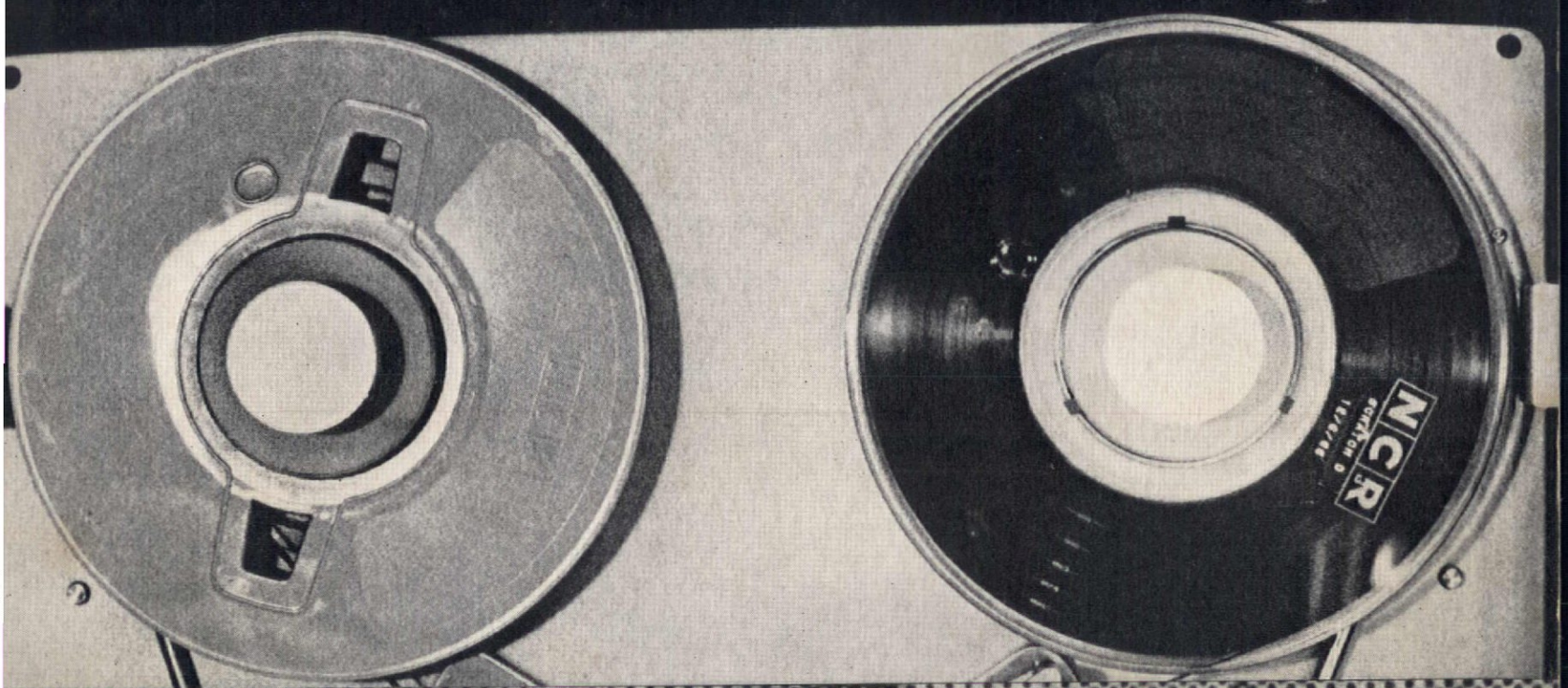
AD

Architectural Design November 1968. 7/6



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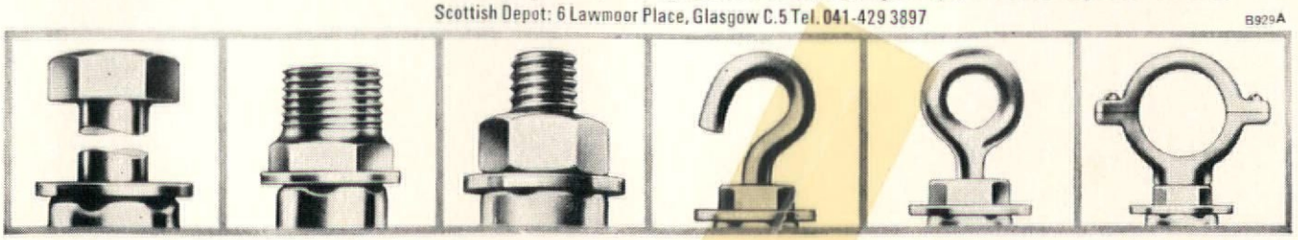

Letters

Correction

Sir, As one professionally involved in the maintenance of historical truth, I must point out an error in Hans Hollein's account of this year's Aspen conference. I did *not* fit myself out with a set of Western threads especially for the occasion—only the hat, which came from the drugstore at Frisco, Colorado. The jacket had been in the family some time, the shoes came from Oxford Street, the cord pants from a previous trip to the States and the shirt from Marks and Sparks.

To turn now to less serious matters; may I point out that the 'not too unfair' summary of my piece, 'A home is not a house' which appears in Martin Pawley's article, 'The time house' (*AD*, September last), is not so much unfair as grotesquely ignorant and unobservant. The description of the complex stand-of-life package simply as 'a television set' shows that he has failed to grasp the whole intention of the article. The alternative, that he is deliberately misrepresenting the contents of a document that most of his readers will have difficulty in finding and reading, is—of course—too horrible to contemplate. I would like to urge every reader who can get it to read it, though . . . just in the interests of maintaining historical truth.

Reyner Banham, London, September 1968

Confession

Sir, Only a few short months ago I was a starving architectural mendicant in Bedford Square. Reyner Banham took pity on me, bought me a set of Western threads and suggested that fame could be mine if I took part in a small promotional coup he was about to bring off. Showing me some drawings of naked figures hunkering round a television set, and tapping his watch meaningfully, he instructed me to prepare a grotesque parody of a little known article he had published in the States.

My belly full with the first decent popcorn I had tasted in years, I agreed, and in a spirit of cynical abandon penned *The Time House*. After publication RB turned on me savagely (as we had planned), redirecting readers of my article to the American Embassy, the British Museum and those few far-sighted purchasers of liquidation stocks of 'ClipKit', in pursuit of the much maligned 'original'.

Now it is all over, my beads and popcorn all used up and I am back scratching a living amongst the drawing boards and telephones.

I want readers of *Architectural Design* to know the truth about my guilty association with Reyner Banham so that next time they are down and out in Bedford Square they will hide in doorways when his Kandy Kolored Tangerine flake Moulton bicycle rolls up on its fat slicks. *Martin Pawley*, London, October 1968.

Ivy League

Sir, My loyalty to Ivy League values (Columbia '49) prompts this mild protest regarding the cover of the July *AD*.

While in an egalitarian society there tends to be an ever diminishing gap between the image of the Ivy League and the Mafia, nonetheless there remains some distinguishing features of the Ivy League type. No proper Ivy Leaguer at the Ford Foundation or otherwise would come to work in those European style dark glasses nestling into his long and heavily pomaded sideburns. Highly padded shoulders went out with Al Capone and the deeply notched lapels have never been a favourite at Brooks Brothers. Nor would the double breasted vest or weskit be a suitable office garment for the Ivy Leaguer. And of course the button-down collar tends normally to button somewhat above the navel in our better university circles.

Johnathan King, EFL, New York, 16/8/1968.

Robert McAulay (Mafia 68) makes a few points in his defence

The glasses are American and were intended to be mildly tinted, not dark. Neither the sideburns nor collar are long—and *padded* shoulders . . . My God NO! If this is how the drawing appears then I can only suggest humbly that Mr. King has never stood above a 400 foot Ford EX-EC and tried to convey the zooming perspective one sees.

As for the weskit—admittedly not *true* Ivy—but taken from *Esquires good grooming guide No. 1.* I took this liberty because, as the guide says, *The most unfair falsehood one could perpetrate today would be to tell the American male that there are only a certain number of ways to dress.*

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MINAFORM CEILING SYSTEMS IN 3-D BY ARMSTRONG

Another Armstrong first! A mineral fibre ceiling system, using Minaboard, that's got depth as well as length and breadth. A system that offers new design flexibility, new and exciting lighting opportunities, new effects of light and shade. Minaform perceptibly increases acoustic efficiency. Shown in the 'Classic' Minaboard design which adds richness of texture to the dramatic interest of the cellular construction.

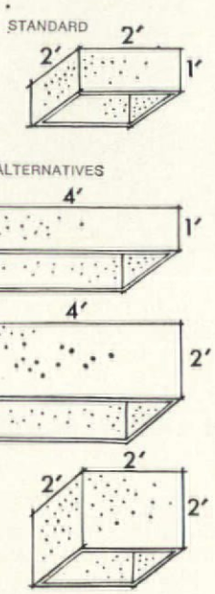
The new Minaform ceiling system by Armstrong is particularly suitable for large ceiling expanses in open-plan offices, factories, canteens, public buildings etc. for these reasons:

APPEARANCE

It provides an interesting perspective of square to diamond shapes, depending upon the angle of vision.

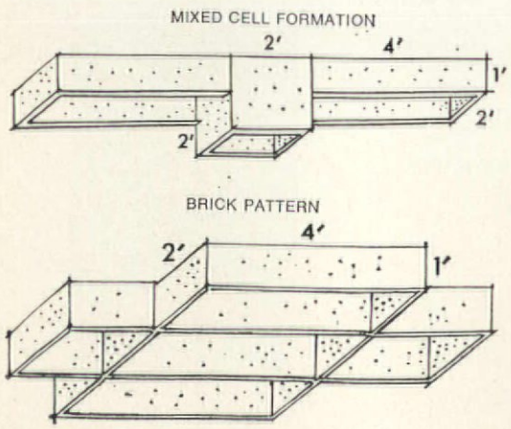
MODULAR VARIATIONS

The standard cell size is 24″ x 24″ with a 12″ depth. However, cells can also be made up in a 48″ x 24″ size and the depth can be increased to 24″.



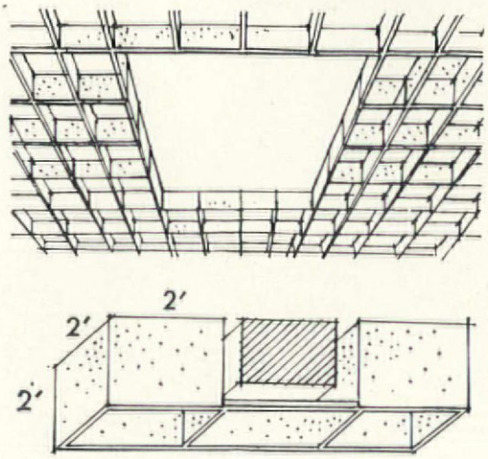
FORMATION VARIATIONS

Mixed cell, brick pattern, and step formations are possible using the different modules mentioned above.



