuses—the other is Erindale—that have been built to accommodate an estimated expansion in enrolment from 20,000 full-time students to 35,000 by 1970. These satellite campuses are designed as non-residential commuter campuses to operate independently of the downtown campus. In the case of Scarborough all students are clearly expected, for the present, to gain access to the site by car and bus. This considerable commuter parking load for 1500 students now (5000 to 6000 by 1972) is to be accommodated in a series of peripheral ground level parking lots located adjacent to a feeder road along the northern limits of the site. There is evidently no intention at the moment to cover these lots or the pedestrian ways linking them to the main building, a lack of provision which seems inconsistent given the severity of the climate and the elaborate pro-

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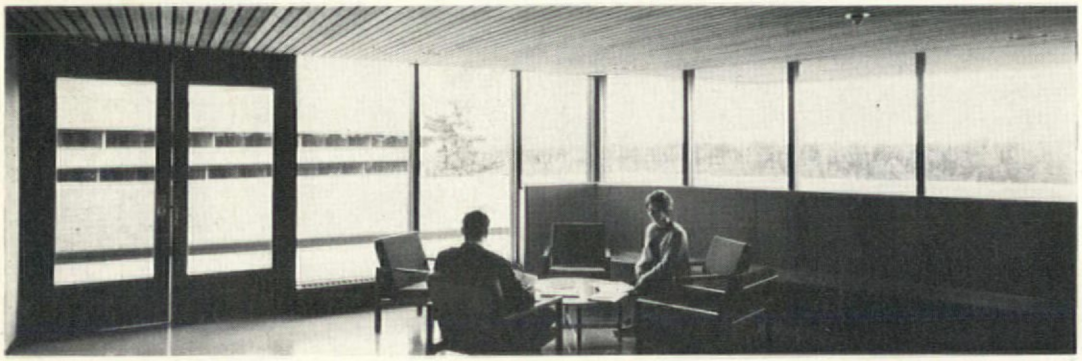
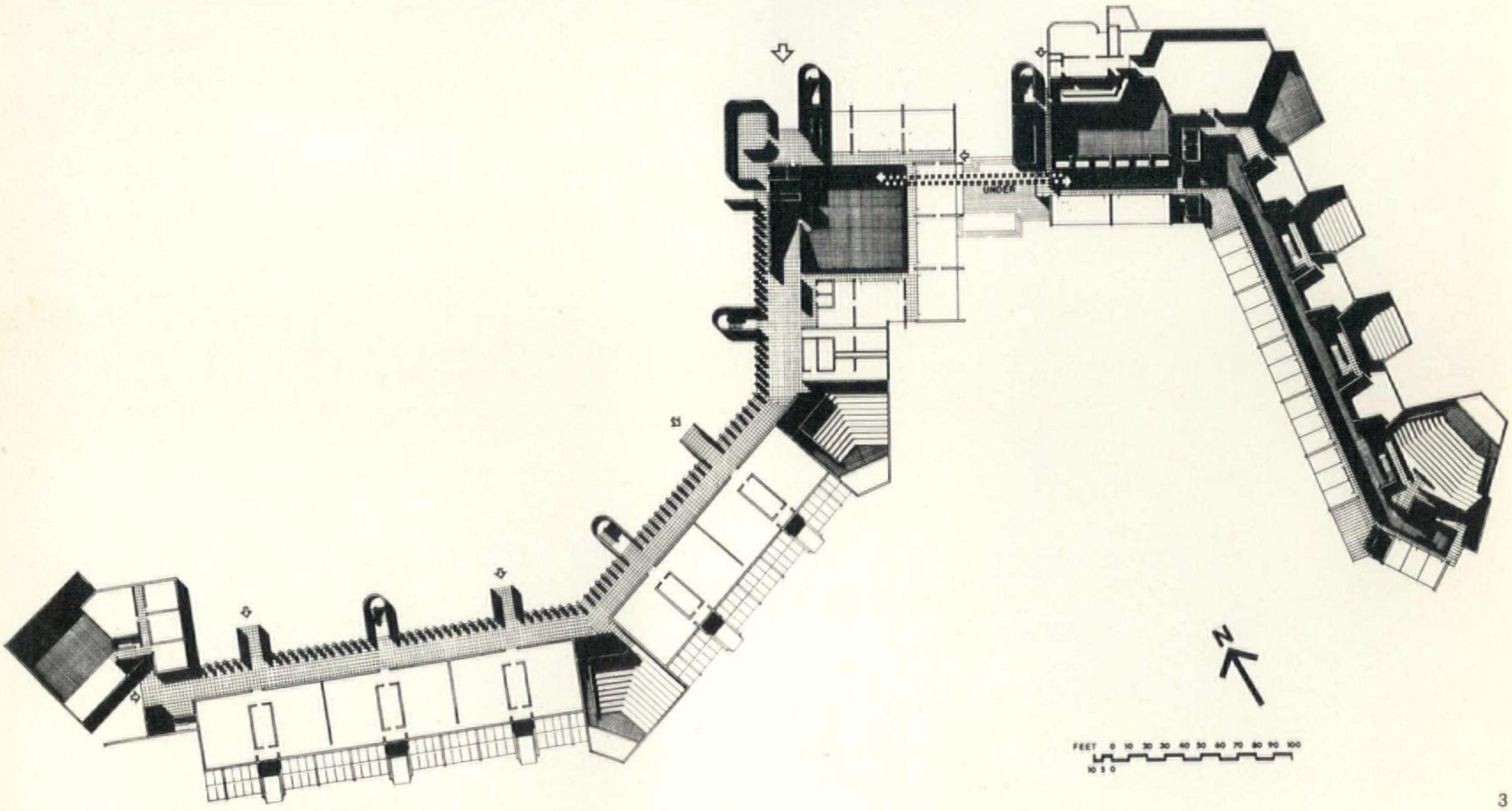


2

1
Diagrammatic section through administration block, showing the importance of the 'meeting place'
2
Graduate students' lounge
3
Plan showing approaches and main circulation route
4
'Meeting place' looking across from the gallery to the main stair
5
Main stair leading up from the 'meeting place'
6
Cafeteria
Photos: 5 & 6 John Reeves



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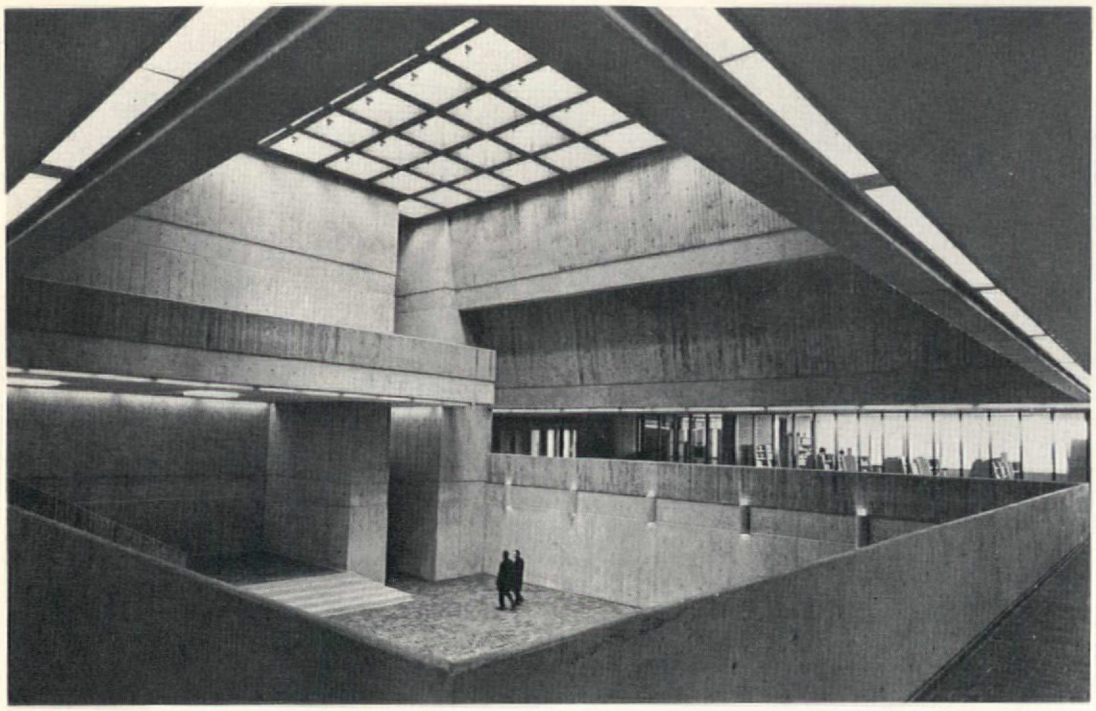
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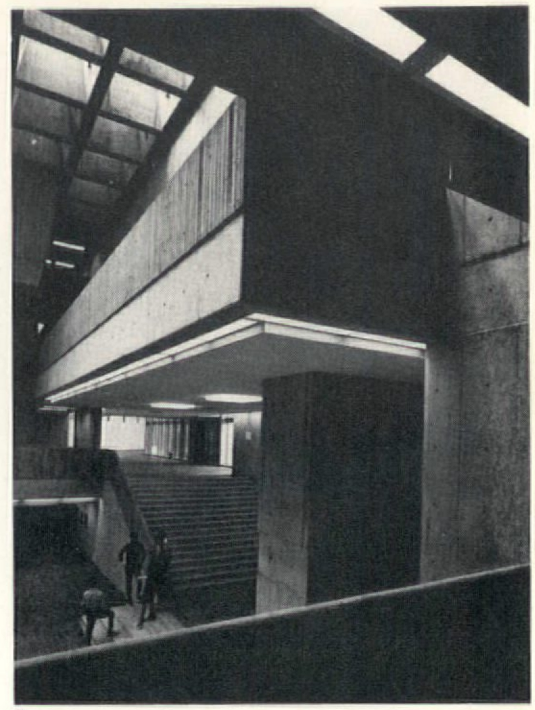
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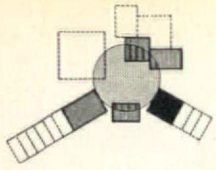

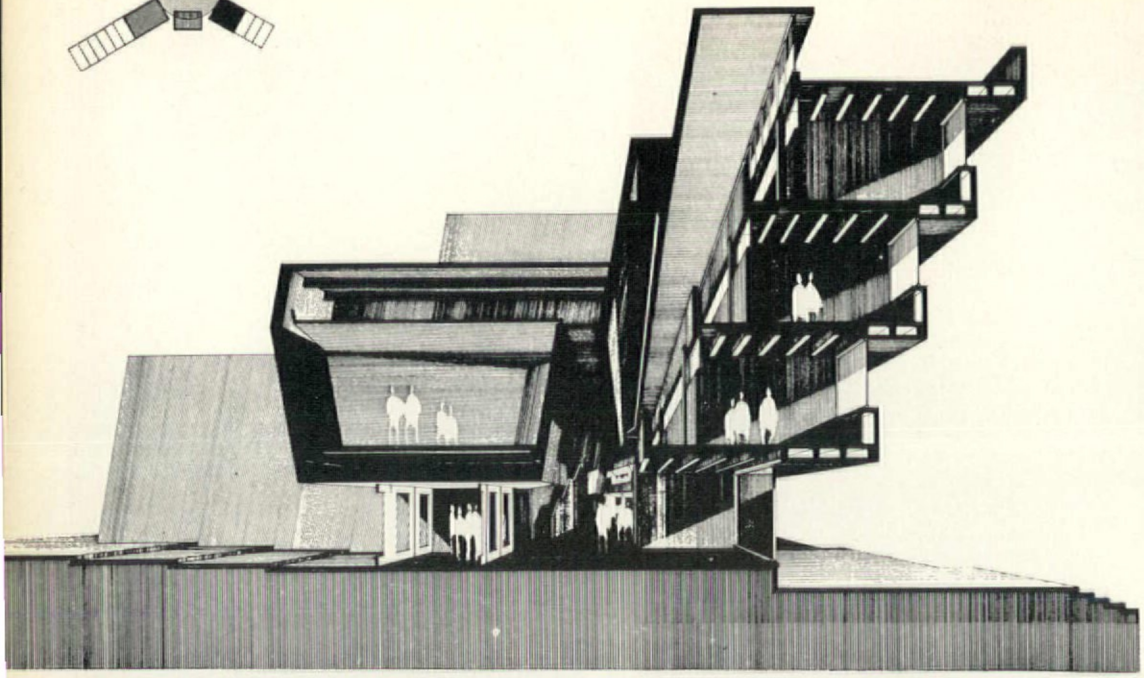

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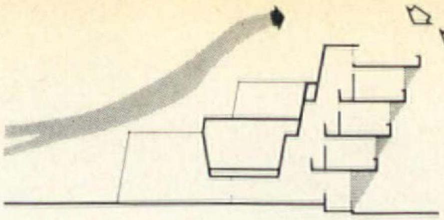

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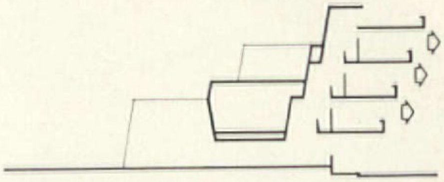
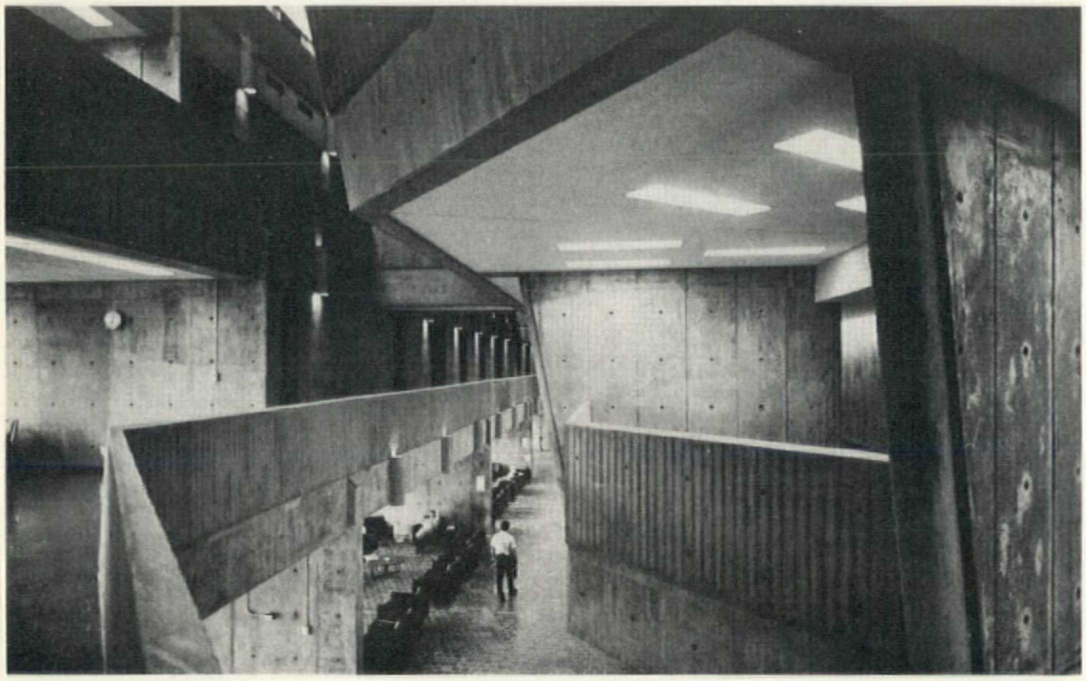


3

1
Diagrammatic section through humanities wing
2 & 3
Diagrams indicating wind and sun control, and design for views
4
Pedestrian route in the humanities wing
5
Dining room
6
Humanities pedestrian route on four levels
7 & 8
Lecture theatre and classroom
Photos: 4, 5, 7 & 8 John Reeves



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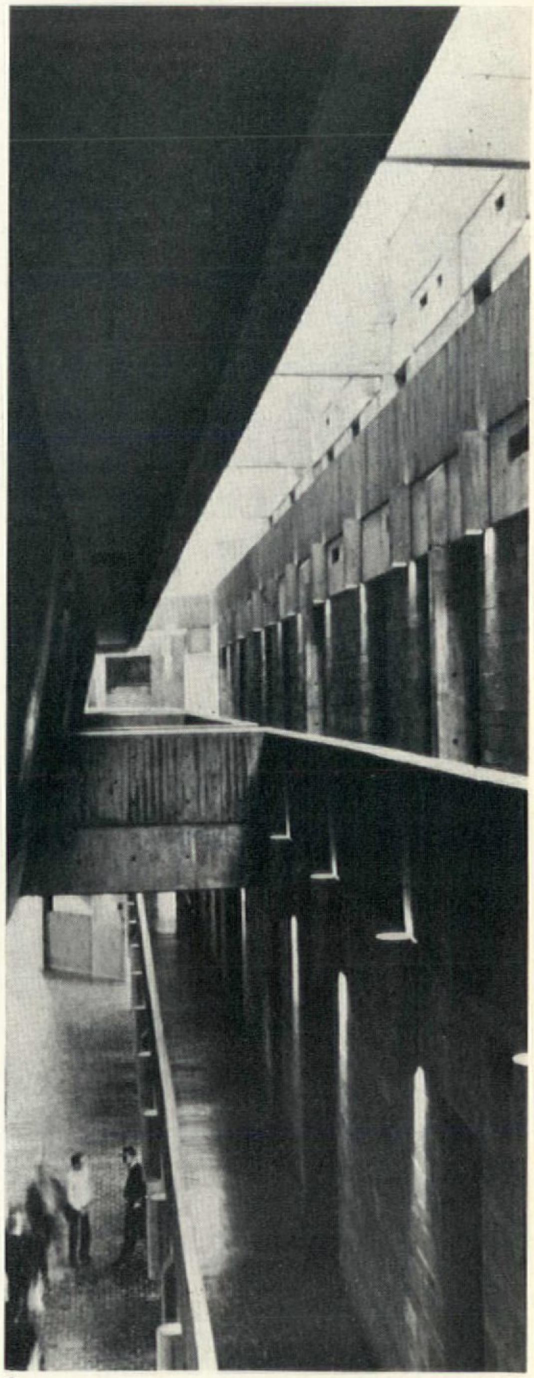

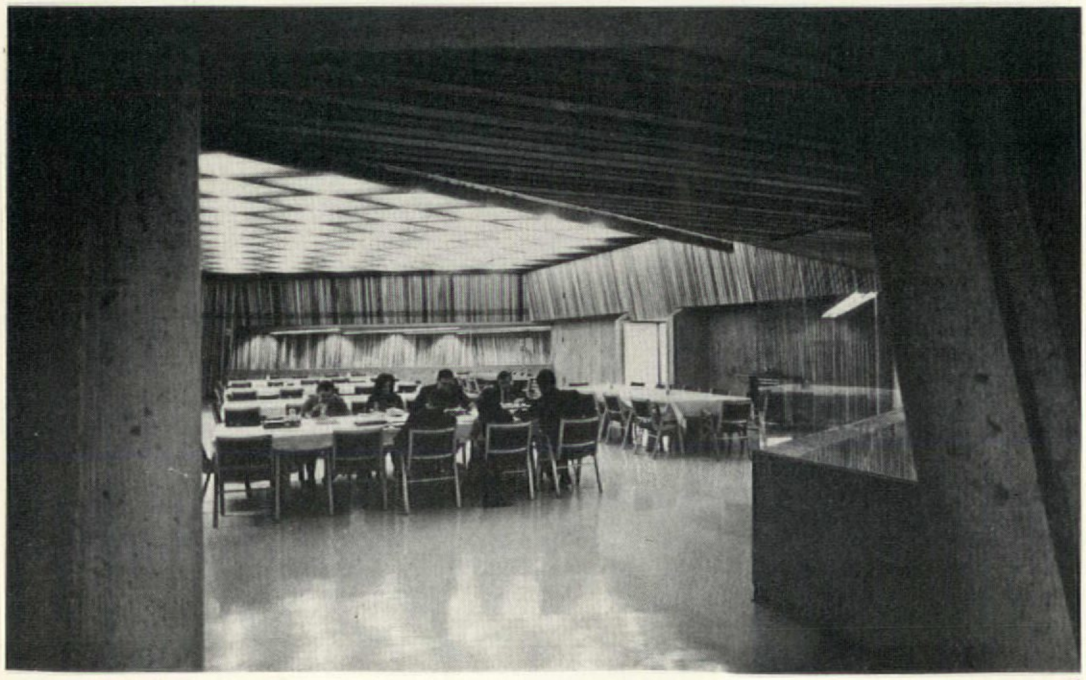

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vision of enclosed pedestrian streets within the building. One can only assume that cost, and possibly certain architectural preconceptions about approach and entry to the building proper, inhibited the provision of more adequate cover both for pedestrians and parking. As the composition stands a certain discipline of route is implicit. It is clear that one is meant to enter the complex from the north by walking up into the open academic court adjacent to the central administration block. This open forecourt is the central academic space of which the architect has written; 'The buildings of the initial stage form the central academic space, a dignified, formal hub of college activity. All the buildings can be entered from this space and expand outward beyond it. In this way academic life remains inviolate during the various phrases of building construction and the construction programme is in no way restricted by the building function'.