DESIGN VARIATIONS

Include irregular perimeters and islands of flat ceilings. Ducts, pipes and beams can be covered by incorporating Minaboard panels.



LIGHTING

Standard 6 ft. 85 watt batten fittings can be used to provide a continuous source of light giving an illumination of approx. 1000 lux.

LOW-GLARE

The Minaform ceiling ensures an efficient, comfortable, low-glare system that can be recommended for all office areas, including drawing offices, where the highest lighting standards are required.

HIGHLIGHTING

Any make of spot lighting can be used.

DOWNLIGHTING

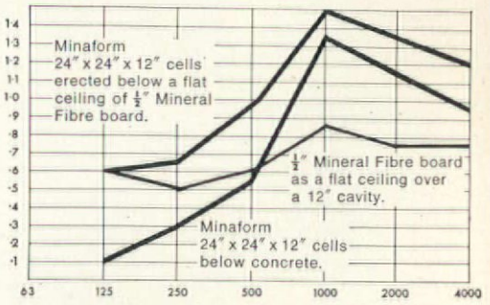
Perimeter lighting is possible to downlight curtains, sculpture, murals etc.

ECONOMY

The reflection factor of the board forming the cells is approximately 85%, and thus the light from the standard, low cost, batten fitting is efficiently directed into the space below. Even with an illumination as high as 1000 lux, the minimum number of fittings is employed, and the problem of waste heat in summer is largely avoided.

ACOUSTICS

The Minaform ceiling offers greater noise absorption than the best competitive ½″ mineral fibre ceilings. A vital factor in open-plan areas.



ASSEMBLY

The Minaform system is semi-prefabricated, quick and easy to install, and requires very little scaffolding. Most of the assembly work takes place at low level. There is little waste of materials.

COST AND BENEFITS

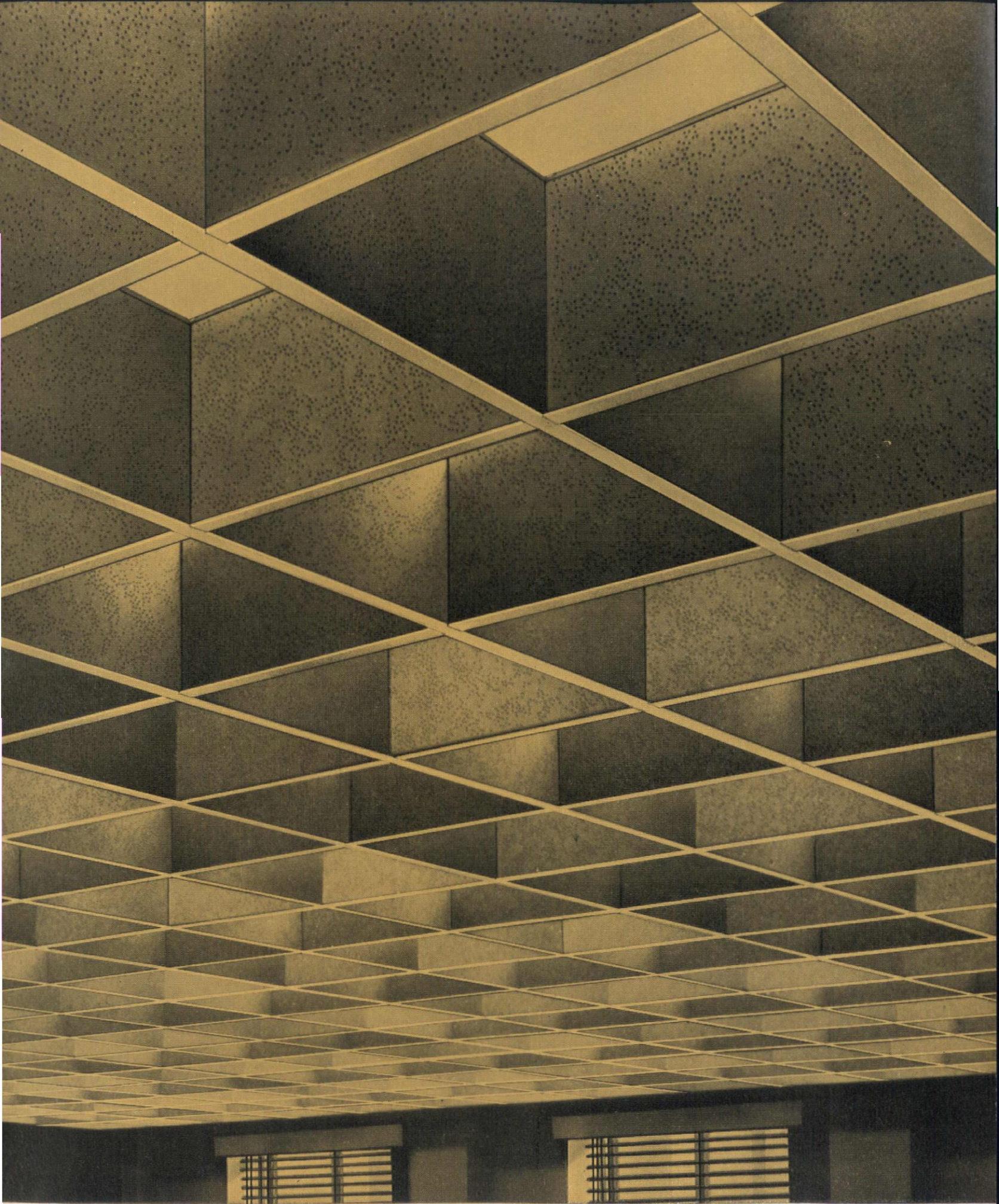
You get all the advantages of a most luxurious appearance, lighting economy and efficiency, design permutations, plus noise absorption, for just about what you'd have to pay for a standard ceiling with recessed lights.

SUGGESTED LOCATIONS

Open-plan offices, factories, canteens, theatre or hotel foyers, restaurants, cocktail bars, libraries, town halls and other prestige public buildings.

TECHNICAL SERVICE

For more technical information and detailed discussion contact your nearest Armstrong office.



MINAFORM CEILING SYSTEMS BY Armstrong

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AT72

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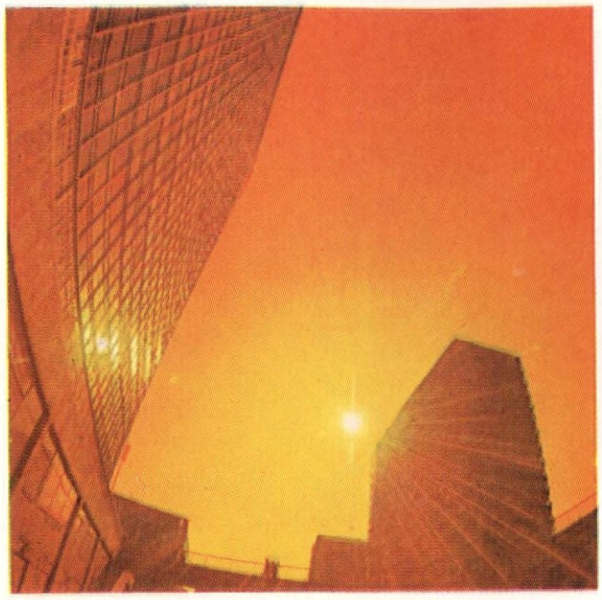
Canteen was erected under the supervision of the Authority's Director of Engineering, Mr. G. A. Wilson C.B.E., M.Eng., C.Eng., M.I.C.E.

Dept AD92

Is the sun your problem?



Now there's a new glass to start a window revolution

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To the architect and designer Pilkington Spectrafloat may well prove to be the most important glass development of the post-war years. The Pilkington development of Float glass revolutionised glassmaking. Now, Spectrafloat, a development of the Float process, provides the beginning of a major change in window design.

It is a glass which reduces the transmission of solar heat. It is a glass which cuts down sky and ground-reflected glare. It has a subtle colour effect. Like Float, it has a permanent fire-finished surface. And it costs very little more than clear Float glass.

In air-conditioned buildings it will reduce both the capital and running costs of the air-conditioning plant. In buildings without air-conditioning, Spectrafloat will make a real contribution to environment.

Properties: Pilkington intend to market eventually a range of Spectrafloat glasses, with different transmission characteristics and colours. Initially one glass is being made: Spectrafloat 50/67 (Bronze) —50% light and 67% total solar heat transmission.

Light: As the above figures show, Spectrafloat will reduce the amount of natural light reaching the interior of a building, but not as significantly as the figures might appear to indicate. Thus, assuming ordinary clear Float glass provides natural illumination in a room up to 20 ft. from the window, the use of Spectrafloat 50/67 only reduces this distance to 16 ft. There will, of course, be a need to pay special attention to the design of artificial lighting.

Glare: Spectrafloat will temper sky glare and ground-reflected glare, giving more comfortable internal visual conditions. Like any transparent glass, it will not combat direct glare from the sun.

View: Perception of the view is little affected. The eye quickly adapts to the colour of the glass.

Double Glazing and Toughening: If advice is needed on any processing, including Double Glazing and Toughening, your Pilkington representative should be consulted.

For further information: If you have a project where you might consider the use of Spectrafloat, the Pilkington Technical Advisory Service is equipped to give the specialist advice necessary, and can be consulted through your nearest Pilkington area office or representative who will supply technical literature and show you samples on request.

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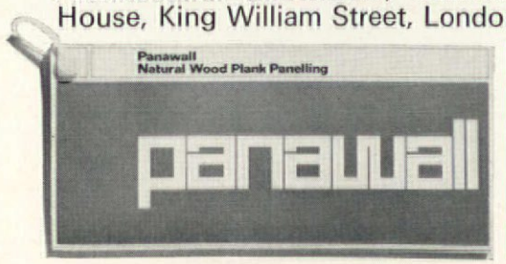
Panawall Natural Wood Plank Panelling can be seen at the Architectural Showroom, Surface Productions Limited, Adelaide House, King William Street, London EC4 Tel: 01-626 0550.