Scarborough, in contrast to the Candilis, Josic and Woods project for the Free University of Berlin (*AD* Aug. '64), is centralized in its organization. All parts of the building either relate to or radiate from the open academic forecourt, their subsequent disposition being thereafter largely determined by site constraints and a maximum walking time radius of 10 minutes. The five main blocks are thus grouped concentrically around the open court, three of these, being in compact finite units, relate directly to the court—the administration, the library and the gymnasium; the last two as yet unbuilt. The remaining two, the humanities and the science wings, are theoretically less determined in size and possessing in any case an initially larger bulk, they have been designed to expand in opposite directions along the ridge, conforming to its irregular contour. The overall form of Scarborough has been as much governed by the site configuration as by its system of organization. In selecting an actual 50-acre building area out of a 200-acre tract the planning committee seems to have been influenced primarily by accessibility and climatological factors: a south facing plateau paralleled by access to the north, overlooking a wooded valley being a natural choice in the given context. This choice however has ruthlessly determined the plan profile of the building, making it an obsessive and rock-like extension of the escarpment upon which it rests. The old classic imperative that man-made form be rendered distinct from natural form is at once challenged by this organic parti.

The building at Scarborough is inherently a biological organization arranged on an irregular site; a combination which is hardly amenable to formal control. In both the science and humanities wings we are confronted with large bulky undulating masses five to six storeys in height, made up of multiple levels which either step back or advance as they rise towards the roof. In the humanities wing there is nothing to modulate the horizontal striations of its southern face. In the science wing, however, the undifferentiated horizontality of the terraced laboratories is modified by structural and servicing elements as well or by cranked 'knuckles' which change the direction of the wing segments. These 'knuckles' contain lecture halls and offices and are in consequence rendered in the syntax of the humanities wing. The entire building is thus 'coded' externally to express consistently four different component functions; lecture halls, offices, laboratories and staircases. Both the science and humanities wings are compounded in various degrees of these elements which are assembled over a continuous enclosed pedestrian street, cranked in plan. In the science block this street rises through two floors, while in the humanities block it continues up for the full height of the building incorporating as it rises a series of gallery access levels.

The science wing is built partly above and partly below the ridge level; the undergraduate laboratories being terraced down into the slope from this level; the graduate laboratories being raised up over the pedestrian street. The whole complex is bonded together vertically by inclined service ducts which not only feed and drain waste from the laboratories but also distribute forced air from and to the mechanical floor located on the roof. The laboratories within the wing segments are planned in pairs and back onto common preparation rooms, coinciding in plan with the inclined man-sized service ducts. Access to the laboratories is also in pairs via projecting stair towers on the northern side of the enclosed street. The stepped south face of the science wing ingeniously varies the resultant laboratory areas and also provides both natural light and optimum solid wall area, the latter always being at a premium in laboratories. Only in the smaller graduate laboratories is this wall space interrupted by semicircular windows permitting occasional views out. The typical undergraduate laboratories are designed to hold 20 students, their size being determined by the number that can conveniently look at a reasonably priced TV monitor.

In the humanities wing on the other hand different programmatic requirements appear to have necessitated building exclusively above the plateau. A two-tiered counterpointed battery of lecture halls maintains a protective windowless wall on the northern windswept face, while on the southern façade, three tiers of faculty offices step out towards the south, each successive cantilevered floor shielding its predecessor from the high angle of the sun;

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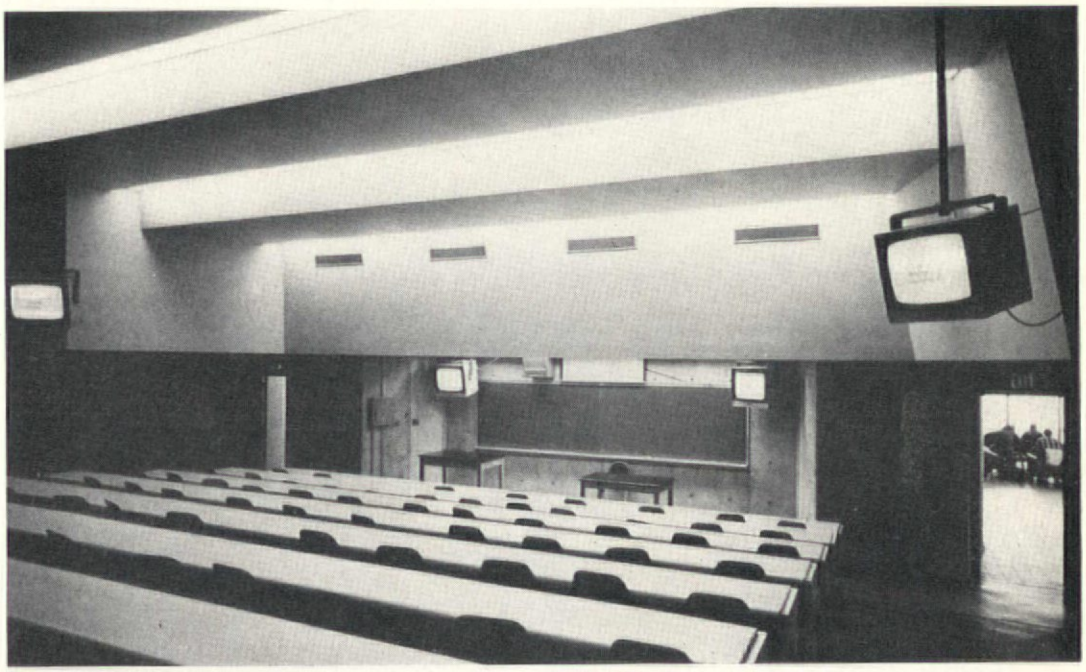

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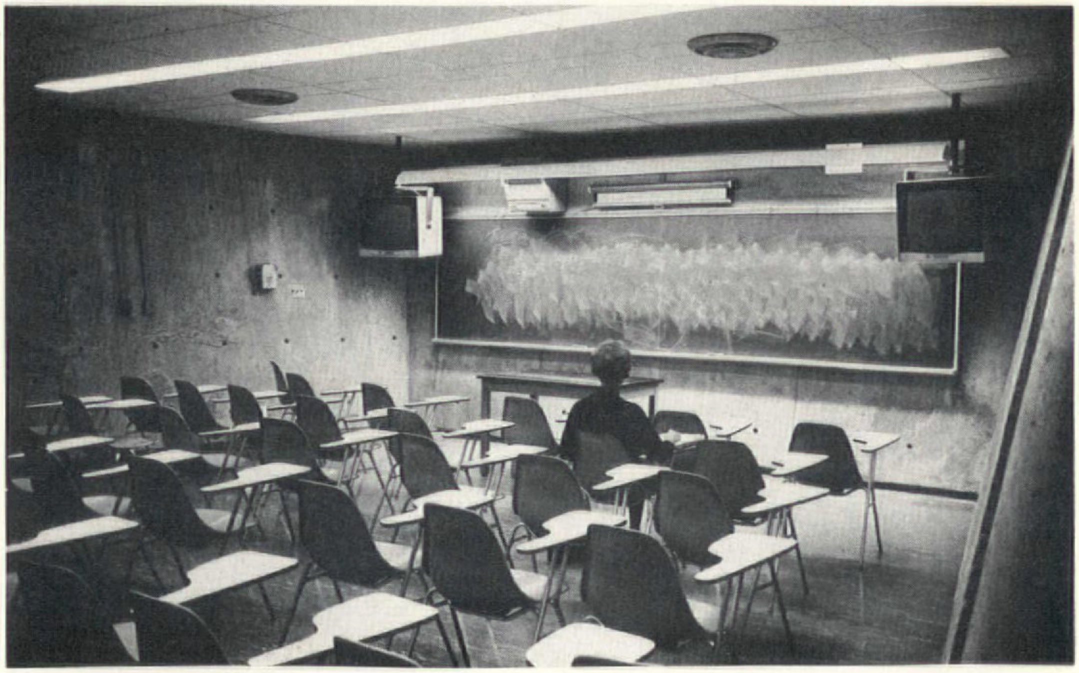

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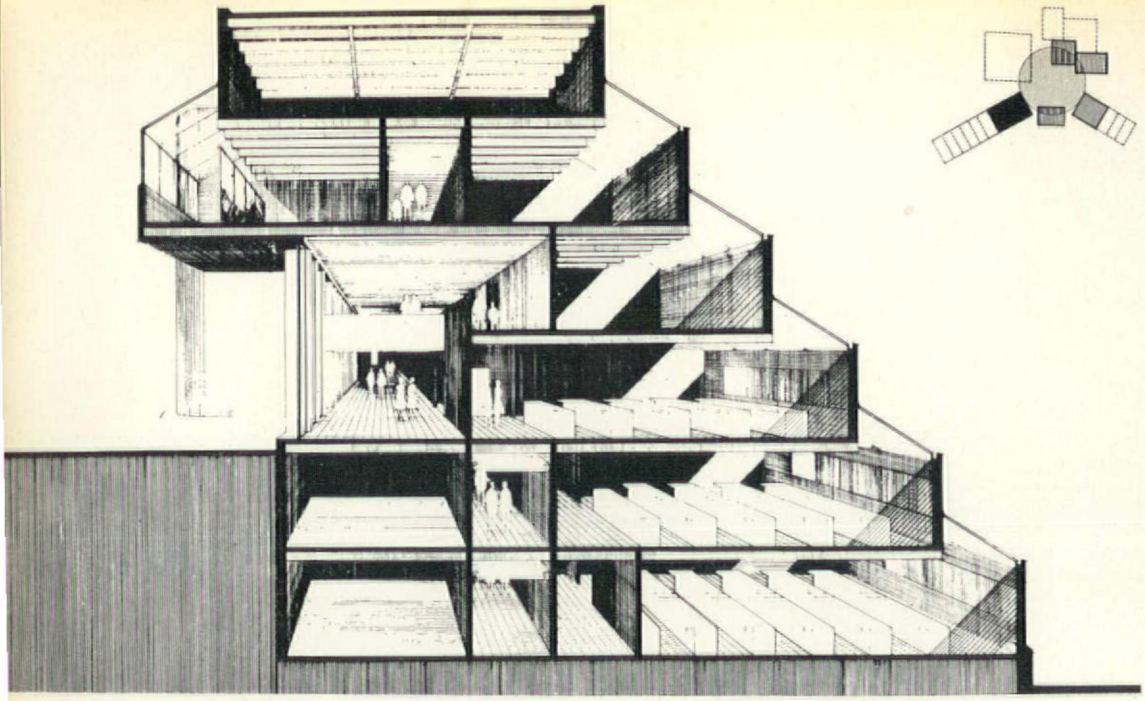

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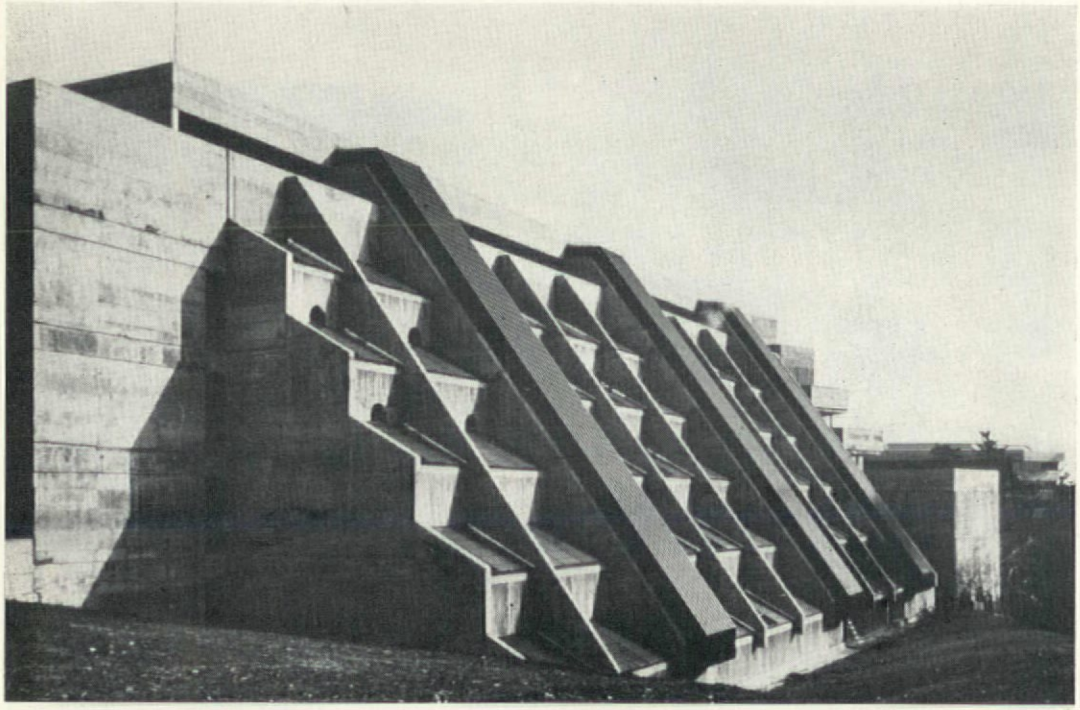

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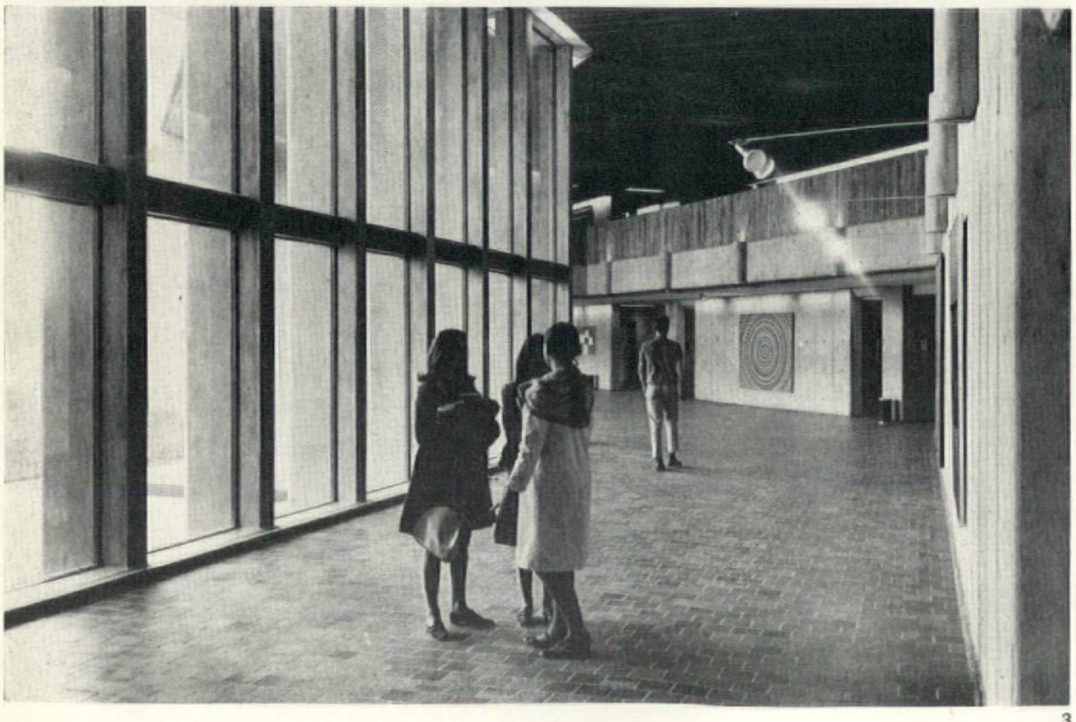

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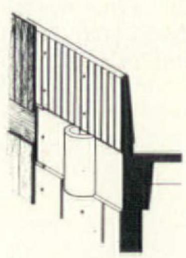
the rake of the whole now paradoxically being reversed. This rake in the humanities wing is mirrored inside the full height corridors, where three elevated access galleries are ranged in tiers above the pedestrian street; light filtering to all levels from a continuous lantern overhead. The raked section, maintained throughout the wing, is also adopted with modifications in the administration block, where it continues as tiered 'office-corridor' space around three sides of the enclosed central court. This full height court, flooded with light from the top has been designed as a 'meeting place' linking the pedestrian 'streets' of the two separated wings. It has been located where the plateau falls sharply away to the east, thus introducing a displacement of one floor height between the two sections. It is thus the natural assembly point of the total complex and is in consequence used for meetings as well as for dramatic and musical presentations. At 'street' level it is possible to walk the entire length of the building under cover, dropping down one floor from the science wing into the 'meeting place' and across into the cafeterias opening off the humanities 'street'. The 'street' in turn gives direct access *en serie* to the main lecture halls, while maintaining a continuous glazed wall to the south opening intermittently onto a sun terrace. One cannot but be impressed by the ingenuity and generosity of this organization and by its evident operational success. It is a success that is 'environmentally' supported by the consistent use of high quality internal finishes and by a felicitous light. The success is limited where the application of any particular finish veers towards the decorative, as in the considerable areas of applique match-boarding to walls and ceilings.



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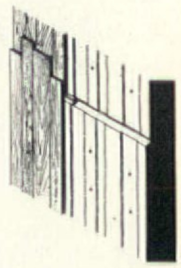

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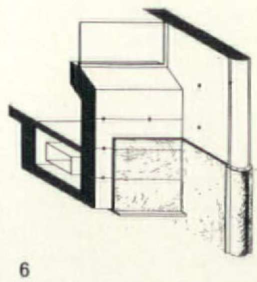

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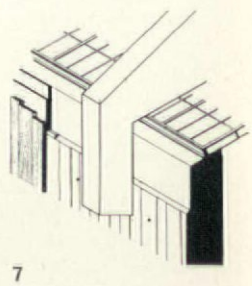

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Scarborough possesses a built-in allowance for variable patterns of use. The humanities offices are connected to the lecture halls in such a manner as to maximize the number of different itineraries between any particular office and a given lecture hall. Similarly, the spaced interjection of lecture halls into the science wing tends to maximize the use of those spaces, with a high frequency of change-over. As Oscar Newman has observed, 'The continuous problem of change can to some extent be avoided by the further development of the organic logic and hierarchical organization of spaces and activities—a solution which in itself goes a long way toward limiting the

need for large-scale future changes.' Scarborough is just such a solution and one which with its simple bi-partite organization reflects the continuing tendency of progressive North American universities to dispense with rigid departmental breakdown in order to achieve optimum use of facilities, greater interaction and higher productivity.
There is no doubt at all that Scarborough is a highly competent exercise in planning and fabrication. It is little short of incredible that design work was first initiated on Scarborough in the spring of 1964. The design team, comprising an architect, a planner and a landscape architect presented their final plans to the University in the fall of that year and the first stage, illustrated here, was on the ground by the summer of 1966. Scarborough must be rated a technical achievement at the educational level. It is packed with electronic equipment. Every lecture hall and laboratory is equipped with closed circuit television screens. Over every lecture-room blackboard three rear projection screens are provided for simultaneous presentation of education films and slide material. The central source for all this visual/educational output is the college's own television studios, one large and five subsidiary units. This TV complex is capable of relaying 11 instructional programmes at the same time to 50 separate classrooms. The college already employs 11 full-time television specialists who put the whole installation to work for 85% of the teaching day. In its physical layout as well, Scarborough departs radically from the traditional Anglo-Saxon quadrangular university. Of all the completed university complexes of recent years it is by far the most daring, comprehensive and radical, and as such merits serious critical attention.

It is finally as an intellectual achievement, that Scarborough appears at its most problematic. Others writing on Scarborough have already compared it to campuses of recent date, from the point of view of the campus or a prototypical city form. This suggests that one is to regard Scarborough as generic built form, as a manifestation of a continuous building type with wide ranging social and urban implications; an event to be evaluated both as a university solution and as a general system of environmental order. Such an assessment is perhaps only to be made on a comparative basis. In this we may follow the lead of Oscar Newman who has compared Scarborough to the premiated design for the Free University of Berlin. A more interesting comparison however may be drawn between Scarborough and an unpremiated project by the same architects, Candilis, Josic and Woods, for Bochum University (*AD* Aug. '64). In the first place both Scarborough and Bochum incorporate, to a different degree, solutions which are ostensibly open ended; in the second place both are located on heavily contoured sites by which their respective organizations have been constrained; finally both solutions initially involve a simple basic division into science and humanities buildings, these two basic categories being united in each case by a central core or spine. It is clear that the fundamental difference between these schemes depends upon the difference between *core* as opposed to a *spine* system of organization. Both in the Bochum scheme and in Scarborough planned growth is allowed for within certain limits, but on an entirely different basis.

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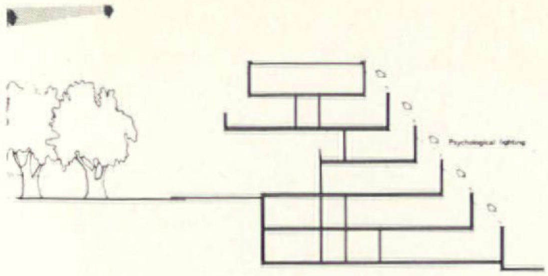

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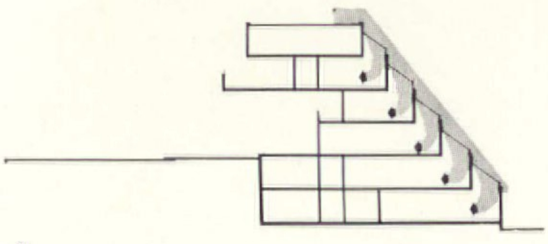

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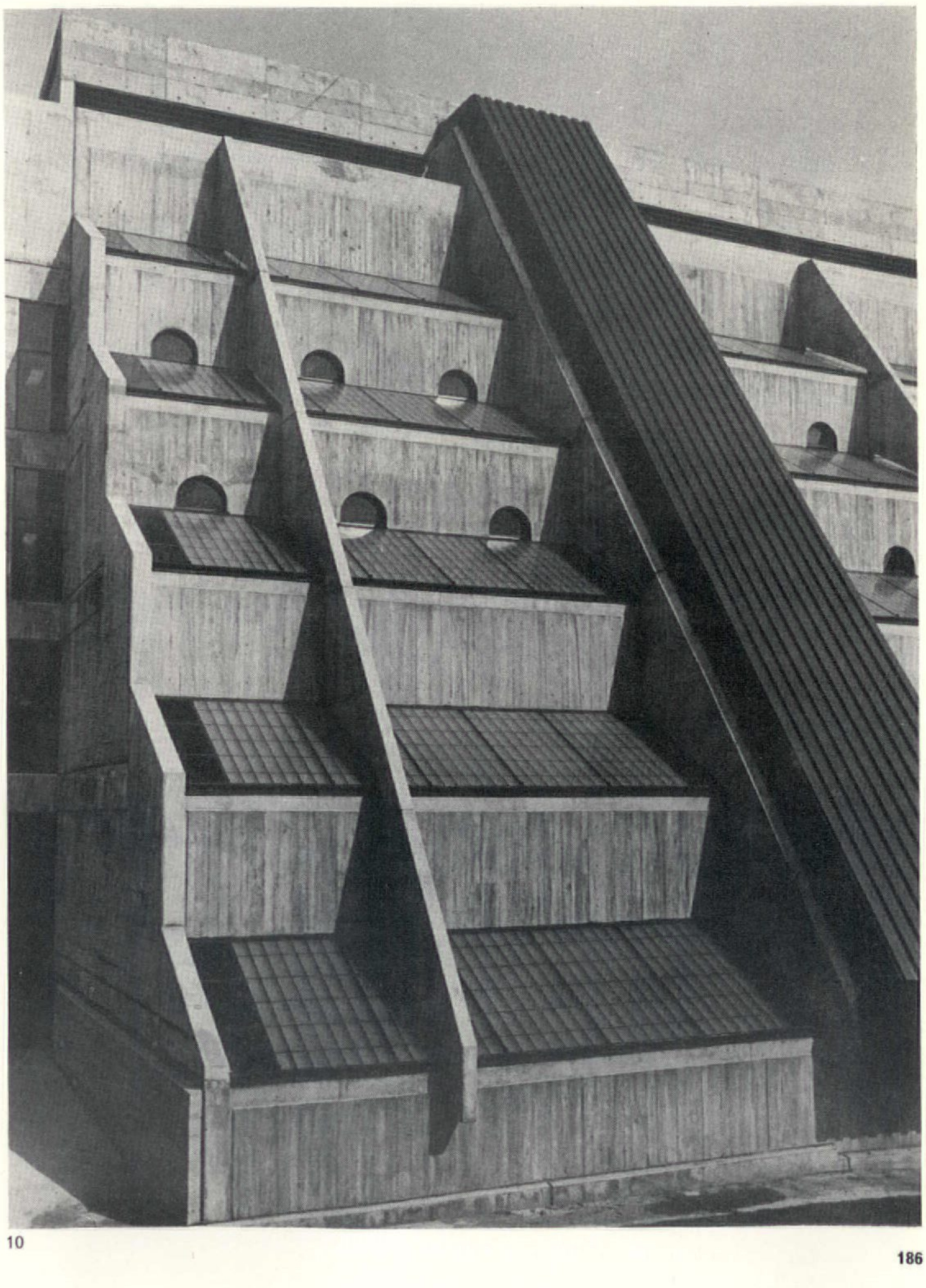
1
Diagrammatic section through science wing
2
South wall of the science wing
3
Pedestrian route in the science wing
4
Internal detail of the gallery to the pedestrian routes in the science wing
5
External detail of the rough board walling
6
External detail of the window spandrel in the administration block and humanities wing
7
External detail of skylight and rough boarded walling on south face of the science wing
8
Diagram indicating wind and light control
9
Diagram indicating the organization of air and ventilation and service ducts
10
Stepped south wall of the science wing showing skylit windows and raking service ducts leading to plant rooms at the top level
Photos: 5 & 6 John Reeves



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Scarborough rapidly exhausts the limits of its external growth in principle as a result of its essentially concentric system of organization. Bochum on the other hand is linear, and hence extendable in principle up to the external and internal limits of both site and programme. These differences of potential in organization prompt one to consider three further questions. Firstly, how is the so-called 'over-design' of flexible indeterminate building solutions to be assessed against the probable entropy of fixed physical forms? Secondly, with Scarborough in mind, how is an actual programmatic indeterminism to be expressed in a body of 'fixed' form largely shaped by empirical circumstances? And finally, what part can our inherited conceptions of architecture and urbanism be allowed to play in the evolution of our present model of an appropriate prototypical city form?
As to the first question, it would seem that there is no means of making a useful comparison except through protracted systems of analysis in conjuction with long-term 'feed back' from experience. Planned obsolescence is a vexed issue and perhaps only extensive economic extrapolation will begin to determine the degree of obsolescence which any given society can afford. The under use of expensive 'built-in' flexibility in realized, partially indeterminate solutions, tends to augur in favour of fixed forms.
The next two questions are best considered together, for they raise the whole issue of what we mean by our inherited concepts of 'architecture' and 'urbanism'. If, as Hannah Arendt maintains, our concept of architecture has built into it cultural connotations of being both public and permanent, in what realm are we to place this concept in situations that are largely dominated by the private and the impermanent? At what juncture, we may ask at a more pragmatic level, is the permanent investment of society most appropriately made and expressed? It is at the level of such questions that recent university solutions are perhaps to be evaluated as prototypical city forms; the university projects of Candilis, Josic and Woods for instance, postulate systems which clearly differentiate between public and private, permanent and impermanent and therby appear potentially to have wide implications for urban form. Although Scarborough, as a continuous enclosed building, inherently possesses potential as prototypical urban form, it is surely limited in its lack of systematic differentiation between permanent and impermanent elements. The issues raised by these considerations are far too complex to be pursued in this critique, nonetheless they suggest a direct comparison of the public and non-public elements in the Scarborough and Bochum solutions.
Bochum is bound together by a covered public spine, the equivalent of an 'agora' or a street, equipped with travelators and linear both in operation and in extent. Scarborough is internally and operationally united by a true 'agora' and externally and in picturesque terms only by a theatrical or vestigial 'agora'. One can hardly envisage that the short Canadian summer will ordain this open academic court as a public space of any consequence. In any case this space is badly connected to the true source of all agora life, the *café terrasse*—in this instance the cafeteria situated, unfortunately, without aspect, at the lower level. In Bochum the public spine is clear and is the fix, the classic 'ideal' ordering principle or point of reference against which the indeterminism of the academic accommodation acquires a true expression of its indeterminate status. In Scarborough, on the other hand, the concentrically situated agora does not assist, by contrast, to express the highly empirical forms of the science and humanities wings as something distinct. Indeed, as a public element it is externally almost indistinguishable from the humanities wing. In this form it is peversely separated from the wing; a separation which primarily serves to stress the picturesque agora of the 'academic court', through providing an appropriate slit view of the southern panorama. One has only to add the vestigial campanile of the chimney shaft, and the 'hilltown' is complete, rendering virtually unavoidable a picturesque reading of the central composition—the architect's own description only serving to reinforce such an interpretation.
Scarborough is ultimately rhetorical in the rampant empiricism of its detail; the literal concretization and plastic exploitation of empirical incident throughout remaining curiously at odds with the monumentality of its location, conception and construction. To modify in any ways these empirical forms would involve acts of preposterous surgery.
In making form the human mind seems eternally stretched between the extreme poles of classic and romantic thought. Bochum is as ultimately classic as Scarborough is romantic. The poles remain, and to bring to Scarborough the canons of a 'classic mind' is to render it totally incomprehensible, notwithstanding the undeniable brilliance of its conception, realization and well deserved worldly success. For Scarborough belongs to that nexus of thought whose Italy is shaped by Camillo Sitte, to that nexus which centres upon North-eastern and Central Europe and runs out via England to the New World across the sea. In America, Frank Lloyd Wright was its unremitting propagator and prophet. Its genesis in modern Europe is to be found in the thought of an Aalto, a Pietilä. It is equally the thought of a James Stirling or a Paul Rudolph. These men are all positively not of the classic mind—and neither is John Andrews.

Kenneth Frampton

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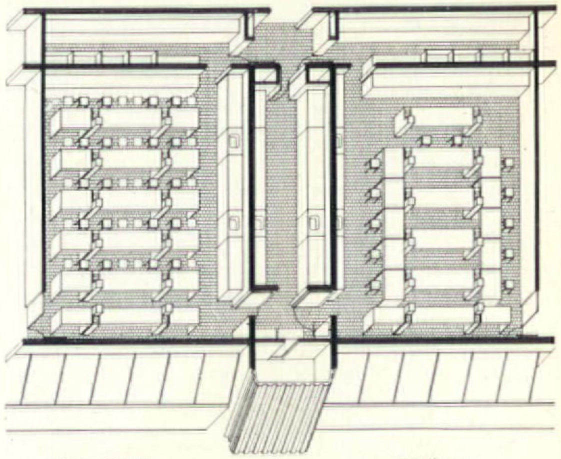

1
Alternative layout of undergraduate laboratories for experimentation on seminar work
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Laboratory interior
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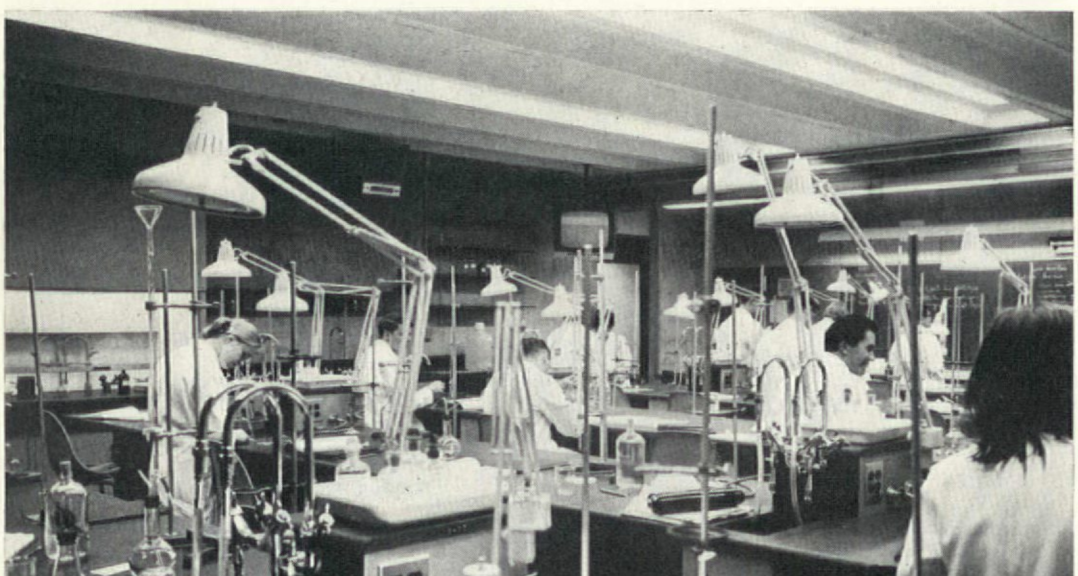
Photographic studio
Photos: 2 & 3 John Reeves



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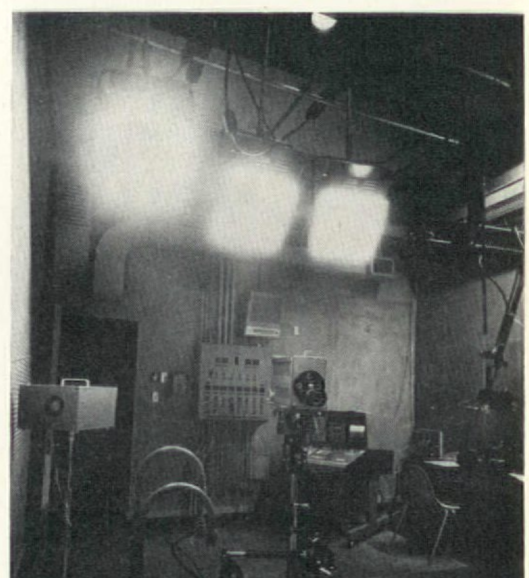

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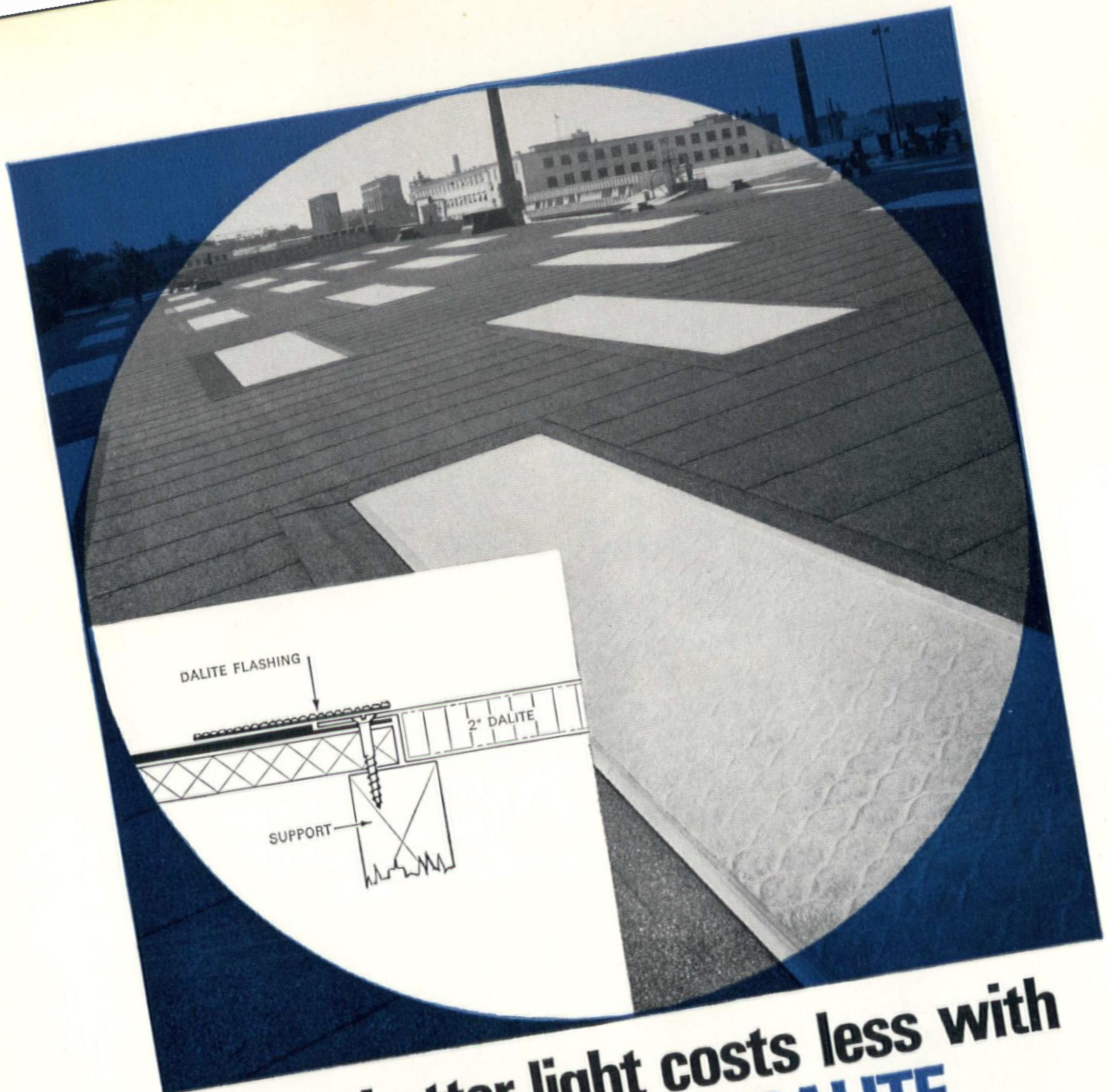

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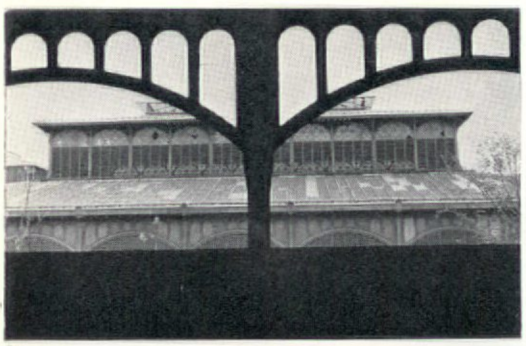

2

3

1, 2, 3 Les Halles is surprisingly free from motifs borrowed from the past, but there is a play of Gothic about the shapes of the roof-trusses over the crossings of the nave and one detail—a structural detail—derived directly from the Middle Ages. The vaults of the cellars consist of intersecting ribs of cast-iron, supporting curved brickwork panels—a paraphrase of the Gothic vault as interpreted by Viollet-le-Duc. *Photos: Humphrey Sutton*

Les Halles to come down

Hector Horeau (1801–72) first thought of building Les Halles, Paris, in cast-iron. His design was done in 1844 and developed during the years that followed. He proposed a great iron and glass structure, similar in appearance to Philibert de l'Orme's Salle de Fetes Royales, the forerunner of Dutert's Galerie des Machines. The design created an immediate stir. But it was not taken up.

The idea of building a vast centralized market for Paris was put forward first by Napoleon; other rulers toyed with it, but not until July 1842 did the Paris municipal authorities take it up in earnest. A commission was dispatched to England, Germany, Belgium and Holland to study markets, and several architects, Horeau among them, were incited to draw up plans. On 4th August, 1845, Victor Baltard (1805–74) was appointed, together with F. E. Callet (1792–1854), to prepare the official design. Horeau at once initiated a campaign against these traditionalists. But on 18th January, 1847, M. Rambuteau, Préfet de la Seine, accepted Baltard and Callet's project—for eight pavilions in stone—superficially inspired by the Baths of Rome, but in character more dull and inert than any Roman architecture. Public opinion was sharply divided and money was not at once made available. Not until after 1848 was construction seriously contemplated. More than forty-two new designs (many of them for cast-iron structures) were submitted by architects eager for the commission. In September 1851, the foundation stone of Baltard's first pavilion was laid. Within a year the building was complete; it was unpleasantly gloomy and stuffy and was at once and loudly condemned. Louis Napoleon himself visited the site and declared that a building of iron should be substituted for this *fort des Halles*.

'Quelque chose,' he suggested, 'de semblable a une immense gare de chemin de fer, une sorte de vaste parapluie de fer et de fonte'. Baltard was furious, but persuaded by the new Préfet de la Seine, no less a man than Haussmann, he submitted a new design within seven days, consisting of fourteen pavilions of iron and glass, with infilling panels of brick, linked together by high-roofed naves. The scheme had something of the breathtaking lightness and appeal of the Crystal Palace. The Emperor was delighted: 'C'est le même architecte,' Haussmann commented drily, 'mais ce n'est pas le même préfet.'