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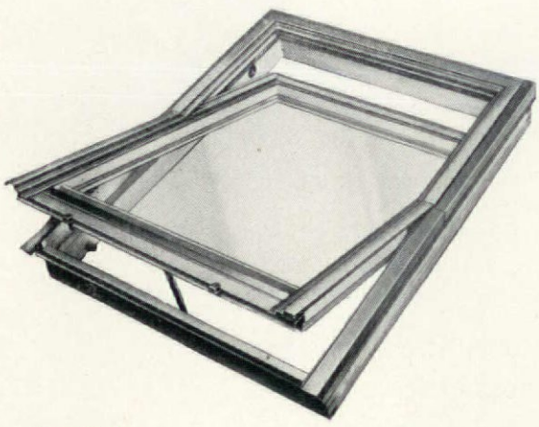

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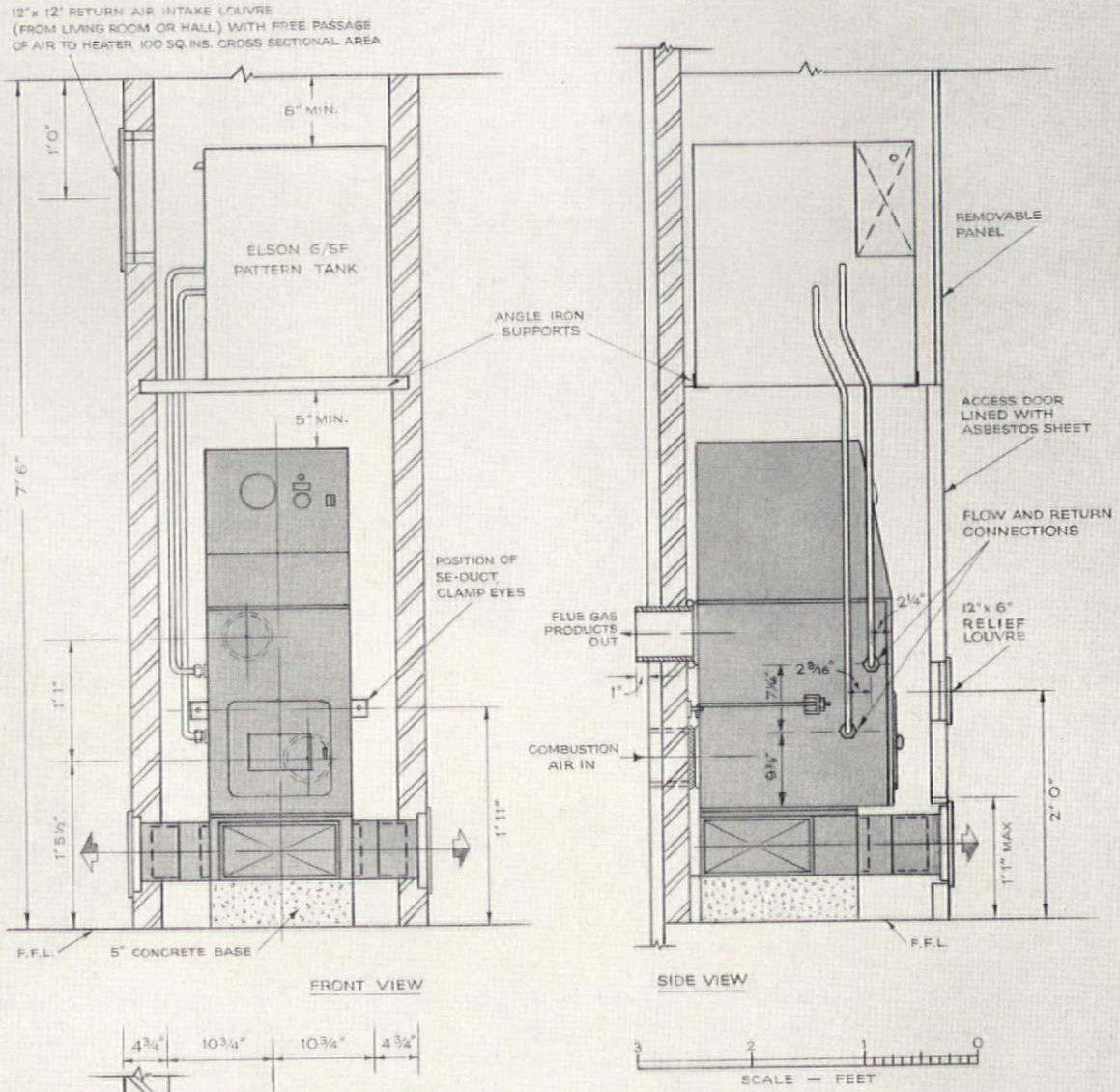

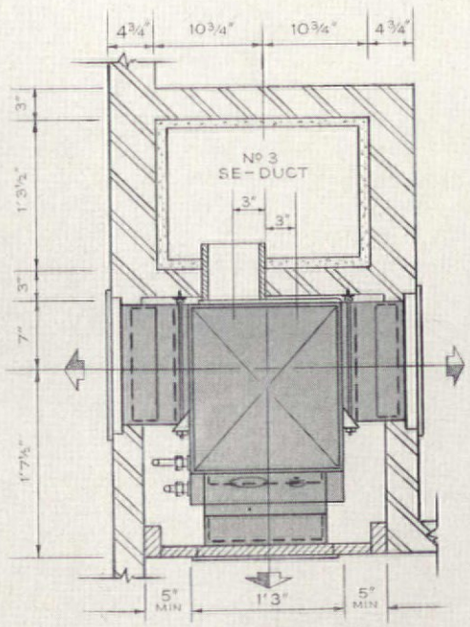

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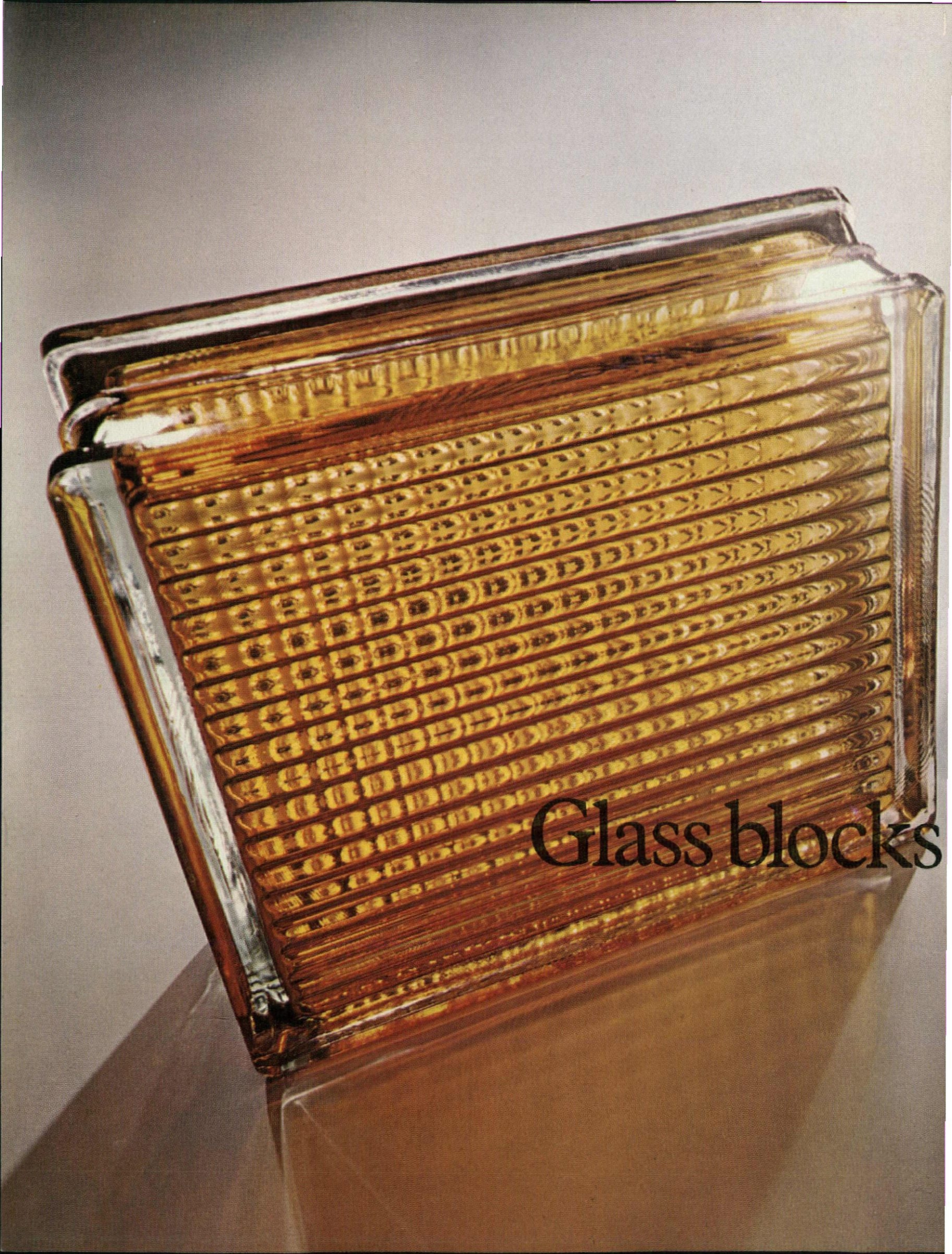
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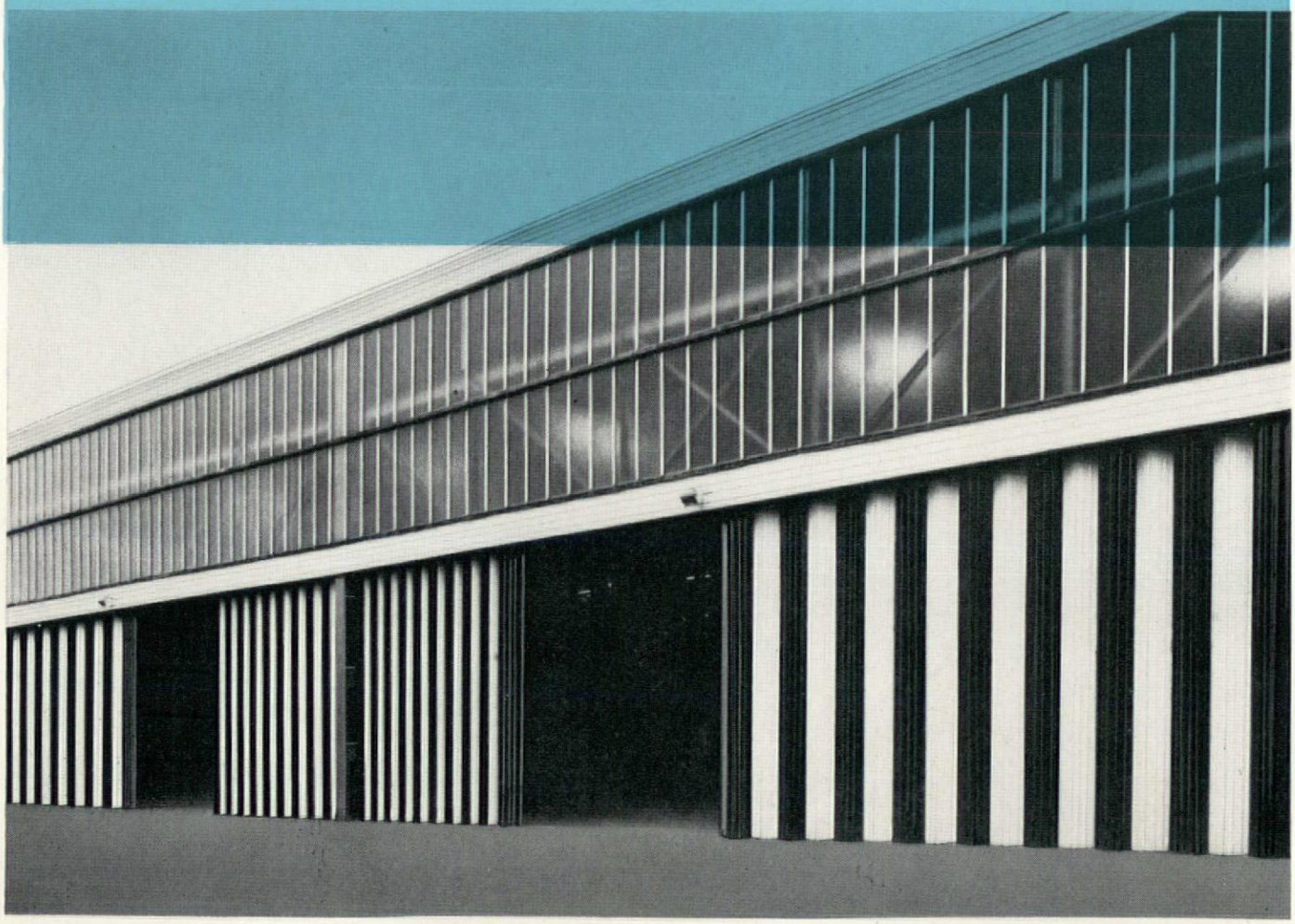