In 1853 the stone pavilion was demolished. In the following year the erection of the iron and glass structure that stands today was started. By 1857 half the work was complete, but by 1870 only ten of the proposed pavilions had been built. Now, after much dithering, *they are shamefully all to be demolished*—shamefully, not because they have a piquant history or, given that history, are a surprisingly successful and straightforward example of nineteenth century iron construction, but because their original purpose having been served, the authorities have no Haussmann firm enough to withhold the developers, and imaginative enough to retain the building as a communal space for Paris, as precise and neat almost as a Tuileries quincunx, but covered. Les Halles already has all the congenial atmosphere of an open-air market. It should be made a great centre of entertainment and fun. Despite its stupendous vistas and boulevards, Paris desperately needs places where people can gather together in crowds. There is still time for a change of mind. Already a vast new market is taking shape outside Paris (see p. 153). A somewhat academic committee—de Marien, Arretche, Charpentier, Guitton and Fougeron—is considering the future of Les Halles, but the outcome is likely to be ominous. Malraux, one hopes, will be induced to interfere. For the problems of Les Halles are not isolated, they impinge on the future of Covent Garden. *Robin Middleton*

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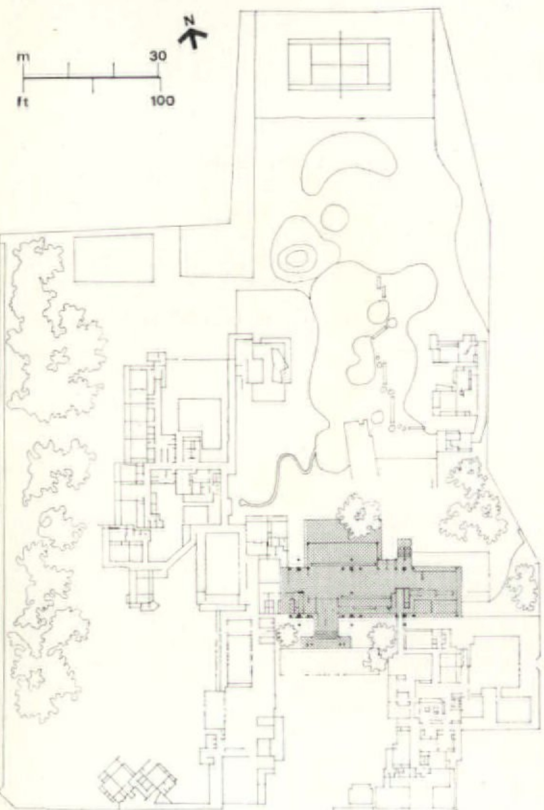


2

Hotel Tokoen

Kiyonori Kikutake and Associates

The existing hotel is an old one, facing quiet shores and forests that lie along the Japan Sea coast, outside the city of Yonago.

The addition of western-style public rooms to old inn buildings, without spoiling the courts and low wings of bedrooms intimately related to gardens, is not an unusual problem. In the traditional hotel the only communal room was the large bathroom, which, in effect, was for men, as women hardly travelled at all as individuals.

At Tokoen, Kikutake has added a compact central building, but one that provides for future change or expansion of the bedrooms, or even the public rooms. There is a main lobby, Japanese lunch room, front desk and administration office on the ground floor, conference rooms and a small Japanese-style banquet room on the mezzanine level, kitchens in the basement and a skyroom restaurant on the seventh floor. The bedrooms on the intermediate floors are both Japanese and Japanese/Western in style.

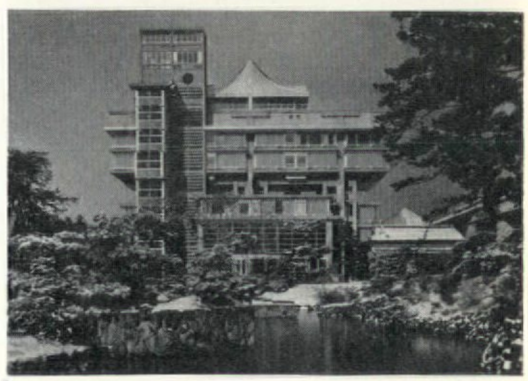
The main support of the building is given by six great compound columns or *nukibari*,* but the structural system involves suspension. This is because the central column in each case passes through the third, fourth and fifth floors to eight-foot deep trusses on the sixth (machinery) floor that support those floors on perimeter steel hangers. Light beams actually tie the floor slabs into the columns as well, to resist the excess loads under earthquake conditions. The idea for this modern use of the old *nukibari* principle comes from their use in such famous shrine ceremonial gateways as the one at Miyajima, where a couple of main columns, linked together by a massive lintel in one direction, are strengthened in the other by a couple of minor columns either side of each main column, joined in two places by stiff cross beams passing right through the main wooden column.

The possibility of change, in either the public or private sector, is inherent by virtue of their separation and independence of the main, permanent structure, called by Kenzo Tange the 'superstructure'.

The standard of finish is much higher at the Tokoen hotel than at the Pacific Park Hotel on the next page. More important, it has an almost mystic feeling of high purpose, especially as seen from outside. Its tough *in-situ* structure, which is generally visible, and aluminium sashes and plate glass contrast well with the traditional Japanese buildings around it—heavy roofs of blue-black pantiles, always at the same pitch, always following the changing ground levels, with sandy coloured walls to preserve privacy in the gardens near the guest rooms, cypress in various stages of weathering and window glass set well back so it seldom becomes a mirror, but allows one to see through to the white *shoji* panels which make even the glass walled spaces private.

Jeremy Dodds and Nobuo Hozumi

*Concerning the position of the column as the basic space definer in Japan, one should note that the Shinto site dedication ceremony consists of defining a space by placing four freshly cut bamboos at the four corners of a square and making it sacred by connecting the posts together with a special straw rope with strips of white folded paper attached to it.



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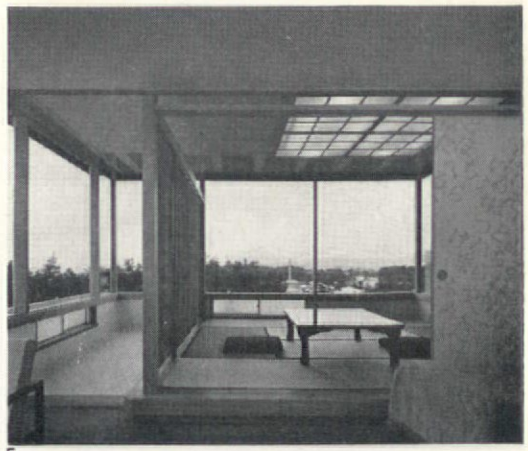

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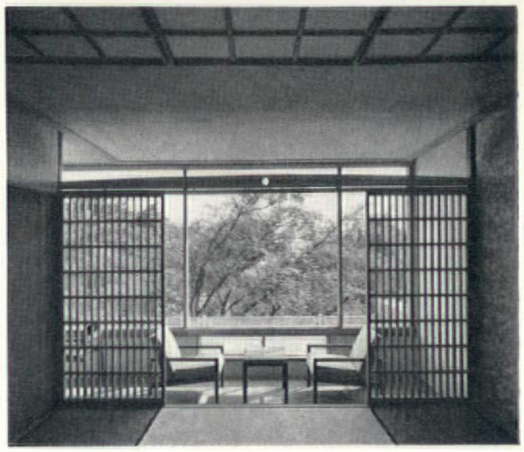

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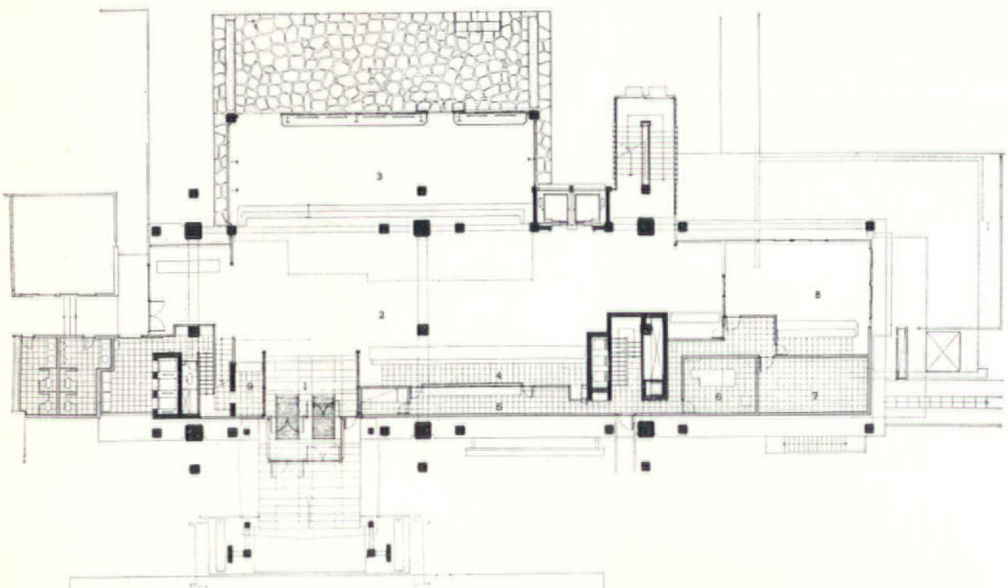

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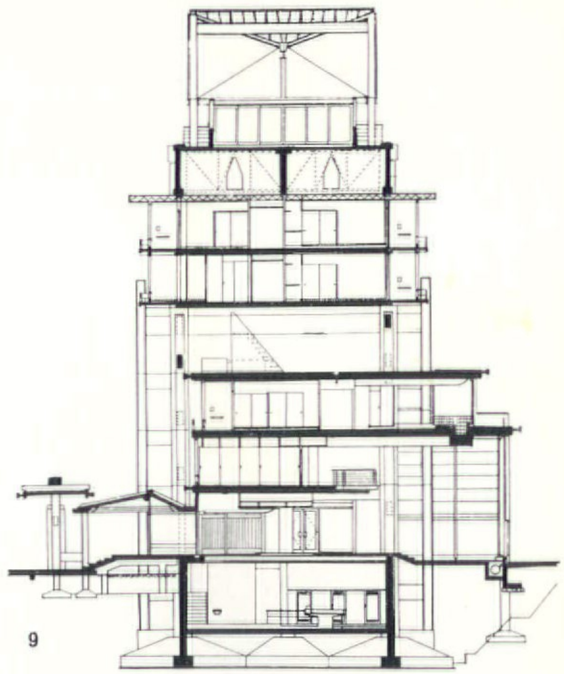

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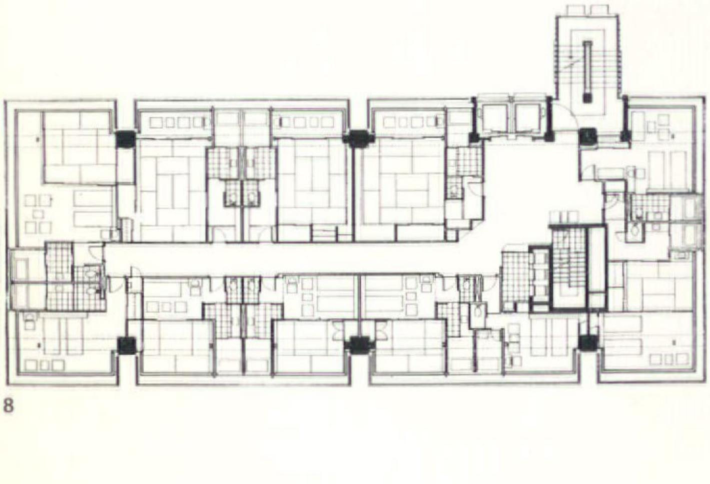
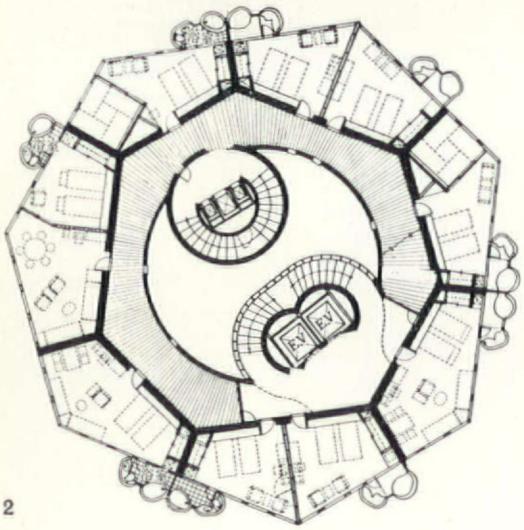


8

Key
1 entrance
2 lobby
3 lounge
4 front office
5 office
6 telephone exchange
7 reception room
8 dining room
9 cloak room

1
View of the upper floors, from the south, looking over the roofs of the existing hotel. The 8ft beams from which the 4th and 5th bedroom floors are suspended is readily apparent
2
Site plan
3
View of the south façade from the garden
4
The main lobby seen from the mezzanine floor on which are the private dining and conference rooms
5
View from one of the large suites
6
Tatami room with western-style sitting space beyond
7, 8 & 9
Ground and fourth floor plans and section

1



2

1
South Pacific Hotel from the beach
2
Typical bedroom floor plan
3
Exterior from the playdeck.
4, 5 & 6
Indoor swimming pool, lobby and Typical suite
7–15
Variations possible in the layout of the plastic bathroom pods and elevations and sections of the pods
Photos: Taisuke Ogawa

Pacific Park Hotel

Kiyonori Kikutake and Associates

In the centre of the Kanagawa prefecture's long beachline, facing the Pacific Ocean (a growing playground for the Tokyo megalopolis) a romantic hotel tower rises, with Mt Fuji in the background.

In the original design the elevator and service towers were to rise much higher to allow for bedroom expansion upwards, and these bedrooms were to be emphasized by separating them from the public rooms below. For economic reasons, however, the intermediate space has become a restaurant, etc.

The whole consists of a hotel, a group of three restaurants and amusement facilities, and a broad playdeck with several swimming pools. The public is divided into two streams, the casual beachgoer who enters at playdeck level and makes use of the bowling lanes, several restaurants, shopping arcades and an exotic plant-adorned indoor pool. A ramp leads to the first floor entrance of the hotel where are the main lobby, front desk, and dining room. The finest spaces of the lower level are the twelve-lane bowling alley with its tubular space frame trusses set unusually low, and the pool enclosed in a tall lozenge-shaped space, glass walled on two sides. Above the open space on top of the public area (now a Chinese restaurant and wedding ceremony/reception rooms), the irregular seven-sided bedroom stem begins, which is cantilevered from a thick-walled seven-sided structural tube. The wall gives privacy to the bedrooms and also carries the winding ramp around the hollow core to the five bedroom floors. Each floor contains no less than four types of bedrooms, each with a different view to Sagami bay. The plastic form of the building is heightened by the bathrooms which are cantilevered out beyond the bedrooms in prefabricated 'pods'. These are made up from two PVC shells that can be joined together in various ways around a $1\frac{1}{2}$ in steel pipe. They could be removed later and replaced with other models. The spiral ramp is lit by slit windows in the hollow core.

The sky restaurant and bar on the tenth and eleventh floors, which one eventually reaches by ramp, has a magnificent view of sweeping shoreline, pine-covered island of Enoshima and the wild Eboshi rocks that rise sheer out of the sea like a ship's sail. The rich turquoise carpet, comfortable, soft purple chairs and pale lilac table cloths, together with the aluminium light fittings and window sash and the white ceiling, make the interior worthy of the bright sea view.

JD and NH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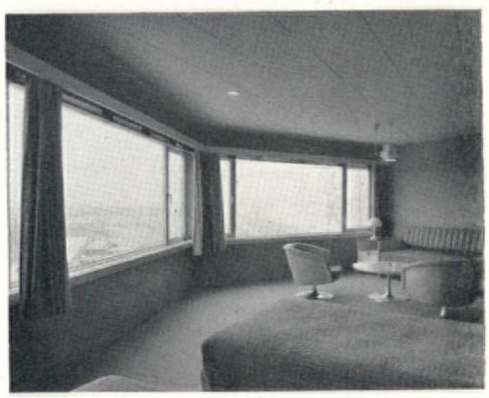
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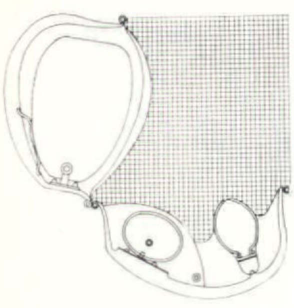
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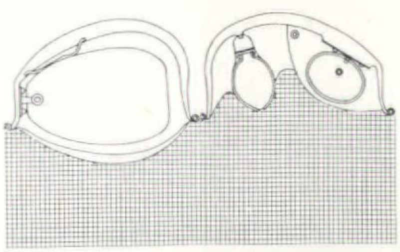
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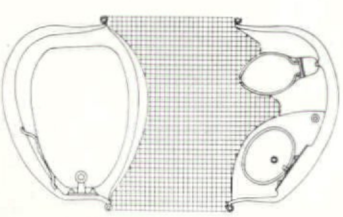
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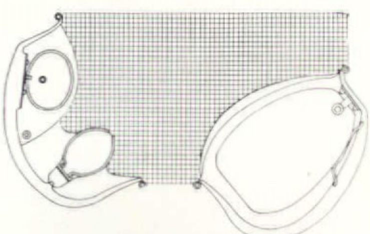
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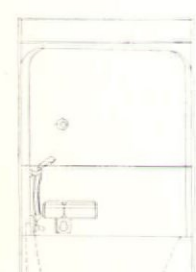
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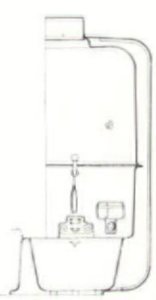
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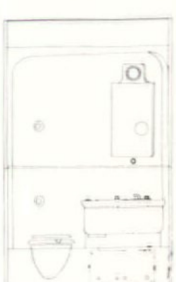
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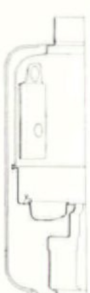
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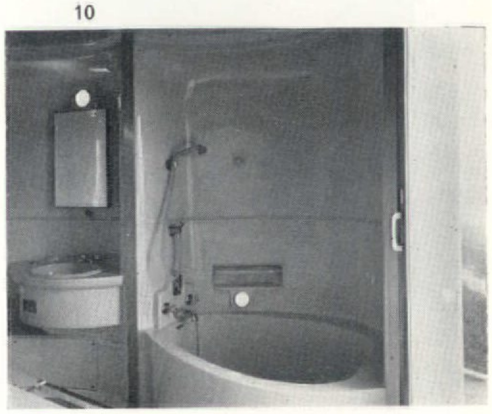
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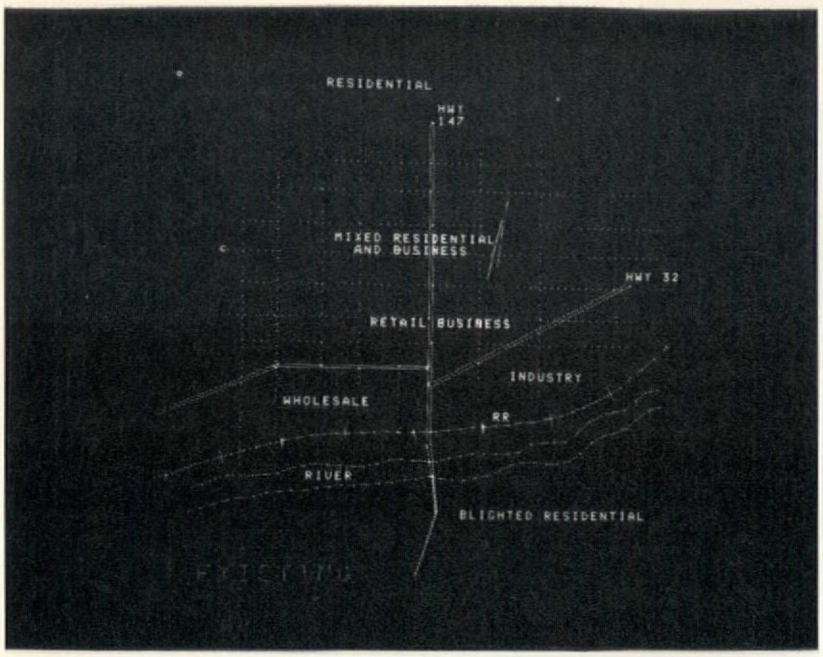
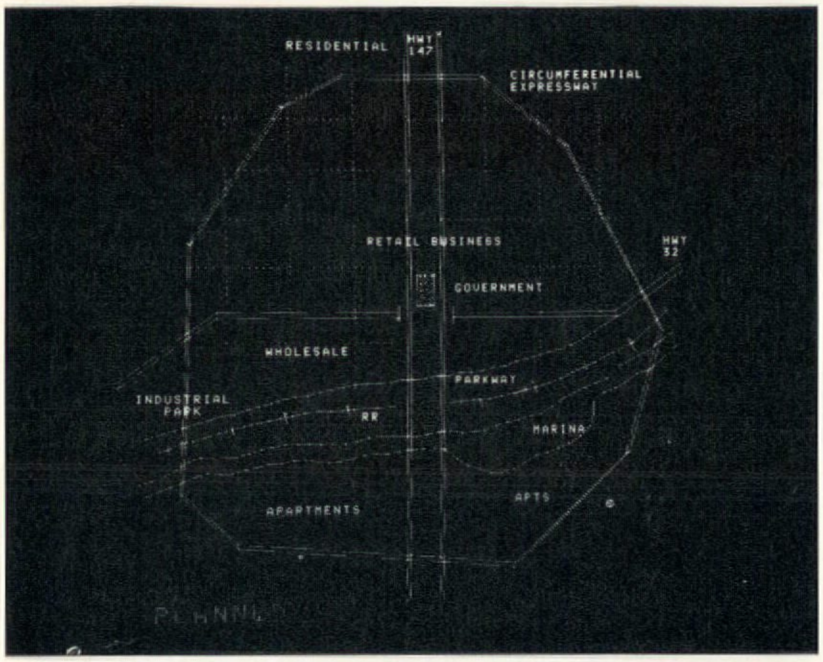
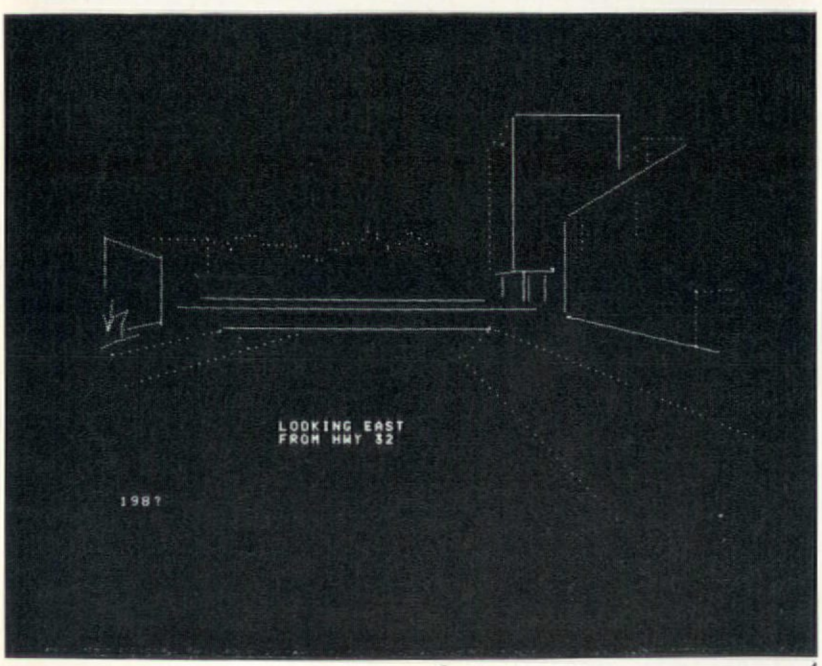






1

Graphic computer equipment in 'conversational' use. In the foreground, the Grafacon, a graphic input tablet. In the background an oscilloscope display

2 1

An oscilloscope computer display suggesting applications in urban planning

Photos: courtesy Welden Clark

2

Architectural practice and the computer revolution

Theodore H. Myer (Bolt Beranek and Newman Inc.)
Richard I. Kraus (Ashley, Myer and Associates)

Architects are poorly prepared for their information handling role. Possibly because the actual procedures involved seem repetitious and uncreative, this aspect of their professional work is slighted. As clients become anonymous populations and corporations, as the number of social and technical experts and the degree of their expertise grows, as more technical factors are discovered and compounded, the information that architects must deal with becomes increasingly voluminous, complex, uncoordinated and incomprehensible. It is imperative that architects develop new ways to master and handle information.

The architect uses pencils, paper, crude drawing tools and telephones. But, these tools are inert; they do not, by themselves, add to the architect's ability to organize, check over, expand, or add data to the information with which he must deal. His present tools only impose limitations and compound the chance for error. Yet, an active machine, ideally suited to handling large bodies of information does exist—the computer.

In some of their work, architects, and more typically, engineers and contractors are already using computers.

Computer applications in the building industry include:

Stress, a computer system developed at MIT, that analyses the stresses, displacements and distortions in a structure, given a description of its layout and members.

A system developed by IBM that selects steel members when given a geometric description of the structure to be designed.

A Westinghouse system that calculates heating and cooling loads for a building and then simulates its internal climate hour by hour throughout a typical year.

Cobestco, a computer system developed by Professor L. R. Schaffer at the University of Illinois that helps contractors at cost estimating.

Computer studies, by Skidmore Owings and Merrill, of the economic factors influencing building height.

Numerous instances of computer-aided project scheduling using the critical path method.

Several prototype computer systems that aid in specification writing.

As time passes, more and more separate and distinct problems will yield to the computer. However, of greater significance will be the development of more general, comprehensive systems that come to grips directly with the architect's central problem of information control. Systems of this sort do not exist today. But the basic ingredients for them do exist in the work being done in a number of fields of computer research.

Computer graphics

Architects have shown considerable interest in this field because of their great concern with graphic information and more efficient ways of handling it. There are two kinds of graphic system. In one, found typically in the aircraft and car industries, the computer manipulates existing graphic information, producing projections such as perspectives, stereographic pairs, and sequential views for animated films. These systems include automatic scanning devices for entering existing drawings into the computer, and elaborate recording equipment, such as automatic plotting boards and microfilm recorders. However, the user must enter rather complete graphic data into these systems; he has relatively little power to modify the object depicted or to construct drawings with the computer's help.

By contrast, systems of the second sort include less elaborate input and output gear, but place heavy emphasis on construction of drawings through interaction with the computer. A product of groups concerned with pure computer research, these systems let the user converse with the computer using an oscilloscope and light pen, or specially constructed tablet. The power of these systems lies in the graphic languages on which they are based. Building upon the basic geometric relationships inherent in any drawing, these languages include commands that cause the computer to straighten free-hand lines, construct standard geometric figures, copy repetitive parts of a drawing, and the like. Often the user can move the parts of a drawing about, and change the drawing's scale, working with a small part of it at high magnification. In some cases, he can draw in three dimensions, constructing a mathematical model of a three dimensional object. Inherent in these systems is the power to relieve a human designer of much of the redundant, repetitive effort required in recording his decisions by hand. However, graphic languages have not yet developed to the point where this power can be used on a production basis.

An exciting development in graphics work is the provision for associating other than graphic meaning with the parts of a computer-stored drawing. In a recent demonstration at MIT's Lincoln Laboratory, a researcher sketched an electrical circuit at the graphic console. The computer then operated the circuit he had drawn, displaying the electrical wave generated by that particular configuration. It is easy to see how this capability could be useful to architects. The symbols of an architectural drawing could, to take a simple example, be associated within the computer with the costs and properties of the materials represented. ▷194

shower in the house

Times have changed. A shower's the thing! The right thing. The done thing. The thing of the day in the modern home. Tingling freshness, exhilaration, right at the finger tips. Set the temperature, set the flow. Accurately, with no nonsense. Out in a flash or stay to soak. Full of zest and the joy of living — BUT. It must be a Leonard shower. With its unfailing dependability, its simple, spot-on, finger-tip control of water, temperature and flow. Shower in the house. Get under it. Get with it. Install one yourself. You'll never hesitate to recommend it.

a leonard thermostatic shower

WALKER CROSWELLER & COMPANY LIMITED CHELTENHAM GLOS.

```
*TYPE 2+3
     2+3=    5
*
*TYPE 2*3,2/3,2↑3
     2*3=    6
     2/3=     .6666667
     2↑3=    8
*
*TYPE SIN(SPI),COS(0),LOG(2),LN(2)
 SIN(SPI)=    0
   COS(0)=    1
   LOG(2)=     .30103
    LN(2)=     .6931472
*
*SET X=5
*TYPE X,2*X↑2,LOG(5*X-15)
        X=    5
   2*X↑2=   50
LOG(5*X-15)=     1
*
*FORM 1
  #.##     #.##↑↑↑↑    #.##↑↑↑↑    #.###    #.###
*
*TYPE A,A↑2,A↑3,SQRT(A),A↑(1/3) IN FORM 1 FOR A=1:1:5
  1.00    1.00+00    1.00+00    1.000    1.000
  2.00    4.00+00    8.00+00    1.414    1.260
  3.00    9.00+00    2.70+01    1.732    1.442
  4.00    1.60+01    6.40+01    2.000    1.587
  5.00    2.50+01    1.25+02    2.236    1.710
*
*PLOT SIN(X),COS(X) ON X*180/SPI FOR X=0:SPI/10:2*SPI
```

◁193

Simulation

Work on military planning and complex weapon systems has yielded a number of mathematical techniques potentially useful to architects. In one of these, a physical entity, or system so complicated that its behaviour cannot be determined analytically, is studied by building a mathematical model and operating the model in simulation of the system.

Coplanner[1], a prototype computer system that applies simulation techniques to architectural design, the user describes a building by sketching its floor plans with a light pen on an oscilloscope display. The computer converts this information into a numerical description of the indicated physical layout, and applies it to other programs that simulate the building's behaviour. This prototype system is at present limited to one aspect of performance—the efficiency with which people and goods can flow through the building. To make this analysis the user enters, with the light pen, a series of graphs that contain statistical information on the expected circulation. From these graphs, the computer generates a series of specific, but imaginary, trips and then runs them through the model describing the building. The resulting tabulations and graphs indicate to the user the efficiency of his layout, points of traffic congestion, and so forth.

Time sharing

About a decade ago, computer researchers conceived the idea of taking the computer out of the remoteness of the computer centre, and placing it in direct partnership with its human user. This approach, its proponents felt, would capitalize on the disparate natures of the partners—the imagination and intuition of the man and the rapid and accurate clerical ability of the machine. Unfortunately, the slow-thinking man made too little use of his far more rapid, but expensive, partner to make the approach feasible economically.

As a way out of this dilemma came the notion of sharing a single computer among a number of users; the technical realization of this idea is known as time sharing. In a typical time-sharing system, the computer devotes a fraction of its time to each user, switching its attention from one user to the next so fast (as rapidly as forty or fifty times a second) that any single user feels he has the full attention of the machine.

Time sharing has brought man-machine partnership into being in a number of university and commercial time-shared systems. Physically, such a system consists of a central computer connected by telephone or telegraph lines to a number of frequently distant user stations. Generally, the user can converse with the computer in a wide variety of languages; fragments of a conversation in Telcomp[2], an algebraic problem-solving language are shown in **3**. Because architects must coordinate their work with others, it is significant that certain time-shared systems let the users share the programs and information in the system. The flow of information through systems of this sort is carefully controlled to take account of the nature of the information itself and the status of the individual users. Confidential information is protected from access by unauthorized users, and vital information is similarly protected from destruction or modification. However, within these limits, remotely located users jointly add to the fund of information in the system and automatically receive information generated by others.

Information retrieval

In developing computer systems where users share information, one problem is how to organize, catalogue, and gain access to information in general. Researchers in this area are concerned with problems created by the information explosion in the sciences and technical fields. Their work relates to the architect's problems because the architect also must deal with greatly increasing amounts of information.

Computer systems that manage information can provide automatic catalogue and index systems that let the user locate documents far more rapidly than is possible with a card or book catalogue or a manual filing system. More significantly, the information in a computer library can be linked automatically to programs that manipulate it and relate it to other information. This means, for example, that a library of cost data could be linked to the computer-stored description of a building project in order to produce cost estimates and update them as changes are made in the design or prices.

Communications systems

In a time-shared system, the computer can be used as a communication device. A prototype information system, designed with this idea explicitly in mind, is being developed jointly by the Massachusetts General Hospital and Bolt Beranek and Newman Inc in Boston[3].

Messages entered through teletypewriters in the hospital are read by a central computer and routed according to their content to other users, a central file, or any of a number of processing programs. For example, information extracted from a drug prescription, entered at a nursing station, goes to the pharmacy, the accounting department, and the central medical files. It is checked against computer-stored drug inventories, and for counter-indications in the patient's history, and is added to his bill and permanent record. In this system the computer eliminates most clerical work and record keeping, as well as aiding in human judgment and decision-making.

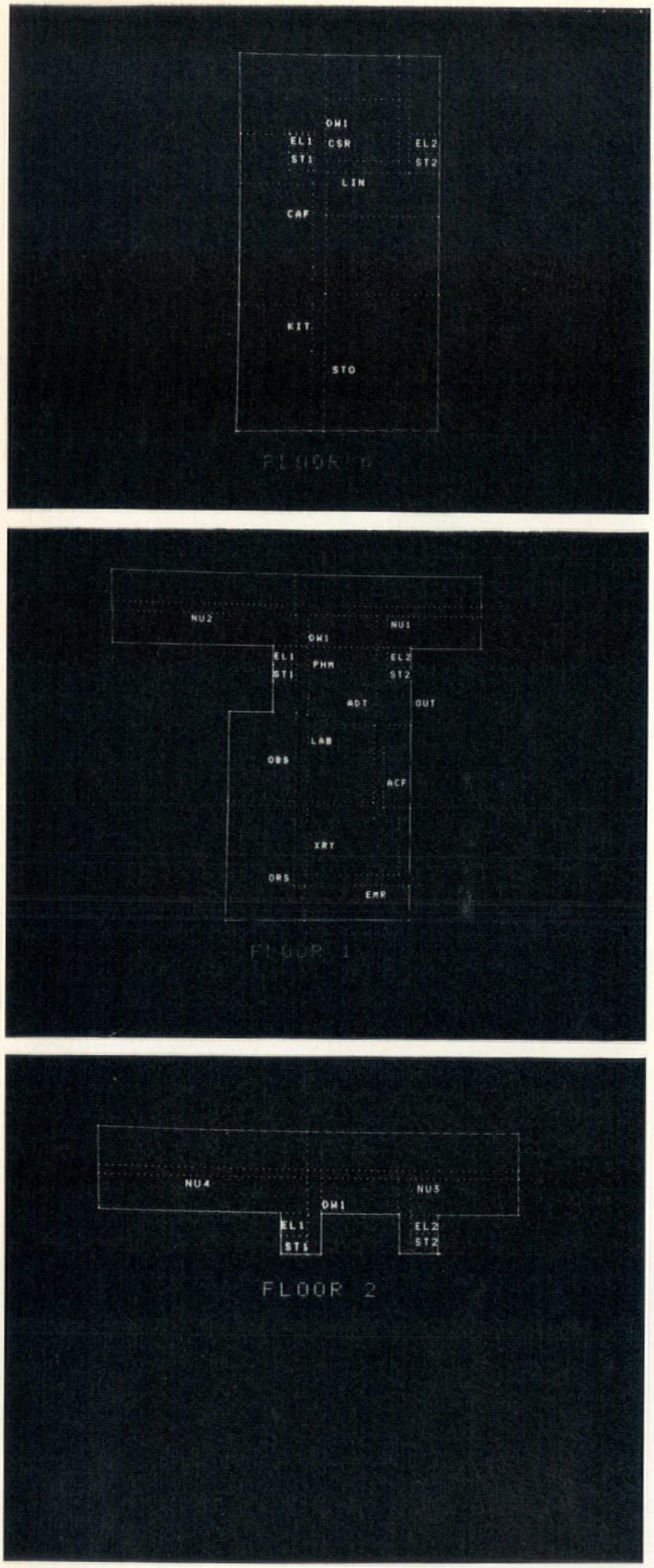
Artificial intelligence

About a decade ago, researchers began experiments aimed at making the computer behave in ways that men would call intelligent. This work led to computer systems that play games, solve algebra problems stated in everyday language, and recognize graphic patterns. While still very much a research activity, work in artificial intelligence nevertheless has ramifications of practical interest to the architect. ▷195

[1] Coplanner is described in more detail by J. J. Souder, W. E. Clark, J. I. Elkind, M. B. Brown. *Planning for Hospitals, A Systems Approach Using Computer-Aided Techniques*. American Hospital Association, Chicago, 1964.

[2] Telcomp is offered in the Boston area by Bolt Beranek and Newman Inc.

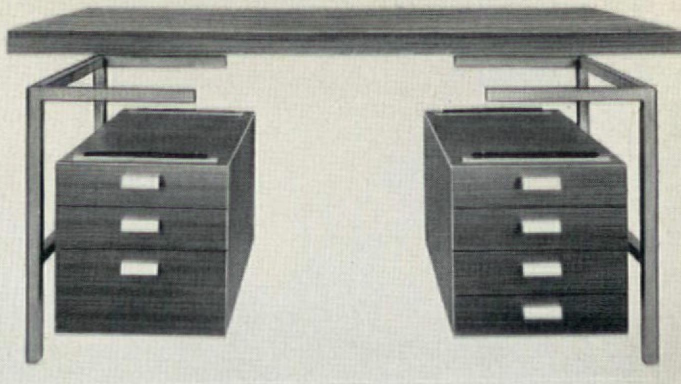
[3] This project is supported by the National Institutes of Health.



3
Fragments of a conversation with a time-shared computer. The user enters commands (underlined) and the computer executes the commands

4
Floor plans of a hospital as shown on the computer display after entry by user

Photo: courtesy Welden Clark



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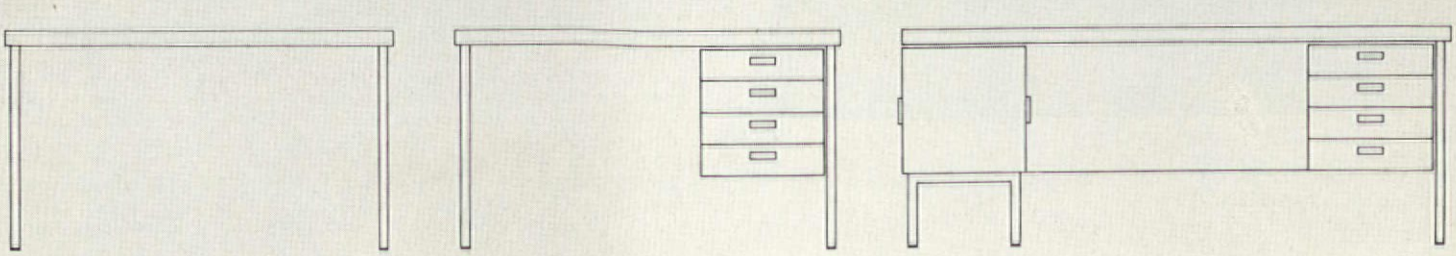
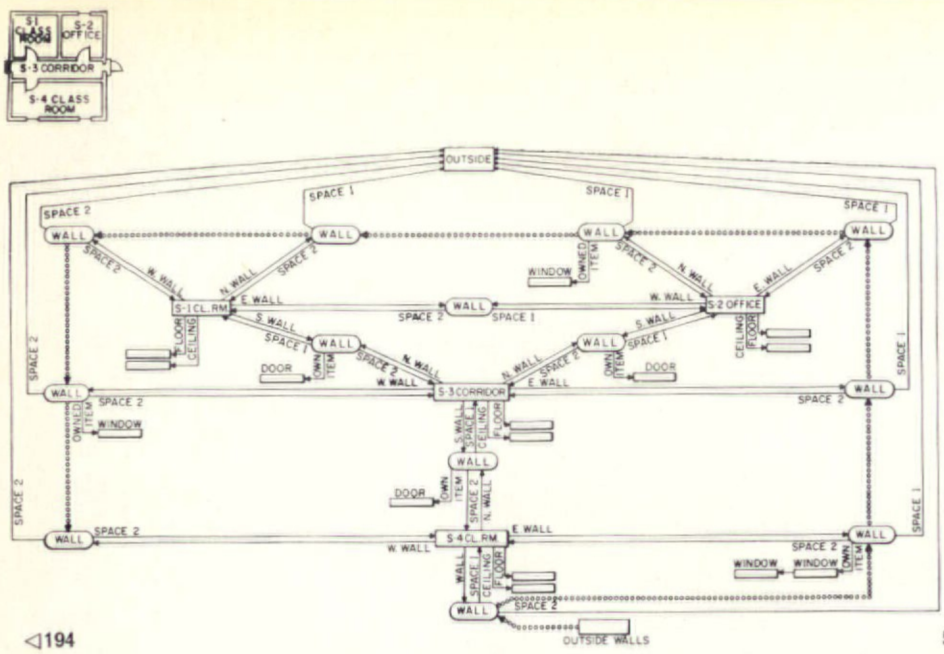
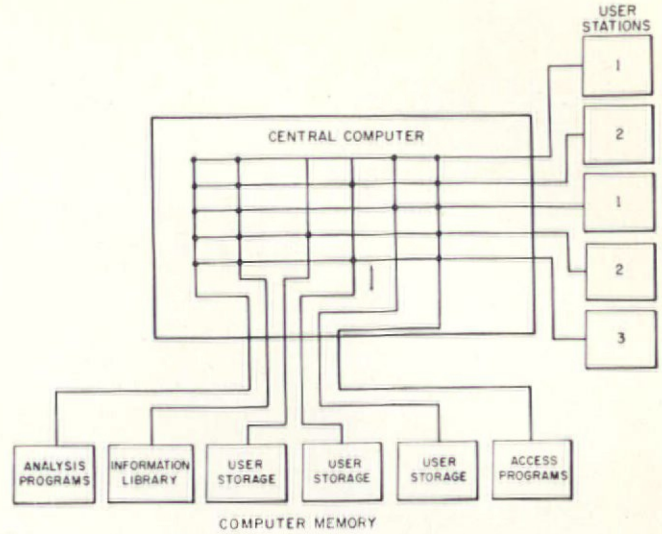






◁194

5 6

If the computer is to analyse intelligently some part of the real world, then it must be given a realistic model to work with. To be realistic, such a model must indicate not only the objects that make up that portion of the world, but also their properties and the relationships between them. Furthermore, if the piece of the world is to be analysed from more than one viewpoint, then successive networks of properties and relationships must be overlaid upon one another to link together its component parts. One of the important accomplishments of artificial intelligence work is a number of computer languages that make possible these ways of organizing information.