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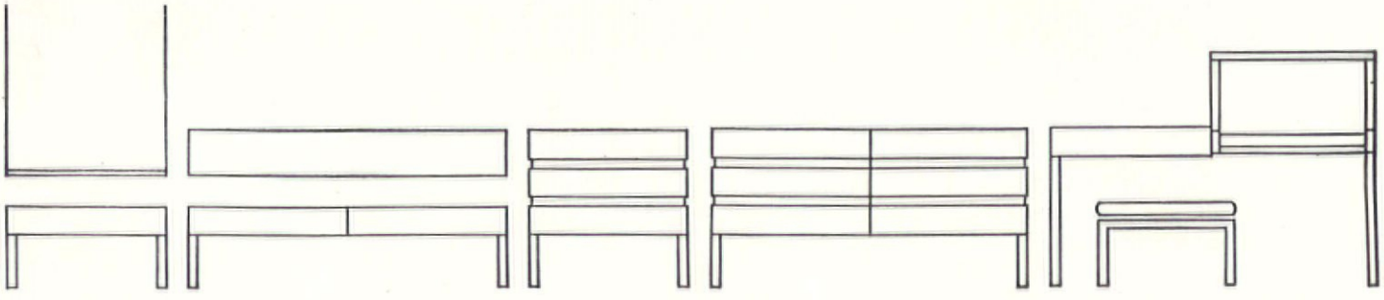

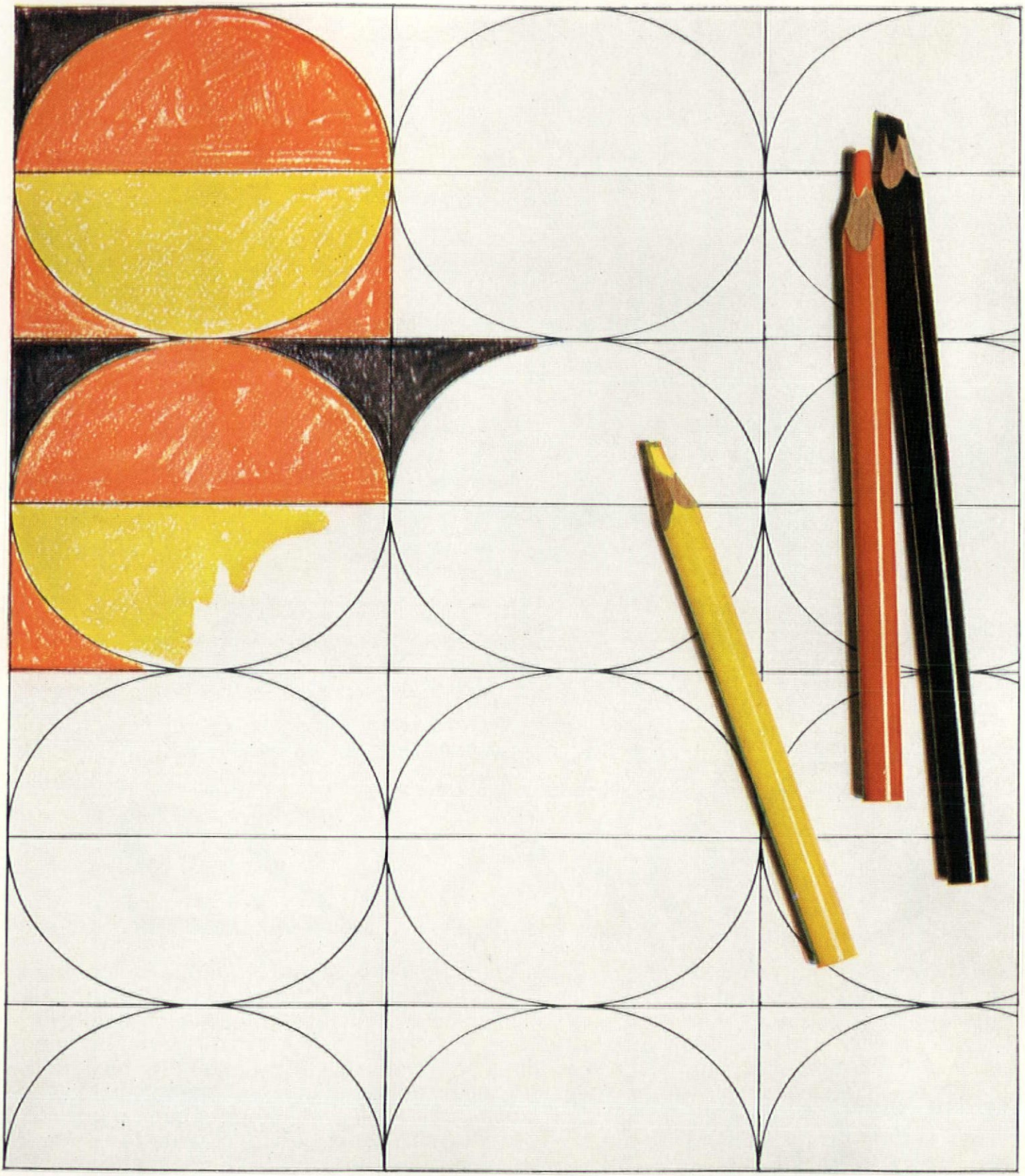

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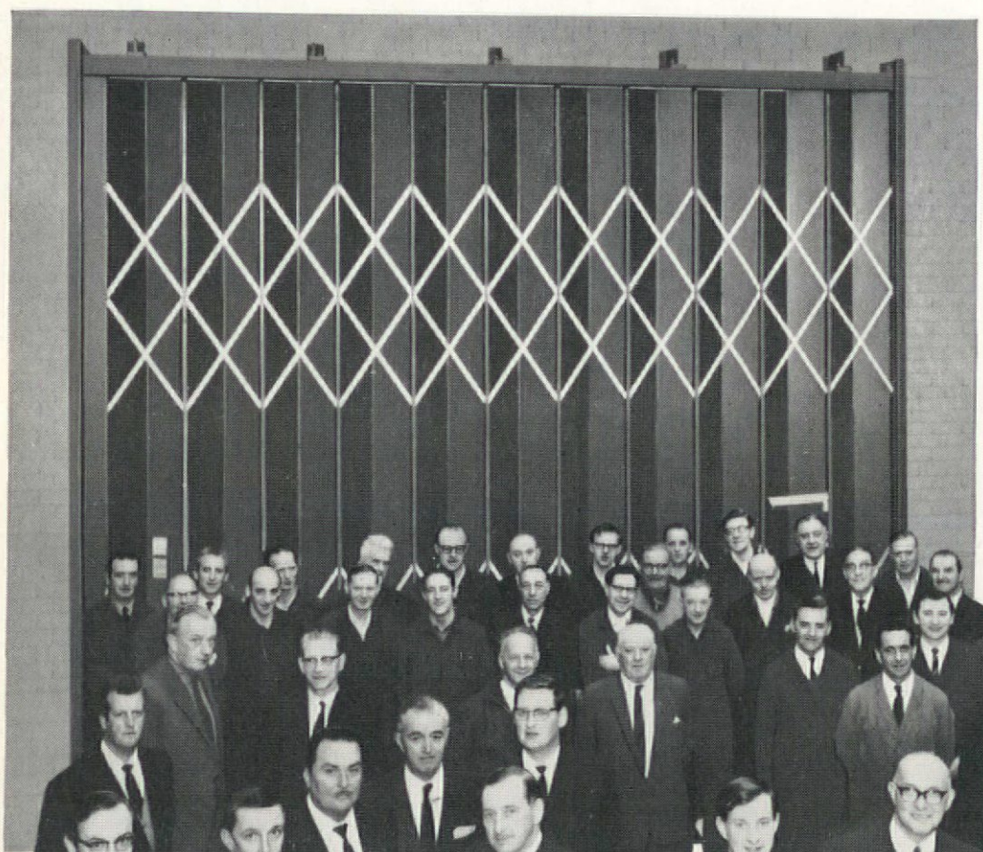