Data structures of this sort are precisely what is needed to describe complex objects such as buildings. Central to a computer system intended to help the architects might be a single body of information, serving as a model of the project being designed, and subject to scrutiny and analysis from the diverse viewpoints of the designer, the client, the engineers and the other specialists working on the project.

A comprehensive system

In surprisingly diverse fields, computer research is proceeding today that promises to be of practical use to architects. However, the work we have seen appears as a series of fragments and the question naturally arises, how can these be put together into a useful whole.

The basis for this whole, or comprehensive system, probably lies in time sharing. People involved with the economics of time sharing predict that in the United States it will grow in a decade into a 2·4 billion dollar industry. At that time, we can expect to see time-shared computer networks, somewhat like public utilities, offering a variety of services. Such a system, or part of one, suited to building design might have five components:

Equipment

Keyboard and graphic input devices, soft and hard copy output devices in the architect's and related professional offices; a large central computer; a communication network such as the telephone system joining the two.

Information

Public information including engineering, planning, and cost data; private information describing each subscriber's project, accessible only to him and his associates.

Access

A graphic language for entering descriptive information about a project and for viewing information previously entered. Views obtainable equivalent to details, plans, perspectives, etc. An information retrieval system for access to public reference information and for linkage between reference and project information.

Analysis

Engineering and analysis programs, as listed earlier, serving as modules in the system, and linked automatically to information in the system.

Communication

An executive program to oversee the transfer of information through the system, and to provide a message handling facility. Messages would include notices of design changes, new products, etc.

Impact on architectural practice

If such a system is created (and some workers feel it is less than ten years away), the architect's working environment will change. The change will affect both his techniques for working and the nature of the problems he undertakes.

The change in his techniques will be dramatic. His principal working tool, both for written and graphic analysis, will be the computer. Because the computer excels at routine calculation, he will spend far less time than he does today on such chores as manipulating cost estimates, planning project schedules, and the like. Because computer drafting will be a more efficient and less repetitive method of encoding information than the manual sort, architects will spend less time at this task too. If the computer serves as the chief repository for design information, the design process may become continuous in a way unachievable today. Rather than make succeeding sets of discrete drawings, each appearing with an increased amount of detail, the architect may continuously build up and modify a single block of information.

The coordination problems, generated by the separation between architectural and engineering drawings may also disappear if engineers are allowed to add their input to this same body of data. There is also the possibility, through simultaneous use of computer stations in separate offices, of conferences where distantly located participants discuss and perhaps change a single body of information. Additionally, the architect will no longer need to keep the morass of paper documents that he requires today; if needed, preliminary sketches, working drawings, specifications, and even quantity surveys will be obtainable, as hard output from the computer. Made available to the contractor, this computer-stored information might also become a direct basis for bids, shop drawings, and construction schedules.

Carrying further the notion of a computer-based communication net, it may affect the entire construction industry. If manufacturers and contractors are allowed to exchange information directly with architects and engineers through the computer, the resulting computer-based market may be more fluid, less local, and consequently a larger market place than now exists for the single manufacturer or contractor.

Often industries have first turned to the computer to help them perform their present tasks more efficiently. However, further adaptation and study leads to basic changes in the service given. Likewise, architects can expect that using the computer will ultimately change the services they now perform.

The architect spends much of his time processing information. With the aid of the computer, he will be able to expand upon his ability to perform this role. For example, clients generally provide the background data and analysis of such factors as the economic and social goals of a project. However, as a more efficient information processor, the architect may well perform such preliminary analyses, so that their conclusions can be more flexibly handled during the design process.

A computer-based communication system can not only enlarge the market place for each contractor, but might stimulate further industrialization of the building industry as well. In that event, the structure of the architectural profession might change.

For example, one might argue that three different specialties will develop. First, there might be architects developing products or building systems for manufacturers. Second, there may be other architects who design by assembling catalogue parts and modifying the basic manufactured component systems. And third, there might be professionals consulting with appropriate authorities and giving direction to the whole mechanism of the building industry. These last professionals are least like the architects of today, because there does not yet exist sufficient organization in the industry for them to operate.

As well as changing the architect's role, the computer may also change his approach to design. The task of assembling a computer system to assist in architectural practice will require a thorough and systematic investigation of what an architect does in designing and communicating, how various design criteria are really established, the relationships between structural demands, modular flexibility and budget, and so forth. In other words, there must be established, as a matter of necessity, a precise, unified architectural vocabulary and theory of how designing is done. Such a theory may be limited at the start and may evolve slowly; but, if this development causes the hitherto intuitive design operations to be done more rigorously (i.e. on the basis of theory) its effect will be revolutionary.

Odi et amo

Because it is hard to foresee even a fraction of the repercussions that will come from employing the computer, it is difficult to know whether we should welcome or fear the prospect. Any computer system will impose restrictions on the architect. In order to describe a building to a computer, assumptions about the form of its elements and the relationships between them must be built into the system. For an architect to use different elements, or relate them differently than was assumed correct by those developing the system, might be difficult and cumbersome. Even worse, this conceptual framework, built into the computer, might become in time the framework for the architect's thoughts—so that not only would innovation be difficult to carry out, but difficult to conceive as well. However, one should not conclude that the computer will be a bad influence; rather, one must conclude that enormous care and great attention should be paid by the best talents available to see that a good framework evolves and that sufficient flexibility is built into it.

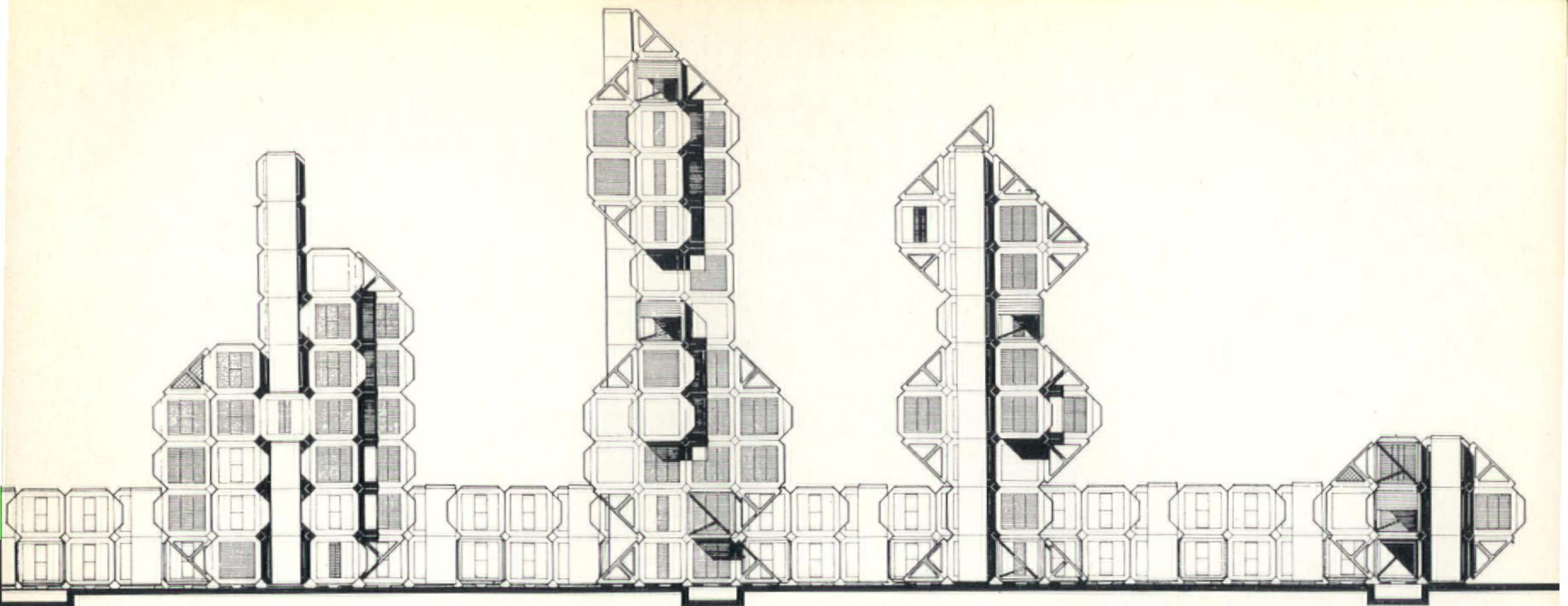
The extent of the benefits that use of the computer may bring is also difficult to foresee, but they appear manifold. In the broadest sense, the computer can do for us all we do now by rote. It can carry out the repetitive, automatic procedures: gather information, keep track of changing budgets, inform relevant persons, account for structural and mechanical parameters, check for code compliance, inconsistencies, and against other automatic design restrictions. With a comprehensive system, the architect will be able to spend less time gathering facts, more time exercising judgments based on a more thorough, selected group of data, and be able to adminstrate more efficiently. Consequently, he will be able to handle more projects more thoroughly and, especially, be able to spend more time on design.

5

A network notation—providing a graphic means for illustrating the data structures that can be used to describe a complex object within a computer—greatly simplified representation of a small building. The rounded and rectangular boxes represent objects; the solid arrows the relationships between them. The broken arrows link one group of similar objects into a class

6

Diagram of a time-shared computer system for use in a field such as architecture. As well as calculating, the computer controls interconnections between users and portions of computer memory. The dots indicate possible interconnections; numbers indicate associations between users

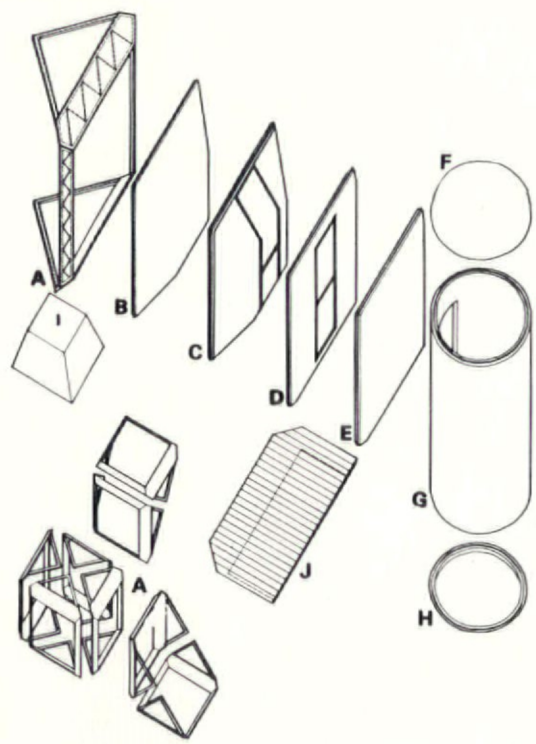


Steel housing

K. L. Bartlett

1

2



This building system was an unsuccessful entry in the recent European Coal and Steel Community International housing competition, using an RIBA research fellowship given to the architect to study maintenance problems in lightweight industrialized buildings.

Three major conditions imposed on the design were: the limitations on component size because of road and rail transportation regulations, minimum number of components for production cost limitation, and the design of these components for the use in detached dwellings, maisonettes, flats and terrace houses.

Nine components form the complete structure. To this will be added internal plasterboard and flat steel sheet partitions, and kitchen and bathroom units.

Ceilings are obscure plastic sheeting in metal trays which fit into the triangle formed by the diagonal bracing of the structural component. Lighting of the rooms is concealed above the plastic ceiling with dimmers controlling the lights in each room.

The cell unit dimensions are $3 \times 3 \times 3$ metres divided into ·75 metre modules giving convenient window and door sizes. Internal room height will be 2·25 metres giving one module of ·75 metres for warm air ducting and electric lighting.

1
Elevation of two-storey and multi-storey dwellings

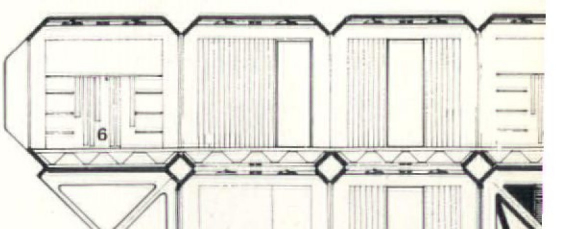
2
Component A. The structure is designed as a triangular prism. Four components make the cube which form the basic cell unit of the complex. Two units turned on their side form cantilever brackets for projecting rooms, balconies and porches. The component is made of lattice steel sections covered with pressed steel casing and fill with polyurethane foam. The steel is presprayed with low density asbestos.
Components B, C, D, E. These are pressed steel clip-on panels again filled with polyurethane foam. These components give doors, windows, projecting windows, clip-on cupboards, bookcases, and roof lights.
Components F, G, H. These make up vertical circulation element. The staircase will be attached to the door panel component. For high flat dwelling the staircase will also accommodate a lift.
Component J. The floor is timber on metal decking; the void below floors forming a horizontal duct for warm air heating.

3
First and ground floor plans of possible two-storey dwelling

1 hall	5 utility room
2 living room	6 bedroom
3 kitchen	7 grandparent's room
4 dining room	8 bathroom

4
Section

5
Two types of gasket joint are required to join the components for all junction conditions. The expanded neoprene gasket is pressed against projecting ribs of the components by screw adjusted plates. Components can be readily removed and replaced.



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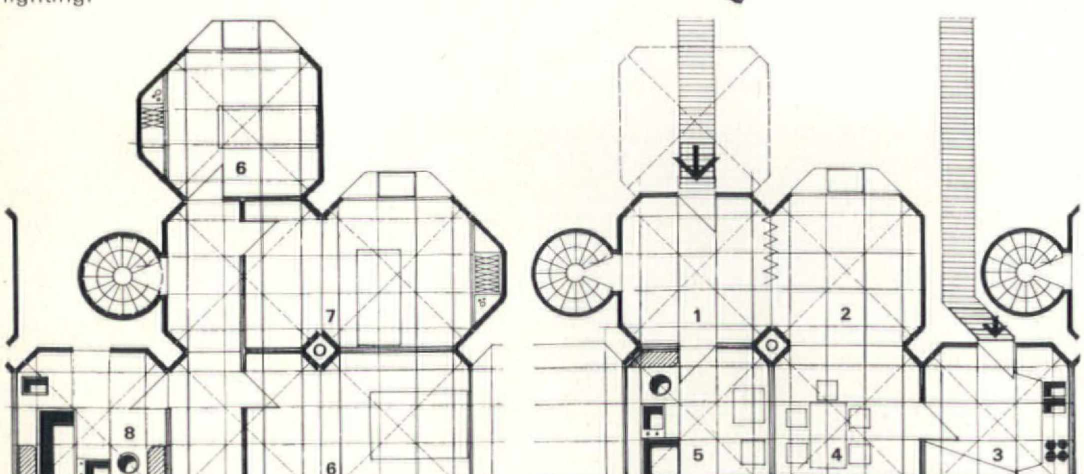

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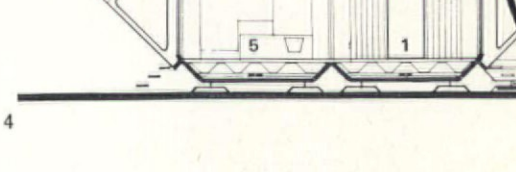
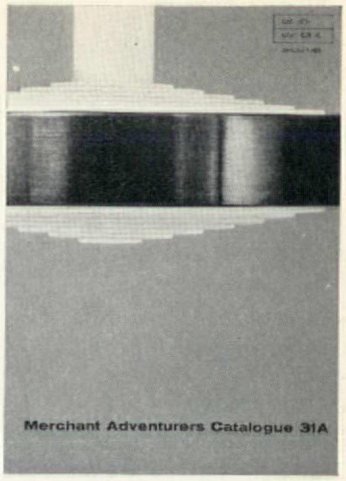


5

lighting concepts . . .

Available in 3 alternative versions with louvre opal glass diffuser or lens, these units form part of a wide range in the recessed section of Catalogue 31A, which illustrates some of the best ideas in tungsten lighting to-day



Merchant Adventurers

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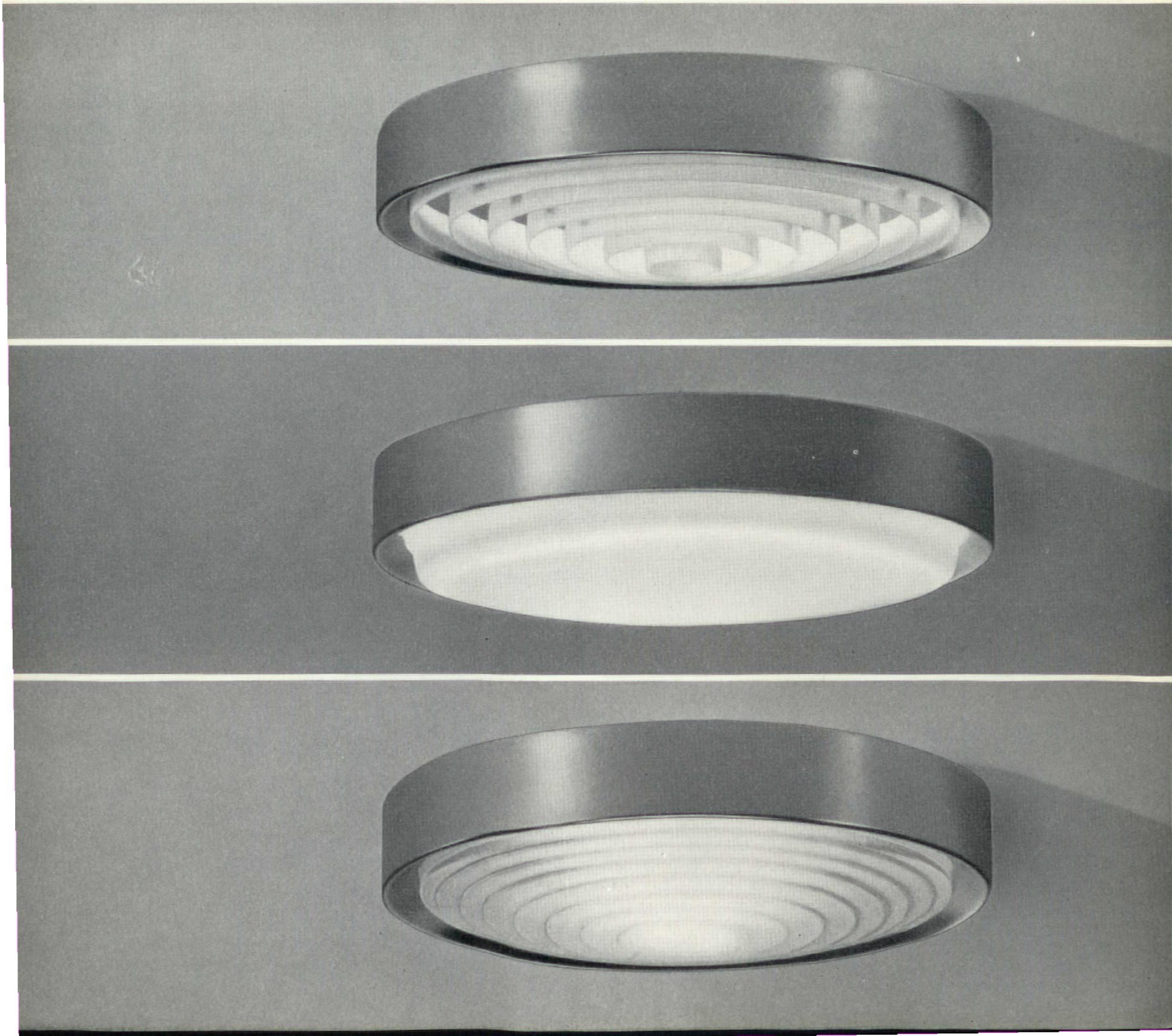
MA LIGHTING

1940 anodised aluminium semi-recessed units made in 7 sizes up to 16" diameter



Design

Hand weaves and machine prints

Interiors International (2 Ridgmount Place, London, WC1) are currently stocking an unusual series of hand-woven cotton textiles **1** from Calicut in the SW Indian state of Kerala. The designer-weaver, Sheila Hicks, some of whose previous inspiration has come from ancient Inca and Aztec crafts, was invited to SW India by the Commonwealth Trust Ltd to see how the local traditional art of handweaving could be expressed to its best advantage, incorporating at the same time modern and novel construction and colours. The resulting collection fully justifies the experiment. Colours glow with a rare intensity in the checks and stripes—violent pinks, reds and oranges, blues and greens—and interest is added to weaves by the random insertion of clumps of weft threads. One called Badagara heavy weight is an outstandingly beautiful example of this technique, the closely packed, bunched wefts producing a rich heavy cloth 50in wide, costing about £7 the yard. (The least expensive textile is as little as £1 the yard, 36in wide.) For wall hangings, Sheila Hicks further exploits the technique by pulling the clumps out here and there and letting them hang fringe-like from the middle of the cloth, perhaps knotting the warp threads at the bottom. Her ingenuity is boundless.

At the other end of the scale, and strictly for the machine age, we have Heal's excellent collection of printed fabrics, from which we have chosen one called *Elevation* **2,** designed by Hilda Durkin, printed in black on white cotton with a 23in repeat and selling for 16s *6d* the yard (48in wide).

Polystyrene drawer/trays

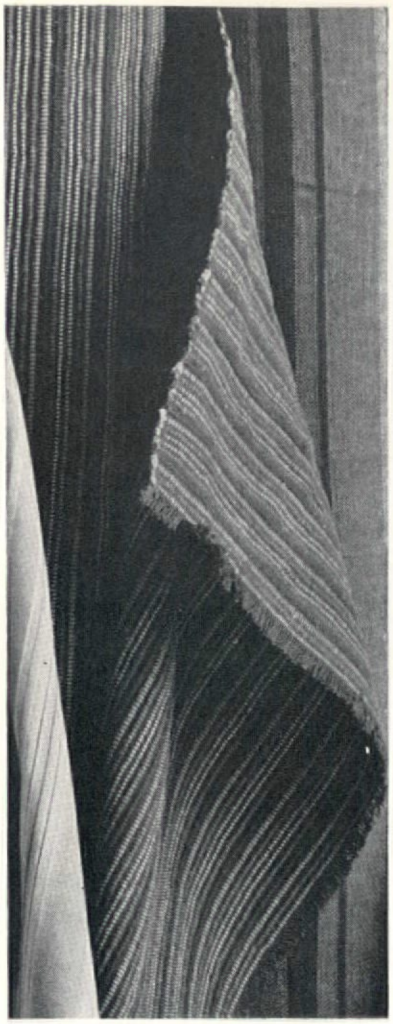
Strong, clear plastic drawer-trays, 18in square and 3$\frac{1}{8}$in deep, in interlocking stacking frames (white, cream, green or black) are available from Gratnells Ltd (31 Queen Anne's Gate, London SW1). The trays have nylon runners for finger-tip movement and to protect the metal frames. A stack of any number of assemblies can be mounted on a base frame with or without castors, and topped with a shelf; or the trays can be used without the frames, a metal track being available for fixing to the sides of storage units. One tray-and-frame assembly costs 32s and the items are packed in boxes of five.
Individual trays are supplied by Pacta Units Ltd (North Woolwich Road, London E16) at 22s *6d* each.

Floor coverings

Two new floor coverings have recently come on to the market—one Courtelle, one Nylon—both of which can be laid straight on to concrete, either with adhesive or just as carpeting without underlay. Both are hard-wearing, washable, sound-absorbing.

Duti-Flor is made of 100 per cent Courtelle fibres chemically bonded together to produce a textured surface in a range of six colours (two blues, two greens, a brown and a red). It is made by Fogarty Fillings Ltd, 6ft wide and costs about 30s the square yard, depending on quantity.
(Fogarty Ariel Products Ltd, Boston, Lincs.)

Iron Duke, by Heckmondwike Carpets Ltd, is made from a specially treated tough fibre, reinforced and bonded with resins and surfaced with 100 per cent Bri-Nylon. It comes in eight colours (orange, red, gold, two greens, blue, grey and anthracite), in widths up to 12ft (366cm) or in 18in square tiles, and retails at about 53s the square yard.
(Croft Mills, Heckmondwike, Yorks.)



1

2

The Furniture Industry

The following extract is taken from Leslie Julius' paper to the Royal Society of Arts in London last February.

It might be as well to look at some of the present techniques of manufacture. The most advanced of these are represented by the chip-board-making plants which enable timber coming from the forest to be formed into furniture parts on a continuous line. Such a plant consists of saws, chippers, pre-presses, automatic loaders, as well as multi-opening presses: devices to store the part while awaiting the next cutting process, automatic moving conveyors, automatic veneering machines, double double-ended tenoning machines, edge veneering devices, contact sanders, curtain coaters and drying tunnels. A line of these machines, complete with automatic transfers and tape control, removes all our present skilled craftsmen from the factory floor. The once skilled cabinet-maker only has to screw on the fittings, to wrap and inspect each part prior to its preparation for despatch to the customer. The polisher is completely eliminated.

Such a plant as I have outlined could cost from £$\frac{1}{4}$ to £2 million, depending upon the form of mechanization and automization. Yet I believe that such a plant is already out of date because our environment makers are designing, as I have indicated, plastic houses intended to be obsolescent in 20 to 30 years time, when furniture will be foam-moulded as part of the walls, and the walls themselves will be manufactured in such a way as to be moveable and changeable according to the family requirements. The traditional machinery used for the manufacture of upholstered frames is also out of date. We have already reached the rigid polystyrene-upholstered chair shell manufactured by means of inserting polystyrene beads into a kettle mould, the shape of which is the outline of the chair shell and into which is injected steam. In a matter of minutes a complete chair shell is ready for upholstery. Similar systems fed by rigid urethane foam are already being used in Denmark and Germany, and one-shot mouldings, which comprise rigid foam shells with a hard interior and soft exterior and a finish of simulated leather, have been successfuly manufactured in the United States and Great Britain. These particular systems of manufacturing demand a high standard of design and technical capability, and perhaps it is for this reason that most manufacturers have not kept pace with the change. Our younger designers . . . have developed throwaway cardboard furniture that holds much promise for future developments.

. . . It is incumbent upon good managers to cast their thoughts ten or twenty years ahead, and to be, above all, innovators. Bearing in mind the changes that will take place during the 1970s in terms of energy conversion devices for heating and lighting our homes, for communications, perhaps even for total environmental control, the furniture industry should be re-thinking its position with regard to these changes. How will it compete with the new consumer-durable goods such as the thermoelectric refrigerator and air-conditioners, videophones, microwave cookers, and other revolutions in domestic appliances brought about by fuel cells, such as the vacuum cleaner working by means of a sensory device and without any human supervision? Above all, there is the personal vest-pocket computer which will be able to programme the various humanly-worked household chores and thus supplant the wife as the family chancellor of the exchequer.

How can the industry turn these new devices to its own ends? My company is doing some thinking about this in relation to the problem of offices. We have asked ourselves, whether, for example, the executive desk is a paper-processing plant or a communications centre. Bearing this in mind, we come to Marshall McLuhan's view that electronics will lead to the final rejection of the typographical. We have come to the conclusion that the office desk will therefore eventually become a data-processing plant and will be equipped with electronic problem-solving and communicating devices. At present an executive desk is cluttered with baskets, telephones and a whole array of outdated equipment. The need to remove the junk as well as paper from the executive's desk is urgent. Filing and archive systems are likely to become subject to electronic control, and information retrieval devices are likely to grow in use. Videophone conferences, both national and international, are inevitable as the pressure of time placed on the executive increases. Machines that capture information at the point of sale or manufacture will feed the information on to a tape and so to a video machine on the executive's desk. These are likely to become an economic possibility in the very near future. Systems of electronic, press-button, user-to-user internal and external telephones, fitted into the desk, will have attached to them control panels composed of predetermined telephone numbers on a press-button impulse-controlled communicating device: it will thereby be possible for the executive to press a button and be in instantaneous communication with his opposite number in any part of the world. It is calculated that, as no more than 100 numbers would be required, the panel could be of small dimension. Personal telephones which can be carried in the handkerchief pocket will enable the executive to be in constant touch with his office as he walks around. Because of his pocket-size computer, he will be able to solve the answers to his problems wherever he is, and give this information back over his pocket telephone. As electronic miniaturization increases, so our new office equipment will have to take this fact into account. In addition, microphoto-copiers and readers will have to be made available so that filing is reduced to a minimum, and at the press of a button the required file or letter should be made available on the television screen by the executive's desk. It will not be possible, with such equipment, simply to put a desk down in any empty office. Careful planning will be required, so that the more complicated our equipment becomes, the greater care we shall have to take in planning the exact use of it. This is a measure of the challenge to the office furniture section of the industry.

If you think that the revolution is likely to terminate at this point you are mistaken, for even the privacy of the bedroom is being explored now by that *enfant terrible* of architecture, Cedric Price, who is considering the control of human posture in beds consisting of air jets. The imagination boggles at the thought, but I too hold that it will be possible, by the use of superconductivity and electromagnetic fields built into clothing, to suspend humans without use of an upholding frame, thus giving them complete freedom to move their limbs or manoeuvre themselves as they think fit, without regard to weight. Will we then need chairs or settees? Peter Drucker, in his book *The Practice of Management*, demands that companies ask themselves the question 'what is our business'?—after this—well, what is our business?

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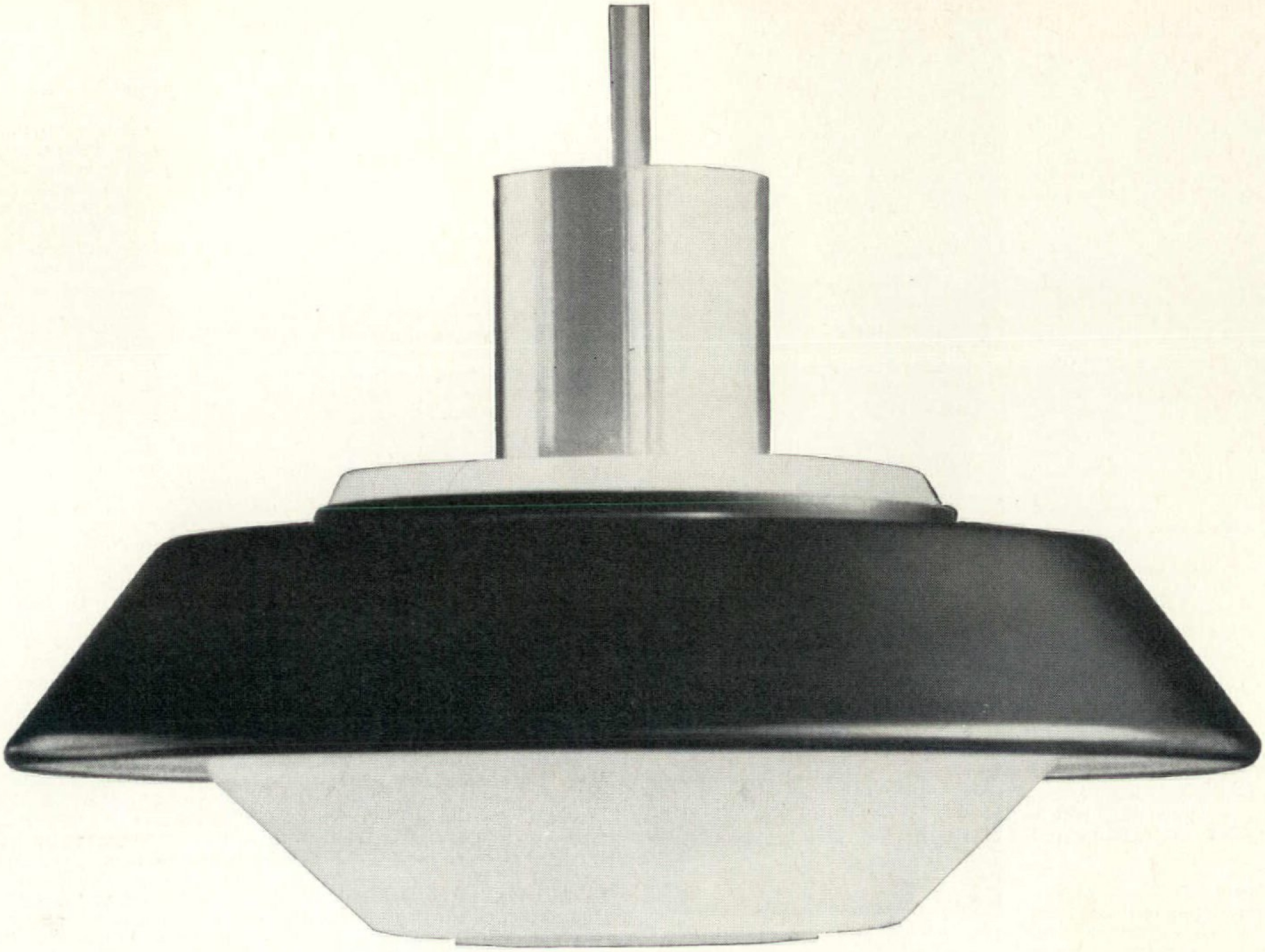

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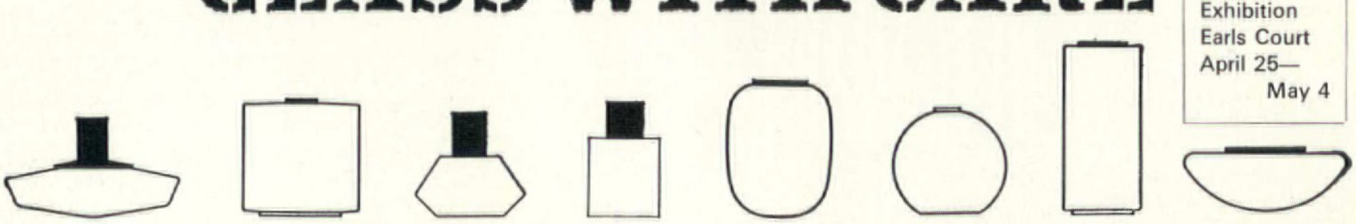

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Chairs

Maximus seating 1, 2
Max Clendinning, who last year designed the *Maxima* range* for Race Furniture Ltd (15 Rathbone Street, London W1), has evolved a simpler, less expensive range, the *Maximus*. As with the earlier range, it is based on a few moulded, laminated timber shapes, joined by angle corner brackets which, in the case of the seats, also provide anchorage for the flexible rubber suspension platforms. The loose cushions have a polyether form core wrapped round with combed Dacron fibre, as soft as down but with a better 'come back' after compression.
The units are available with coloured lacquered finish or veneered in ash or rosewood, and each piece is fitted with roller castors. The recommended retail price of the armchair is about £36 in rosewood, or £47 lacquered.

OMK Design 3, 4
Jerzy Olejnik, Bryan Morrison and Rodney Kinsman are the designers as well as the manufacturers of an upholstered fibreglass shell chair cantilevered from a central bar and mounted on a cruciform swivel base. The chair is available in a variety of PVC patent colours with nylon dipped bases at £106 10s, or in suede and leather with satin chrome bases, £129. Matching stool, £56 2s or £64 10s.
11 Tottenham Mews, Tottenham Street, London W1.

Cushioned ease 5
Bernard Holdaway, creator of the pop *Tomotom* furniture (see *AD, 4/66, p.20*) for Hull Traders, has taken a dive into the luxury 'prestige' field with the *Trawden* easy chairs made from chromed tubular steel and piled up cushions, the bottom one of solid foam, the rest filled with down and feathers. If upholstered in hide it retails for about £210, but a heavy cotton duck substitute knocks £80 off the bill.
There is a matching table—a slab of plate glass resting on a similar frame—costing about £74.
Hull Traders Furniture Ltd, 7 Sedley Place, Woodstock Street, London W1.

Embassy elegance 6
Developed initially for the new British Embassy Offices in Madrid (by the Design Group of the Ministry of Public Buildings & Works' Supplies Division), this chair is in bright chrome with red leather covering.

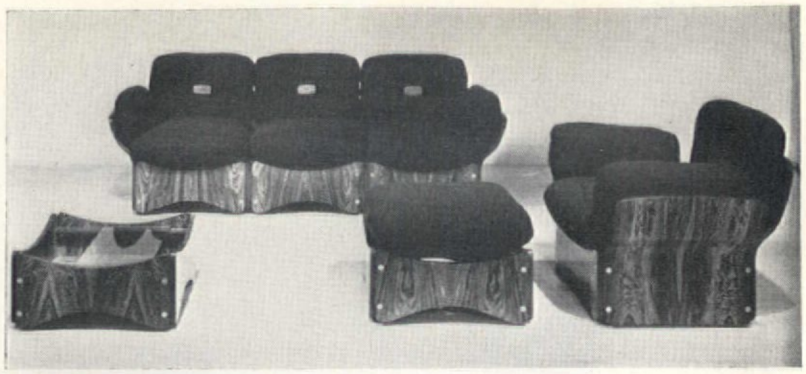
Tapiovaara's 'Kiki' 7
Race Contracts Ltd are importing the *Kiki* range of contract chairs and tables from Metalliteos of Helsinki, which gained a gold medal for their designer, Ilmari Tapiovaara, at the last Milan Triennale. The interesting feature of the range is that their frames are of oval steel tubing with polished chrome finish. All chairs stack or link in rows. Recommended retail price for the armless chair shown here is about £9.

Polystyrene shells 8
Angelo Mangiarotti continues to experiment with polystyrene for chair shells, for Figli di Amedeo Cassina, Meda, Milan, who manufacture them.
Moebel Interior Design, 11/66

Artifort 9
The seat of Geoffrey Harcourt's new easy chair for Wagemans & Van Tuinen, NV (Artifort), Holland, is of preformed ply in one piece, supported and revolving on a cast aluminium pedestal; and the cushions are filled with foam and Dacron. Price £85 at Druce (Baker Street, London).

Steel chairs 10, 11, 12
Hans Eichenberger (of Basel) is the designer of a series of steel-framed chairs and settees made by Dietiker & Co. AG (Stuhl und Tischfabrik, Stein am Rhein, Switzerland). All bends are rectangular and to an equal radius for the sake of mass-production, side frames are standardized, and seat and back sections vary only in their width. The upholstery—loose cushions, foam and down-filled, with removable leather or fabric covers—is supported on plastic-coated, coiled wire springs suspended from adjustable holders.
Moebel Interior Design, 11/66

*AD, 1/1966, p.47

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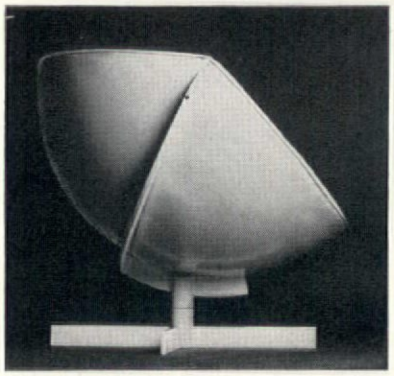
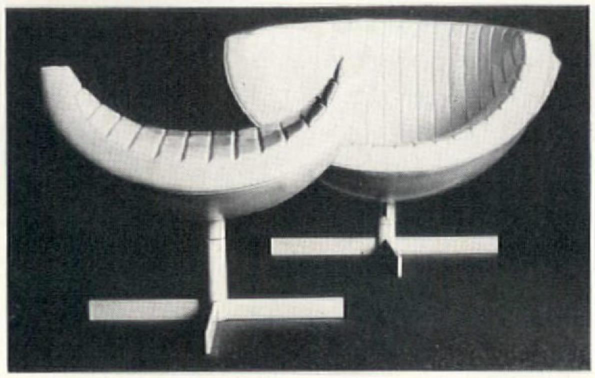


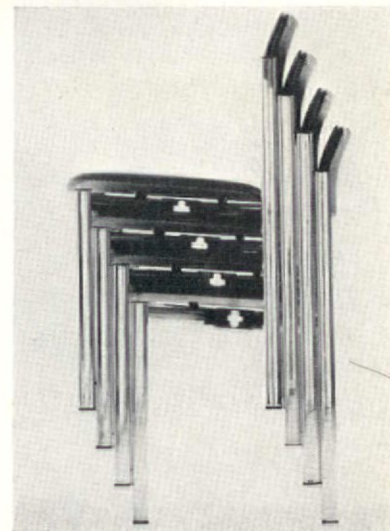


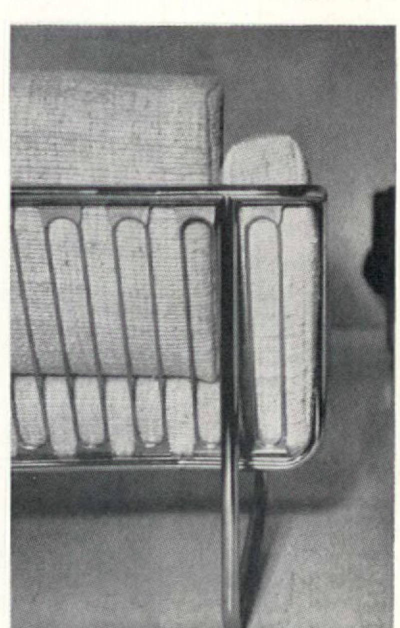
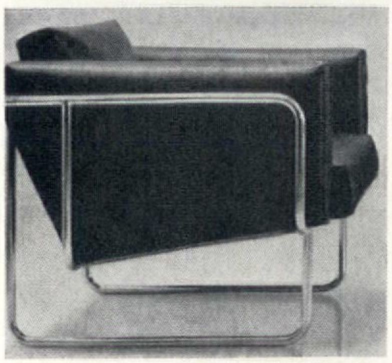
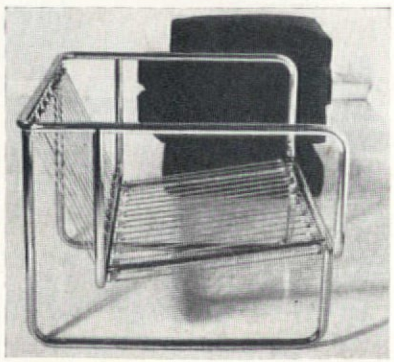

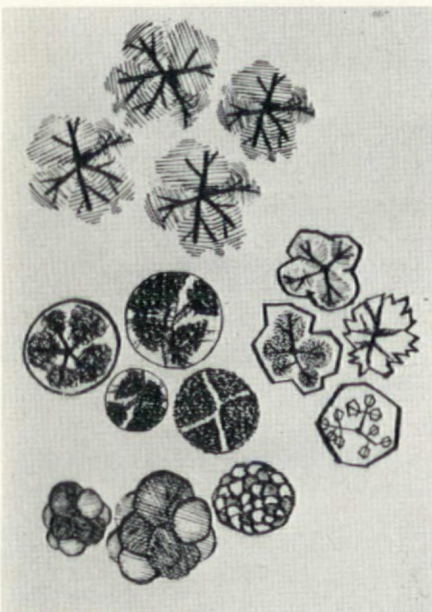

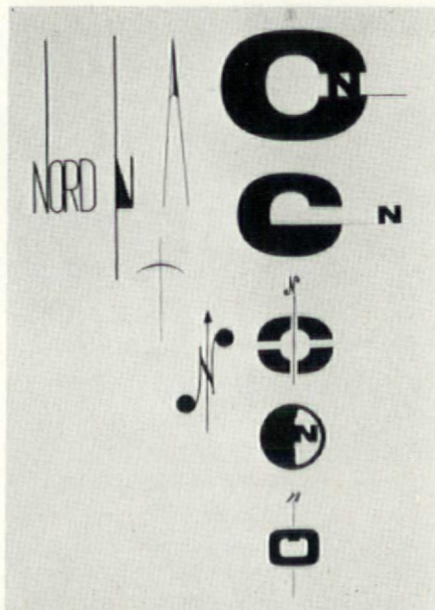

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Trade notes

Alexander Pike

To obtain additional information about any of the items described below, circle their code numbers (T1, T2 . . . etc.) on the Readers' Service Card inserted in this magazine.