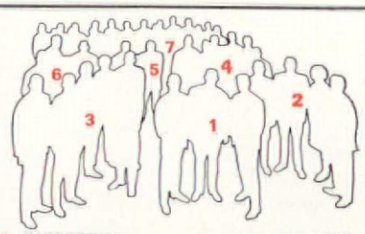

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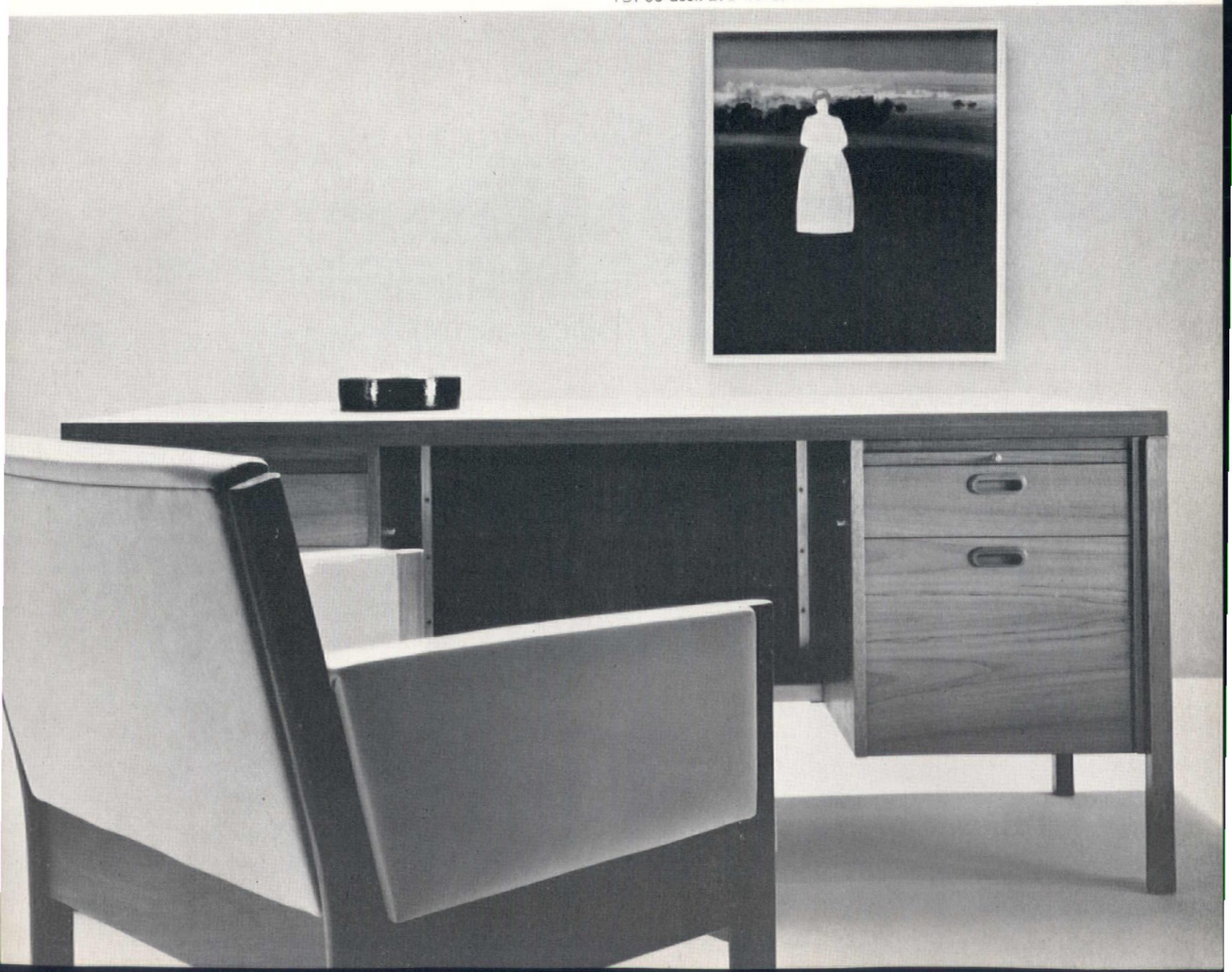

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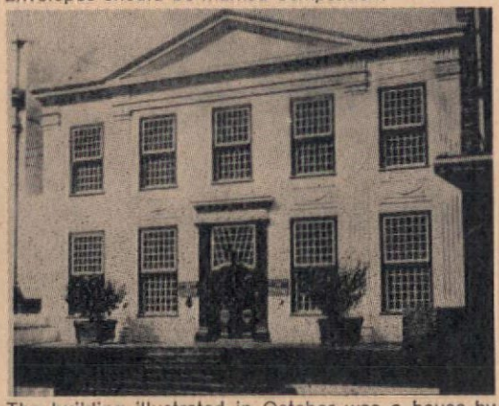
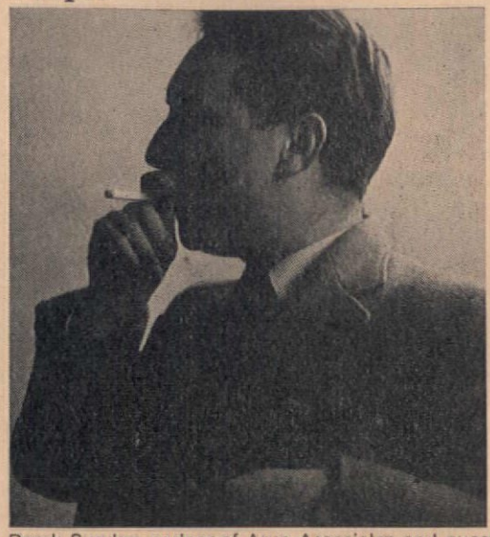
What, where, when, whom

The sender of the first correct answer to this month's problem picture opened in our office on the 20th of this month, will receive £5.
The entry form is on page *AD* 28.
Envelopes should be marked *Competition*.

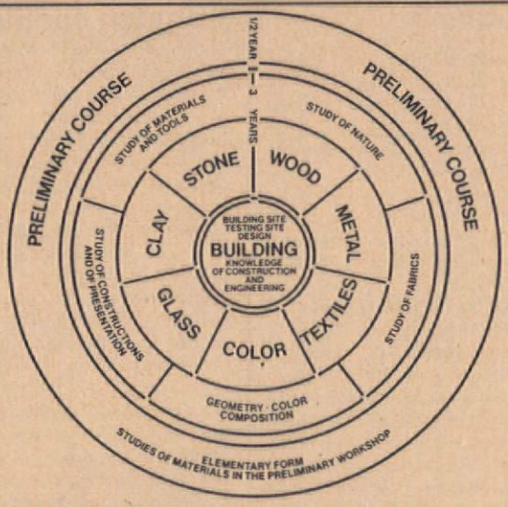


The building illustrated in October was a house by Mart Stam, designed 1928, built 1933, Na Babé 9, Dejvice, Prague. Winner: *Risselada, Rotterdam (address?)*.

People



Derek Sugden, partner of Arup Associates and guest editor of the feature 'Anatomy of the factory' (pp. 513—551)



The Bauhaus at rest

The Bauhaus has finally gone to rest—the archives to the Mathildenhoehe tower at Darmstadt where, under the aegis of the Grand Duke of Hesse, the whole movement might be said to have started; the reflected glory and the reputation to the Royal Academy, London, where, some future historian may note, that it died. From 21st September to 27th October the relics and reliquaries were on display in Burlington House. The great collaborator himself, Walter Gropius, assisted by Herbert Bayer, officiated at the rites. The German Embassy gave a party ('lounge suits will be worn'). Other hortatory rites were widespread. The Architectural Association held a symposium (26th September) and a reception (17th October); the Royal Institute of British Architects organized an evening at which Maxwell Fry spoke (22nd October). Among others on BBC 3 Reyner Banham preached the true gospel (*The Listener*, 26th September), Joseph Rykwert intoned the dark and mystic side (*The Listener*, October 3rd) and Peter Lloyd Jones discussed the fallacy of basic design (*The Listener*, 10th October). The Central School of Art staged the Bauhaus-Grafik (21st September–27th October). The Marlborough Gallery arranged an exhibition of the works of Moholy-Nagy and Lyonel Feininger, and the Ewan Phillips Gallery put on display eleven water colours executed at the Bauhaus by Heinrich Pfeiffer. There was and still is, as can be imagined, a great deal of peripheral activity.

The lessons and examples of the Bauhaus have long since permeated the life style of more than one generation. The pious display of the relics and the accompanying paeans are unlikely to have made any new converts. Indeed, many of the objects disinterred for the ceremonies—some teapots in particular—were best forgotten. The only revelation—though one of a minor sort—was the actual appearance of the tapestries of Gunta (Stadler-) Stölzl. Oskar Schlemmer too, emerged as more worthy of attention than is generally considered.

Far too much of the exhibition was devoted to the work of the Bauhaus masters after they left Dessau. The US Embassy in Athens and the Playboy Club, the late buildings of Marcel Breuer and the bungling attempts at architecture and design made in recent years by Herbert Bayer, indeed by most of the artists and painters of the Bauhaus, cannot but stir doubts. The system needs to be called in question. For the magic of those Weimar and Dessau years when a handful of idiosyncratic artists were interacting, did not last long. The so-called 'system' was clearly of little influence on the creative splurge. They were aesthetes to a man. The 'scientific' system was a prop, but it was an essentially worthless excursion into design theory.

Yet it is that celebrated and now ubiquitous *Vorkurs* (to which a whole room at Burlington House was devoted) that is considered to be the prime legacy of the Bauhaus. All over the world students in schools of art and architecture are asked to initiate themselves into the world of design by dabbling with colours and textures, patterning with lines and with dots and arranging the sphere, the cylinder and the cone. There is no hint in all this that anything other than visual ends are to be met. The appearance is all. There is no thought given to the analysis of real human problems and to their resolution by the most economical means—whether they be visual or not. Reyner Banham made a strong case on the BBC for that teaching tradition of the Bauhaus that was aimed not at providing a more refined and beautiful object, but rather a service to satisfy human needs. Bauhaus masters may have talked in such terms, but the works that they left and the books that survive them show that their ultimate concern was with the stylish object. The Bauhaus was nothing if not stylish. It is for the style that it evolved, not for its thought process, that the Bauhaus is remembered. And it is probably not by mere coincidence that in the year that the Bauhaus has come to rest in the Academy its celebrated basic design course should be vigorously rejected as an adequate programme for teaching at the Architectural Association, which was the first school of architecture in this country to take it up. First year students under Tony Dugdale are no longer expected to hold the visible products of design in awe, they are being encouraged to identify problems and to devise solutions for them by whatever means necessary—to hell with what it all looks like.

Next month

In contrast to the cornucopia of food and drink that inevitably accompanies the festive season, we offer our readers some unusual food for thought, concocted for them by Jonathan Miller assisted by Tony Earnshaw, Francis Haskell, Eric Hobsbawm, D. P. Walker and Frances Yates.

Entitled 'Metaphoropolis' it shows how the image of the city has flourished as an imaginative metaphor, and how the social situations entailed by the physical order which architects and town planners create, are in turn the cause of new dangers like riot, crime, madness 'and all the wilder excesses of civilized anomie'.

cosmorama

A proposal

Theo Crosby

There is, if you read the more intelligent weeklies, getting to be quite a consensus that present housing —policy, form, finances and everything—is all wrong. On one hand our commitment to increasing 'industrialized building' provides an ever larger public with examples of unmemorable and often positively antipathetic environments; on the other the high costs of traditional buildings, and of maintenance, ensure a progressive deterioration of older areas.

In this dilemma the architect becomes less and less important, as the engineers of the big 'system' contractors take over. The recent Ronan Point fracas pointed out very clearly the relative responsibility of the 'architect' as compared to the system builder. It was negligible.

What has happened is that choice, for architect or client, has been gradually reduced, until now only the meanest alternative is available.

We are moving inevitably into a world where economy and conventional thinking predominate: larger clients, larger contractors, committee decisions all work against experiment, in a housing situation where conventional thinking has proved and is daily demonstrated afresh to be barren and inadequate.

If anything can be done, it must be done now, while traditional building still offers a certain flexibility, and an economic alternative. The main need is to feed intelligent data into the hardening IB programme. This cannot be done with paper projects, or with individual research, but by controlled experiments with materials and components, and particularly with layout, community involvement, identity and personalization of the dwelling.

A tiny percentage of the 400,000 houses we build yearly, properly programmed to be used as test beds could begin producing useful feed-back in 5 years.

Perhaps as the architects' farewell to housing, the RIBA might offer the government a deal: a competition for, say, ten test-bed IB or semi-IB environments, to be built by the Ministry of Housing and radically and comparatively researched in use. The results could then be made available to local authorities and IB development conditioned by the appropriate grants.

At the same time various financing arrangements could be comparably consumer tested: weekly or monthly renting, long-term leasing; ownership methods such as housing associations' financing, share ownership in a private company, freehold sale to an insurance company and lease back, and many more. The local authorities have so few financial alternatives to offer their tenants; a wider choice gives more possibility of financing the housing obligation. And each method has a social and environmental consequences well worth investigating.

In general most of the work on industrial building is done by small groups and not necessarily the best architects. IB tends to be worthy but dull at the research end, monstrous and dull at the producers end. Only a larger participation of talent can change the equation.

US in-city housing project

[Ed: The note that follows is reprinted from *Architectural Forum*, September 1968, as it complements Theo Crosby's proposal].

HUD is spending $4·9 million—nearly half of its current research budget—on one big, far-flung experimental 'in-city' low-cost housing project. Kaiser Engineering, a division of Kaiser Industries Corp., has been selected to carry it out, with Building Systems Development Inc.

Under the contract, Kaiser Engineering will recommend the specific housing experiments to be conducted and the cities in which they will be developed; and Ezra Ehrenkrantz, president of BSD, will direct the experiments. 'The program,' said HUD, 'will be carried out only in those cities that indicate a willingness to build a large volume of housing for lower-income families, using flexible and innovative methods suggested by the contractors.' And only in model cities areas.

This is the second phase of the project. The first, completed in June, was conducted by three teams (including Kaiser-BSD) selected from among 19 firms that submitted bids for the new HUD programme in April. Proposals from the three teams contained criteria for selecting the cities; identification of new techniques and systems to be used; descriptions of local needs and constraints; and suggestions of cities to be chosen.

Kaiser has prepared a report, soon to be released, making its recommendations to HUD.

HUD is the US Department of Housing & Urban Development. BSD Inc is the group responsible for the now famous SCSD schools programme

Reprieve

In Bethnal Green, the Simon Community have established a home for eight crude-spirit drinkers—a derelict house to be left as such except for essential mod-cons. An enforcement notice was served by Tower Hamlets Borough Council to close the premises and the Trust appealed. They won a year's respite.

This encouraging step by a Minister can be seen as a gesture against the smugness that goes with respectability at all levels—smugness that is occasionally liberal enough to say 'There, but for the Grace of God, etc.', but too priggish to say, 'Why do I judge my life to be more valid than theirs?' People who have accepted most environmental menaces, noise, dirt, filthy air, digging up the roads on Sundays, draw the line at visibly unhappy humanity. A 'nice' area is one in which one's children will see, on their way to school, the bowler-hatted gent without visible troubles, and not the world's drop-outs, sitting greyly on a doorstep, drunk or drugged.

Those in the vicinity of the Simon Community's Shelter complained of general annoyance and distress. But the drop-outs, products of narrow and repressive conformity, do not complain, although it is just this conformity that has forced them into their mental shelter. Their chosen way of life has made them impregnable, both mentally and physically. In their view, they are not in need of shelter.

The Simon Community, knowing that the human body, even when filled to the teeth with alcohol, is still vulnerable to cold and sickness, takes the view that shelter is essential. But just as essential if the alcoholics are to accept it, is that it should seem to be derelict, although having basic services.

From this concept another point emerges, which could enrich our lives by breaking down some straight-jacketing conditions which people impose unnecessarily on themselves.

As a general rule, when a couple set up a stable relationship, or a single person feels secure and adult, then suddenly, comfort is demanded. However, a minority—but still a large group of people—are at their best in a mod. con. derelict; a dwelling with essential services, but having the special aura that only someone else's very worn, very bad urban taste can provide, or, possibly, an agglomeration of tastes.

Perhaps the Simon Community's shelter is the first step in recognizing that some people might perhaps be happier if they did not 'do up' their terrace house or bijou flat, or least of all, build to their own taste.

A new freedom might thus be born: or perhaps Strand Electric could include a 'bed sitter' disc and a 'derelict' disc—best sellers in their colourful Kaleidospot range.

Ruth Lakofski

Civic Trust conference

Public participation in planning was the major theme of the Civic Trust Conference of Amenity Societies held at York on September 27th–29th. The Trust was celebrating three achievements—its first ten years during which time the number of local amenity societies has grown from 200 to over 600, the coming into force of the Civic Amenities Act, sponsored by Mr Duncan Sandys, the Trust's founder and President, and the new town planning Bill before parliament, which will give the amenity society a formal place in the planning process.

Official speakers, including Mr Niall MacDermot, at that time Minister of State at the Ministry of Housing, welcomed the societies' participation in planning, though opinions varied amongst speakers and delegates as to the best way for an amenity society to achieve its aims. Predictably perhaps, some of the official planners were not keen on too much help from the societies, and Professor J. R. James, of Sheffield University, suggested that when the new bill comes into action the local societies should confine themselves to the policy and principles of the plan for their area, leaving the details of individual applications to the trained official experts. This point was challenged by delegates, and on this point of how *much* public participation in planning the most interesting arguments of the conference revolved.

Though many speakers urged delegates to maintain good relations with the 'establishment' in its varying forms, the amenity movement is essentially a movement of protest, often born of a disastrous threat by some powerful local phillistine to historic buildings or urban amenity spot. When the threat disappears, public support and interest diminishes; though very often with good will on both sides, positive cooperation can develop from a protest, so that on later occasions the local authority can be persuaded to adopt an amenity-minded solution in the first place rather than be challenged after a decision has been made, and official prestige is at stake.

Considerable evidence of the growing professionalism of local societies is shown by the surveys of all shapes and sizes from the excellent Ouse Survey by a professional landscape consultant, promoted by the York Civic Trust and paid for by a local charity, to a survey of historic listed buildings carried out by the Clapham Society, which has encouraged the Ministry to review the listed buildings of the area. It is in the initiation and promotion of such schemes that overworked official architects and planners will find most help from the amenity societies, and in the use of such societies as channels of communication.

Hermione Hobhouse

Camden should . . .

Earlier this year the London borough of Camden successfully supported residents in their fight against demolition of a small sector of Bloomsbury. Its conscience pricked, the borough now proposes a Bloomsbury Conservation Area under the new Civic Amenities Act. The wonder is that it sees any stable door left to close. Bloomsbury as a useful, pleasant multi-occupied housing pool has ceased to exist. London University, the hospitals, and local authority point blocks have seen to that. A few houses in the oldest section of Bloomsbury of individual architectural interest remain: one complete street by the seventeenth century jerry-builder Barbon survives. But, barring the odd set piece like Bedford Square, the big architectural ensembles are gone.

This said, Camden's vow to 'preserve as much as possible of the original character' seems both irrelevant and inadequate. The use has changed: a new planning strategy is required. For a start, Camden could use its left hand (supporting preservation in Great Ormond Street) to nudge its right hand (clenched hard round empty property and a large derelict area in adjacent Millman Street). A cost-rent Housing Association scheme here for young single people might make slight amends for the wholesale destruction of desperately needed accommodation in the Brunswick Square area for the Martin/Hodgkinson valley section extravaganza. It would also, if Camden so wished, give the borough enough moral authority to keep London University's hostel-building paws off Gordon Square.

Stephen Mullin

Briefly

'The cost of all construction research in Britain is about the same as that of providing tea on construction sites' says Dr A. R. Collins, P.I.S.E.

The Council of Industrial Design supports the proposal of the Institute of Mechanical Engineers and the Council of Engineering Institutions that a new national *Design Council* should be set up, absorbing the COID and built upon its existing organization.

Prof *Tomás Maldonado* received this year's SIAD Design Medal and Mr *Marcus Brumwell* the RSA Bicentenary Medal for 1968.

At the Venice Biennale *Bridget Riley* has won the international painting prize (2 million lire) and *Nicholas Shoeffer* the international sculpture prize (2 million lire). *Marcel Duchamp* died last month at the age of 81.

At the *RIBA*, 1969 *exhibitions* will include one on Schindler in February and one on Lutyens in April. The *Discourse* will be given on April 1st by Vincent Scully. The *ABS Ball* takes place on December 12th at Grosvenor House. Tickets £4 4s. each.

Does London need Mies?