U1 Cladding and partitioning units

Kufa Plastics Ltd., Chantry Estate, Kempston, Bedford

Kufa interlocking hollow extruded sections in PVC can be used for cladding or partitioning. Available in a range of colours, they are simple to install, require a minimum of support structure and are claimed to be soundproof—whatever that might mean.

U2 Pneumatic tube conveyor 1

Dialled Despatches Ltd., The Green, Gosport, Hants. Gosport 80221

Designed for low-cost, high efficiency and reliability, the Two-Point-Two system uses non-corrosive materials, PVC, fibre glass, aluminium, stainless steel and nylon, claimed to make the equipment durable, silent and trouble-free. Magnetically operated switching functions are incorporated to give a high level of reliability.

U3 Electric fire 2

Ocees Components and Structures Ltd., 49/54 Knightsbridge Court, Sloane Street, London, S.W.1 BELgravia 1453

The original Acorn open fire, designed by Karl Koch, with 14sq. ft of radiating surface, can now be supplied with the Electracorn 2kW unit. This acts as a fire screen in summer, hiding the open fire but permitting occasional heating. Thermostat and fan provide for quick heat-up or for cold air circulation.

U4 Boiler programmer 3

Randall Electronics Ltd., 70 Willoughby Road, Harpenden, Herts. Harpenden 62345

The Randall Mark 2 has a simple dial and tappet system requiring no clamping devices and offers a choice of six different programmes. It is suitable for all gas- or oil-fired small bore boilers and incorporates thermostatic controls which work in conjunction with the programming sequence.

U5 Digital electronic clock

Darang Electronics Ltd., Restmor Way, Hockbridge Road, Hockbridge, Surrey. Franklin 1140

The Six-Seventy is intended for reading at a distance of forty feet and has a switch permitting programming for either 12- or 24-hour time systems. A neon tube display has hours and minutes digits 30mm high and seconds digits 15mm high. After an interruption in the mains supply, the clock will not start until reset to the correct time. Width 16$\frac{1}{4}$in, depth 8in, height 6$\frac{3}{4}$in.

U6 Gas-fired central heating system

Ringheating Ltd., Northway House, High Road, Whetstone, London, N20 HILlside 5261

A living room stove unit, available in four different designs and in capacities of 40, 52, 68 and 80,000 Btu/h can supply radiators throughout the house. The system incorporates a number of safety devices and uses $\frac{7}{8}$in square-section pipework which can be fixed flush with the skirting. No conversion is necessary for use with natural gas.

U7 All-plastic window

Bovis Building Products Ltd., Newcombe House, Notting Hill Gate, London, W11. BAYswater 2452

The Eton range of vertical and horizontal sliding sashes is fabricated in solid high impact PVC in white, black or grey. All windows are fully weatherstripped, and vertical sliders have balance mechanisms. Surround frames are available, either in cedar or glass reinforced polyester. Sizes: Vertical, from 2ft × 3ft high to 4ft × 4ft 8in high, horizontal from 4ft × 3ft high to 8ft × 4ft high.

U8 Resin coated plywood

Finnish Plywood Development Association, Finland House, Haymarket, London, SW1

Finply birch plywood has an impervious phenolic resin film on both surfaces, bonded under controlled heat and pressure claimed to give resistance to weather, micro-organisms, boiling water, steam and heat. It provides a clear surface leaving the natural grain unobscured, and can be over-painted. Sizes 4ft × 8ft and 4ft², and in eight thicknesses between 4mm and 24mm.

U9 Acoustic telephone hood

Williaam J. Cox (Sales) Ltd., London Road, Tring, Hertfordshire

A new model of the Phonedome moulded in acrylic is now available, either transparent or opaque, in a variety of one-hundred colours and shades. Price £16 15s. complete with acoustic mounting board. A smaller version, the Minidome, costs £9 15s., with an acoustic mounting board as an optional extra at £4 15s.

U10 Self-powered sign 4

Saunders-Roe & Nuclear Enterprises Ltd., North Hyde Road, Hayes, Middx. HAYes 3800

A new type of sign designed for use in public and industrial buildings is illuminated by a series of Beta lights, tritium activated nuclear light sources, hermetically sealed in acrylic plastic case. These signs operate independent of any power supply or batteries. They have a long working life, and will appear half as bright to the eye after about twenty years. For most applications the useful life will be more than fifteen years. No maintenance is required. Price £27 15s.

U11 Rooflight 5

D. Anderson & Son Ltd., Stretford, Manchester

Dalite panels are 2in deep units of cellular twin skin construction moulded from glass reinforced polyester resin, with top and bottom skins separated by a core of corrugated spacers. The bottom skin is moulded to meet the upper surface, forming a 4$\frac{3}{4}$in wide flange for fixing to the roof structure, providing a flush finish with the roof. Standard sizes, 4ft wide, 4, 6, 8, 10 and 12ft long. Light transmission 60 per cent, weight 2lb/ft² 'U' value 0·45. Prices range from 27s 9*d* to 30s. per sq. ft of nett light opening.

U12 Silicone sealant

Expandite Ltd., Chase Road, London, NW10 ELGar 4321

Expandite Silicone Sealant is a one-part, ready-to-use material, claimed to have outstanding flexibility and durability and to bond tenaciously to metals, ceramics, glass, plastics and wood. It cures rapidly on exposure to moisture in the air to form a permanent flexible seal of silicone rubber. It is designed for joints from $\frac{3}{16}$in to 1in wide.

U13 Weather information apparatus

Roberts Instruments, Victoria Road, Burgess Hill, Sussex

The Weatherstation comprises an external roof unit with wind vane and anemometer and an internal cabinet 16in × 5in × 1$\frac{3}{4}$in, giving readings for wind speed and direction, humidity and temperature, and barometric pressure. Price £75.

U14 Fluorescent fitting for high illumination levels

British Lighting Industries Ltd., Thorn House, Upper St Martins Lane, London WC2

Mercury fluorescent fittings suitable for conditions where high illumination and reduced maintenance are important factors are available for mounting heights between 15ft and 30 ft. Prices 250W £10 7s 0*d*, 400W £11 7s.

U15 Oil-fired ducted warm air system 6

Hills, McAuley & Chandler Ltd., 2 Bamborough Gardens, London, W12

The French Airflam N15 system comprises a warm air generator rated at 60,000 Btu/h located in a three-sided niche of refractory material. A double heat exchanger provides high efficiency, rapid temperature rise and low fume temperature. A speed transformer fitted to the fan assembly enables the airflow to be regulated. Approximate size: height 7ft, width 2ft, depth 1ft 7in. Price £90.

U16 Plywood panelling

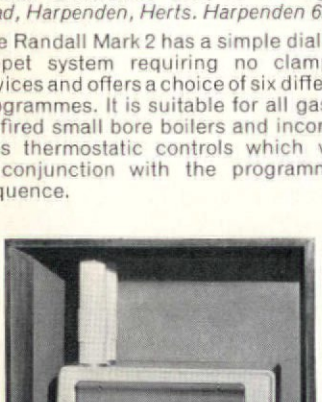
Panelplan Ltd., 120 Bishopsgate, London, EC2 LONdon Wall 3047

Paneltone is pre-finished plywood $\frac{3}{16}$in thick, V-grooved to simulate random width planks. The 8ft × 4ft boards are tinted and polished in one of six different shades and cost 1s 11*d* per ft².

U17 Fan filter unit

Tempair Ltd., Maidstone, Kent

The Tempair unit has a two-stage filter giving a claimed overall efficiency of 95 per cent at 0.5 microns. Originally developed to combat radioactive dust, the glass asbestos filter provides nearly 100sq ft of surface. The airflow capacity is 150cfm and the 2kW heater battery has two-stage control. Size 27$\frac{1}{4}$in deep, 10in high, 26$\frac{1}{2}$in wide. Weight 72$\frac{1}{2}$lb. Price £47 10s.



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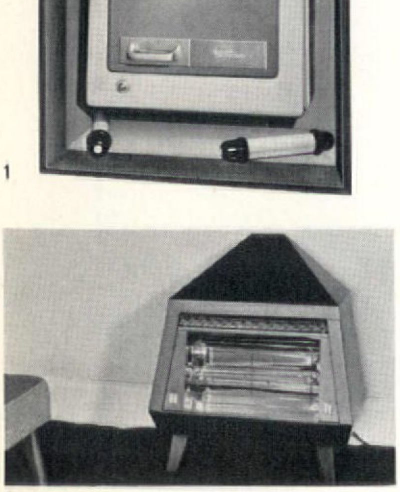

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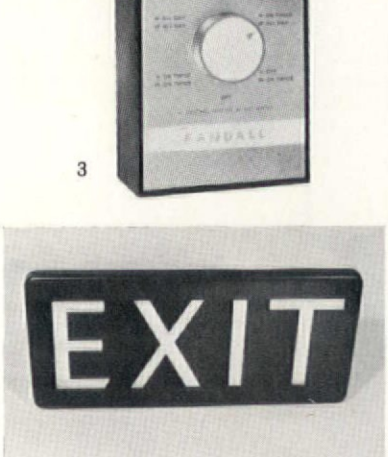

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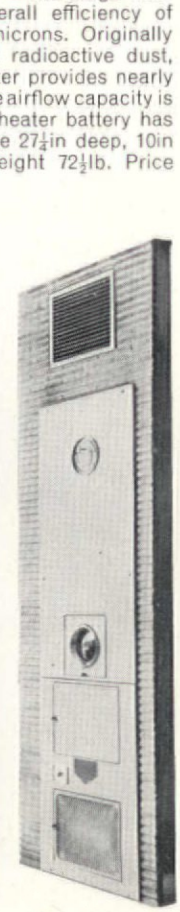

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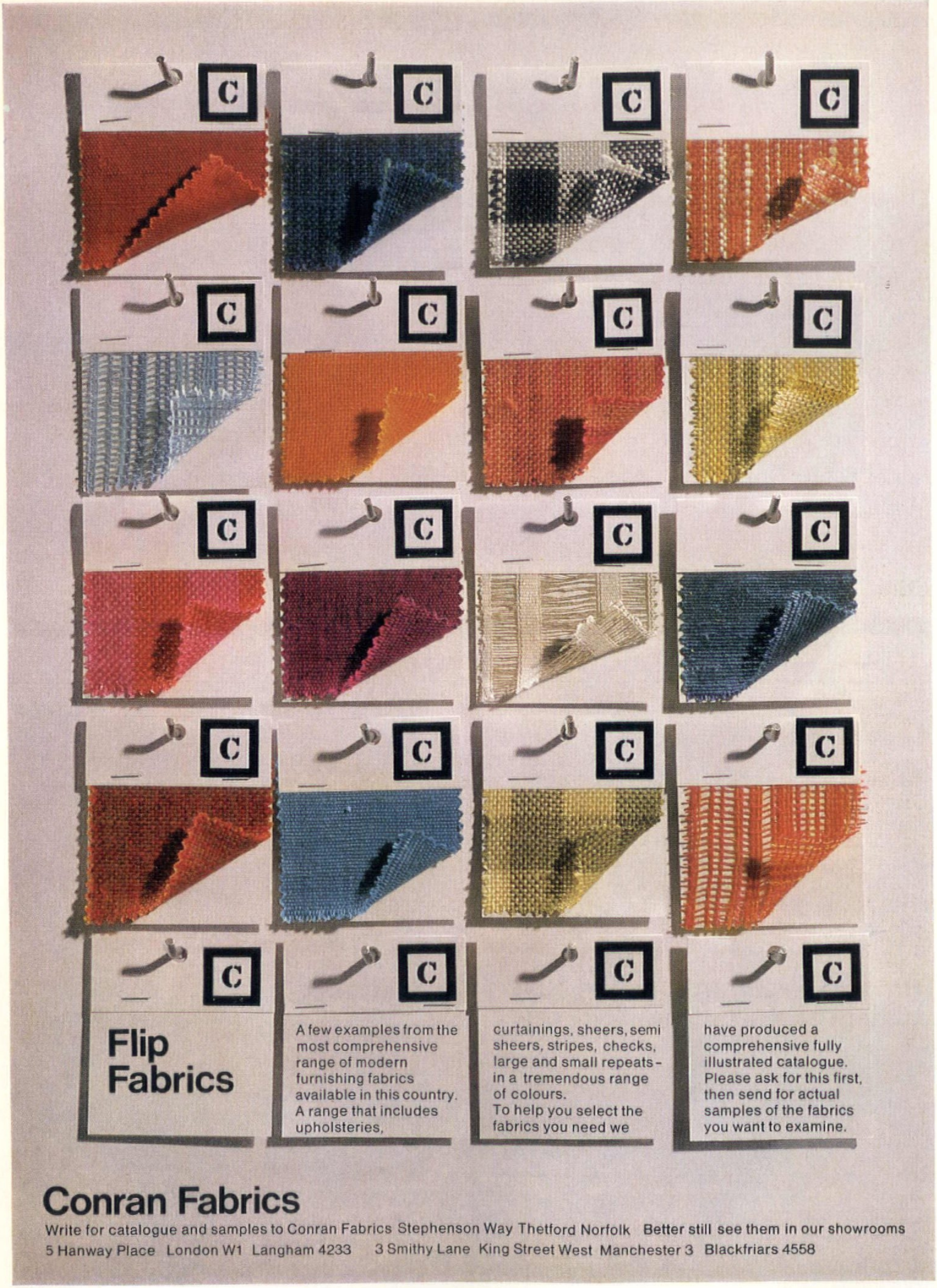

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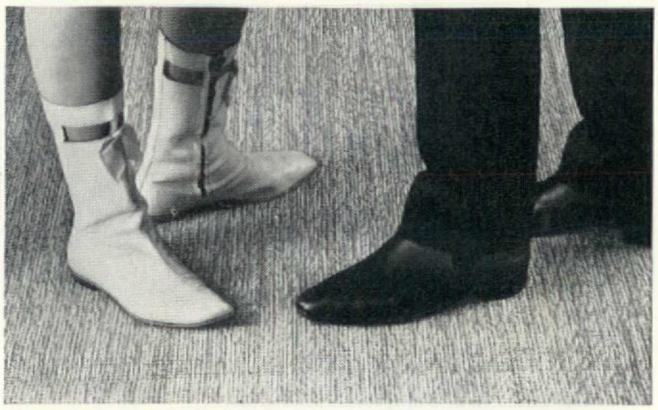

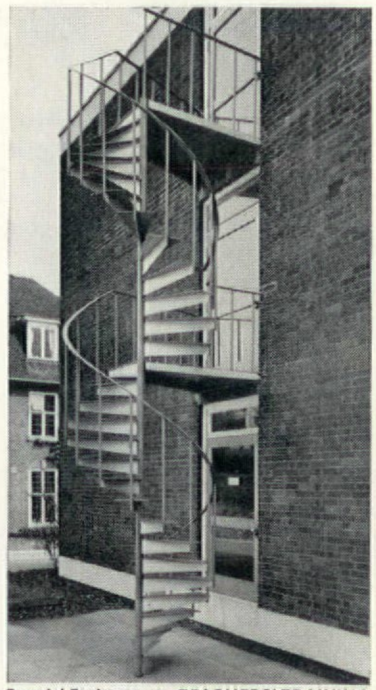

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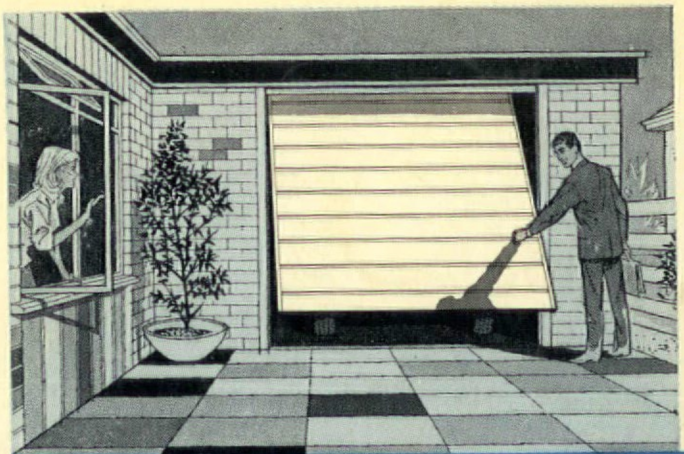

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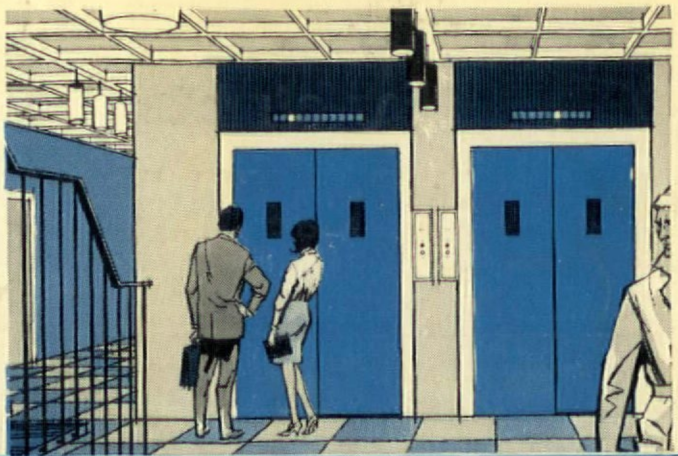

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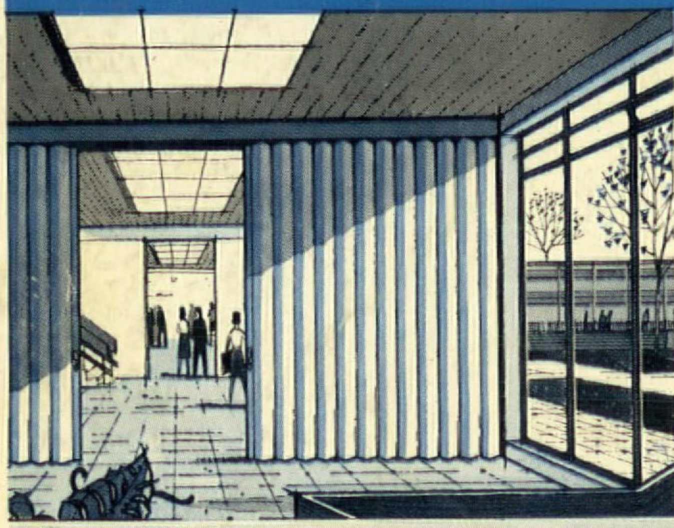

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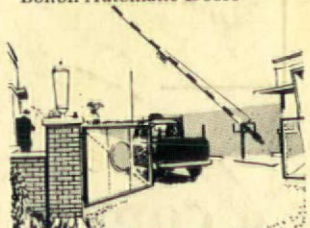

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