Cynically, one might assume that Mies van der Rohe was commissioned to design the new tower for Lloyds Bank Overseas Department, on a site within two hundred yards of St. Paul's, because he was considered sufficiently prestigious to silence the objections of the planning authorities and the Royal Fine Art Commission. If this was indeed so, then the developer Mr Rudolph Palumbo must be praised for his enlightenment. But the strategy might not work, despite the fact that Mies van der Rohe is abetted by Lord Holford, himself a member of the Royal Fine Art Commission. For the Commission has already intimated that it would like the 290ft tower reduced by 90ft. The City authorities have as yet made no comment; instead they have invited the public to participate in the planning decision. From October 7th to 19th an exhibition of the proposed design, in the form of models and magnificent montages, was on display at the Royal Exchange. Everyone was asked to have their say.

Ultimately, though, the decision to allow the building or not will be made by the planning authorities and the Fine Art Commission. Why they should balk at the project is difficult to understand. The bronze clad tower (82ft × 121ft) is of the impeccable—though by now standard—variety for which Mies van der Rohe is famous. By 1986 when the lease for the small triangular building between the Mansion House and Queen Victoria Street falls in and the street can be re-aligned, a vast paved space, the size of Leicester Square, will be opened up in front of the tower. Under this square will be shops and, below them again, some limited parking. Sir Edwin Lutyens' Midland Bank headquarters will be revealed in its splendour on the north of the square, the Mansion House flank to the east, and Bucklersbury House to the south. The tower and possibly the dome of St. Stephen Walbrook will, for the first time, be brought into prominence. The authorities are thus being offered a building of expert design and a great public space (this last not entirely gratuitously, for surveys showed that the maze of underground services on that part of the site made it altogether unsuitable for building upon).

What can be the objections? The authorities have long since given up any attempt to preserve the old texture of the City; towers of indifferent design are sprouting up all over the place. Nor can the proximity of Mies van der Rohe's tower to St Paul's be invoked; the Llewelwyn Davis and Weeks' Stock Exchange tower is 328ft high and is no more than 800 yards from St Paul's; while the Barbican scheme, when complete, will provide a solid wall against which the dome of St Paul's will have to be viewed from the south. The playful silhouette of St Mary le Bow, as seen looking east along Poultry, will never be quite the same against a Mies van der Rohe chequer pattern; but such felicities cannot be preserved for too long in a rebuilt City. More questionable perhaps, is whether the City needs an open, unprotected paved area the size of Leicester Square, scoured by the downdraught from a 19 storey tower—but of that, nothing has been said.

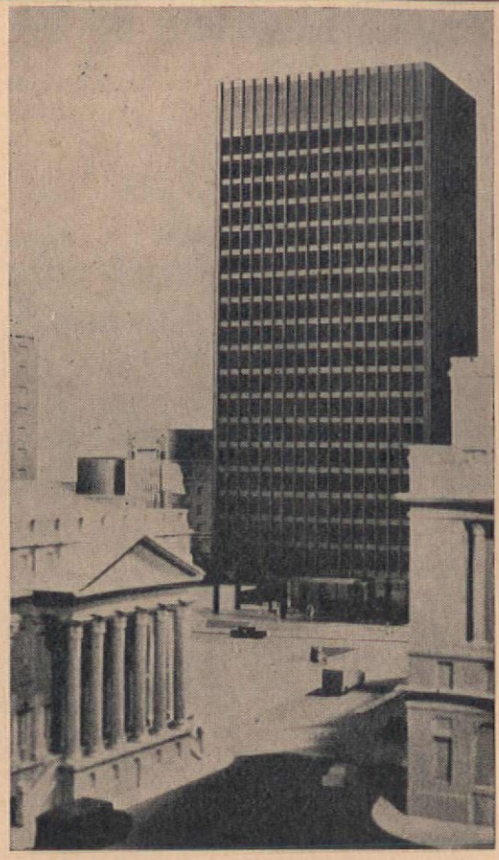
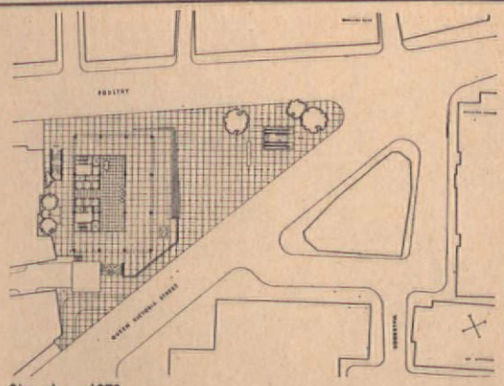
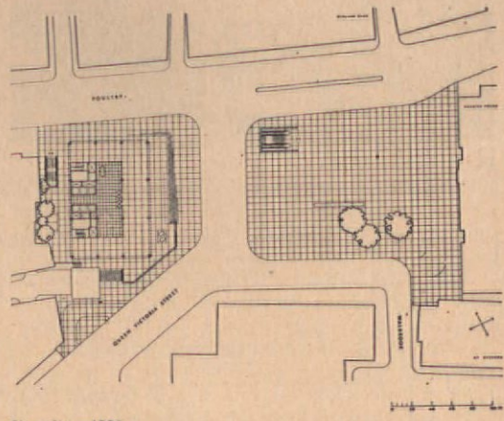


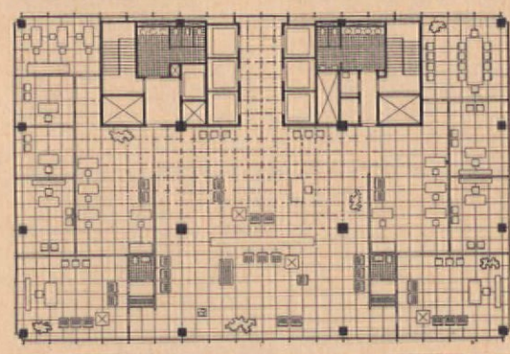
Photo: John Donat



Site plan—1973

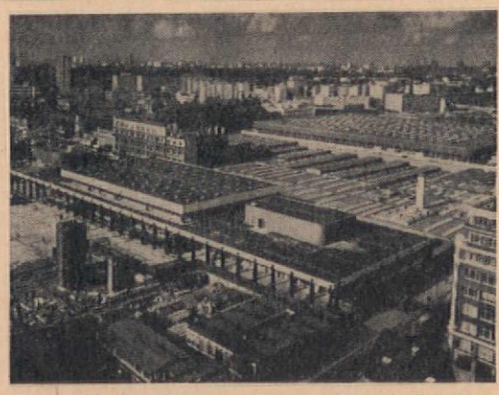


Site plan—1986



Euston

The buffer stops not yet stabilized, the car park and taxi set down still a concrete cavern[1], the site littered with contractors fencing and gear, the new Euston Station was declared open by the Queen on October 14th. The basic activities of the station have been neatly separated: parcels are consigned to the rear end of the trains and are unloaded from there to lifts which take them up directly to the mammoth parcels depot riding above the tracks; mail and newspapers are kept to the front of the trains and are taken from there to service trucks and lorries adjacent to and at the same level as the platforms; between the parcels and the post are the passengers, who move from the platforms to the concourse and booking halls over the service ways at platform level by means of gentle



ramps. So far, the arrangement is neat. But from there onwards the organizational ability of the designers appears to have run awry. Stripped of the great commercial enterprises that were to (and should have) straddled the station[2], the programme is neither large nor complex. Certainly there is no lack of space. Yet passengers are offered no easy apprehension of how it works. Nothing is quite as it seems or where it should be. If, for instance, you come through the ticket barriers and hope to slip out of the station without progressing through the vast and wasteful[3] concourse you will find yourself amongst the luggage lockers or in the gents. If you come up the grand escalator from the underground hoping to have a quick sight of the ticket office you will be disappointed; it is a good two hundred feet behind the escalators in a hall of its own—to which incidentally there are no automatic doors (There are no automatic opening doors anywhere in the station—clearly it is not planned for people in a hurry, whether or not they are carrying suitcases.) There are no seats in the concourse for fear that they might be used by vagrants.

These points might be brushed off as quibbles, but they give evidence of the terrible and general failure at Euston to grasp the possibilities whether they be of financial gain or of operational efficiency. The quality of the design is of that self-effacing pretentious variety.

This is the station that has been substituted for the Hardwicks' terminal. For all its mess—the result of being built piecemeal over half a century—the old buildings had guts and some magnificent features. The new has little to commend it. But the opening of the front end of the site to the public will serve no doubt as grist to the Victorian Society's mill. For they will find if they measure the buildings and plot them on an ordnance survey sheet, that the Euston Arch need not, after all, have been demolished. At the worst it might have stood in the pedestrian concourse—despite architect Moorcroft's misleading disclaimers to the contrary (*Architect's Journal*, July 13th, 1966, p. 72).

[1] The area allowed for the taxi set down and pick up and the provision for car parking will soon enough be found altogether inadequate.

[2] See AD 6/66, p. 267, or more recently *Sunday Times* September 22nd, 1968, p. 37.

[3] The concourse is patently a spacefiller, devised after the collapse of the intended commercial development. British Railways architects convincingly proved many years ago that a large concourse was definitely *not* what was required at Euston.

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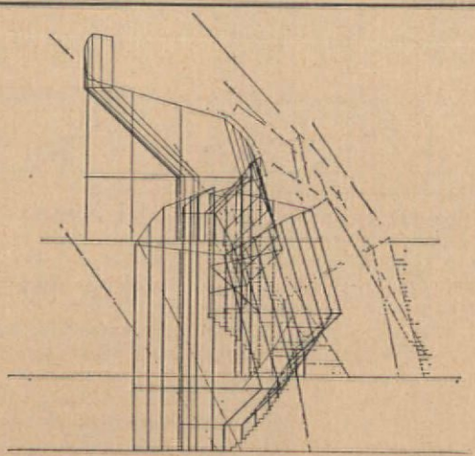
Realpolitik

In Berlin there is a contentious proposal to rebuild Mies van der Rohe's celebrated monument to Karl Liebknecht and Rosa Luxemburg—designed in 1926 during the starry-eyed days of Communism, torn down seven years later when the Nazis came to power. Mies will have no part of it. The 'Aktion 507' group who are sponsoring the proposal are, however, determined. They forced their way into Mies' National Gallery on the day that it was opened with a large model of the monument and collected signatures of support. There is, of course, controversy about whether or not it is right to restore the hammer and sickle. But the main problem is not support—the Friedrichsfeld cemetery in which the monument once stood is no longer accessible so that the pious rebuilding will be off to a bad start. The site proposed is that of the canal in which Karl Liebknecht and Rosa Luxemburg were murdered.

Bauwelt 41, 1968



Baroque calculations

The detail design of the Sydney Opera House has been the subject of much speculation and considerable uneasiness. The problems of geometric projection with which any designer would have to contend might well have been beyond the powers of Jørn Utzon himself. His successors have grappled bravely with the design and have been emboldened even to publicize their intentions in a series of progress reports published in *Architecture in Australia*. The seventh of these reports in the August issue deals with the glass walls intended to fill the gap between the podium and the roof shells. The vertical surface of the glass wall is to lie on the elliptical cylinder of projection of each hanging rib of the shells. The first step of transition is to be effected by bending the glass wall outward, once again on the surface of an elliptical cylinder, but with its projected major axis lying parallel to the axes of the halls. The final link is to be made by again bending the glass wall out, but along the surface of a cone.

The intention can be grasped, though none too readily—but can the contractor effect it?

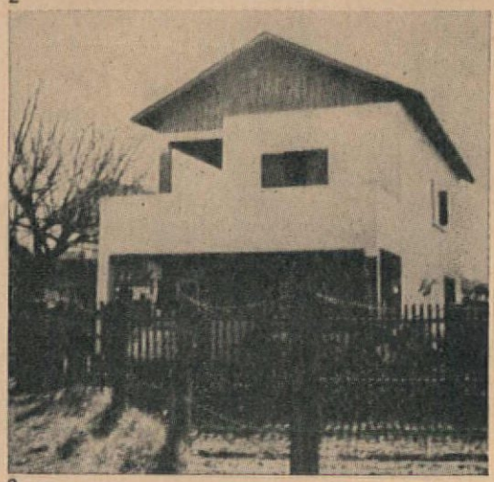
Freedom of a kind

Surveying the incredible transformation **1, 2** of Le Corbusier's Quartiers Modernes Frugès, at Pessac, outside Bordeaux, Philippe Boudon notes wryly* that it is in all likelihood Le Corbusier's celebrated *cinq points de l'architecture moderne* that have proved its undoing. Not one of the points has been found acceptable to the inhabitants—at least not in the spirit intended by Le Corbusier. The *fenêtres en longueur* have been divided up or blocked in; the *toitures-terrasses* have been covered with pitched-roofs and the free space around the *pilotis* has been built in. The *façade libre* and the *plan libre* have, paradoxically, been the points of departure for the most devastating of the alterations. For it was precisely because they recognized the 'possibilities' inherent in the free planning that many people were induced to buy the houses and change them to suit their own tastes. Le Corbusier's houses, unlike those on adjoining estates, are ideally suited for conversion.

1

In the same issue of this journal is a poignant account by Henry Frugès, Le Corbusier's client, of their collaboration, both at the little known (or virtually unrecognizable) estate of Lège (1925) **3** and at Pessac (1926-27). Frugès reveals that it was not Le Corbusier's original intention to paint the Pessac houses in the vigorous tones of blue, yellow, jade green, off-white and chestnut brown in which they ultimately appeared. The painting was the result of a compromise. Frugès wanted some form of decoration on the outside, however rudimentary; Le Corbusier wanted bare walls. Only when Frugès suggested paint was agreement reached.

2



3

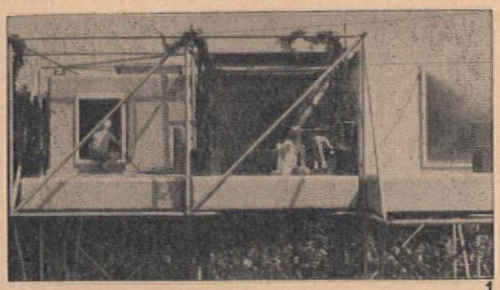
*Le Corbusier à Pessac, 1927–1967' *Architecture, movement continuité* 3 January 1968, Bulletin de la Société des Architectes Diplômés par le Gouvernement, Paris

Erich Mendelsohn—an unfashionable master

An exhibition of the sketches and finished buildings of Erich Mendelsohn was opened at London's Building Centre in October by Reyner Banham, who confessed to a certain folly in standing on the platform there when Arnold Whittick and other chroniclers of that great 'unclubbable' master of the modern movement were standing below. Banham was, as he realized, no more than a book-learned scholar of Mendelsohn and his involvement in his reputation was in itself an odd and wayward event. Mendelsohn was the first of the masters of the modern movement to die. He died at an inopportune time. He died before the writers and the obituarists of the glossy magazines (and Banham was then to be counted amonst them) were ready to assess the work of that generation of architects. The journalists fumbled. Their tributes make sorry reading today. Mendelsohn was remembered for one building alone, the Einstein Tower at Potsdam, built in 1920. This was indeed a remarkable building and one that, despite all the sniping and rude gossip that surrounded it, could be said to epitomize a whole movement in architecture—the Expressionist movement. For Mendelsohn had the unique (and perhaps unfortunate) distinction of not only designing Expressionist buildings, but of getting them built. More remarkable, perhaps, were some of his later buildings.

The salient point in Mendelsohn's career though, was its 'unclubbable' nature. It was and has remained difficult to group Mendelsohn with any of his contemporaries. He was not to be numbered among them. The fact that he put up a major building at Stuttgart at the same time that the Weissenhofsiedlung was building has, for instance, been generally overlooked. The Weissenhofsiedlung buildings are piously visited and preserved (often beyond their merits), while Mendelsohn's Schocken department store is usually forgotten and overlooked. Yet it is, in many respects, more worthy of attention. For, whereas most of the masters of the modern movement used glass as little more than a straight-up-and-down weather barrier, Mendelsohn sought to express its optical, fairy-tale effects. He had a sense, as the curved walls of the Schoken store show, of the wierdness of glass. Similarly, he was, together with Frank Lloyd Wright, Richard Neutra and Rudolph Schindler, one of the few architects of the period who knew what to do with electric lighting. Other contemporaries knew virtually nothing. Even in the Bauhaus interior the lighting was horrible—not only the lighting, but the acoustics and everything else (as Philip Johnson remarked to Banham 'I gave myself forty minutes; after that, Peter, I had to get out'). But Mendelsohn self-consciously and calculatedly—as his drawings demonstrated—used light creatively, he used it to illuminate, model and transform his buildings. Only one man in England attained to any comparable degree of success in the handling of glass and of light—Joseph Emberton—who was perhaps influenced by Mendelsohn and who will, one day, like him be admired for qualities that are only beginning to be fashionable.

The problem that will confront future admirers of Mendelsohn, however, is the fact that, once uprooted from Germany, he became, literally, the Wandering Jew. Walter Gropius and Mies van der Rohe were able to identify themselves as Germans in America; but for Mendelsohn this was not possible; once exiled from Germany he became a displaced person and his architecture suffered in consequence. Those letters that he wrote from aeroplanes have a poignant sense of his alienation—an alienation, like so much else in Mendelsohn, that seems ahead of its time.



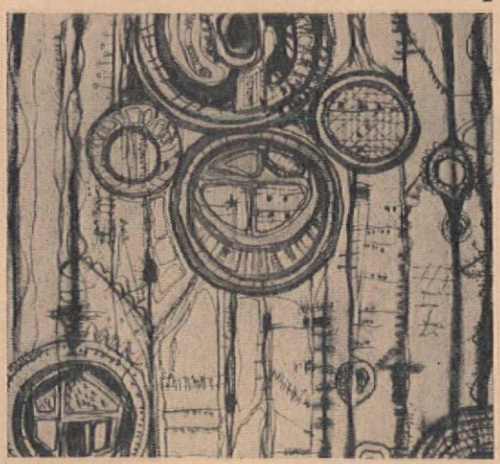
1

Back to the ark

The editors of *Architectural Design* have been accused by Rudolf Doernach of impious chuckling (see *AD* 6/68, p. 249). For hydroponic biotecture is, it seems, all. And Doernach has not only received the call to salvation, but has now built the first of the arks in which we are to go to sea. The plastic Habitainer or Happitainer (also known as the Cubino) shown here **1**, is shortly to go into serial production. Before long we may well be invited to witness and perhaps even to test the less tangible Edible City **2**, made up of Spermobiles suspended in water. For, as Doernach rhetorically asks, if a fish can live in an edible city—the sea—and a stag can live in an edible city—the forest—can man regard himself as their superior unless he too lives in an edible city?

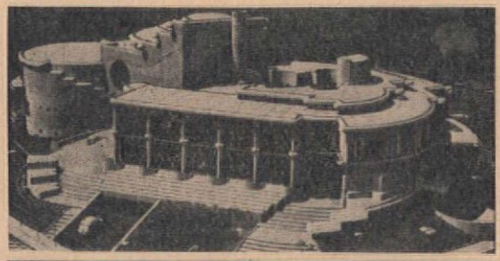
For further information write: Doernach Systemsforschung 7 Stuttgart-Vaihingen Viereichenweg 43-Gy

2

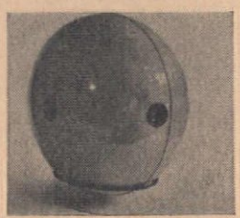


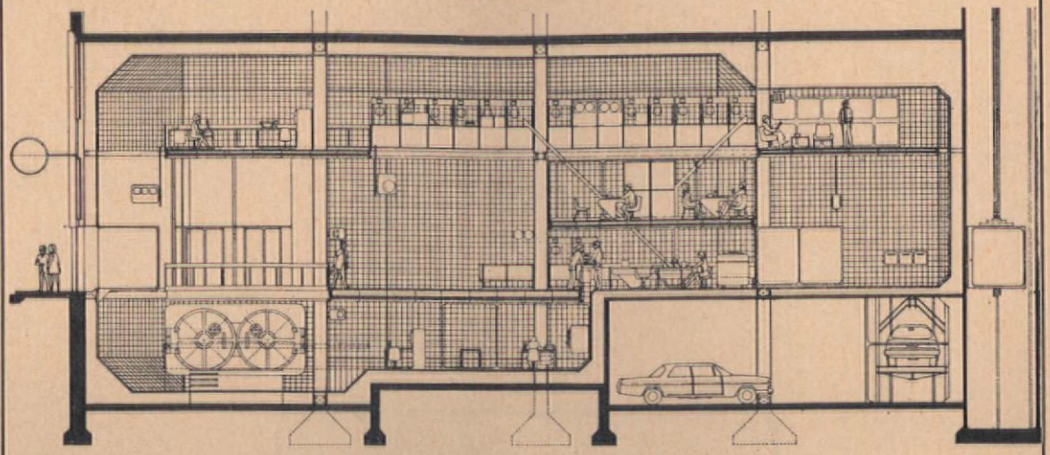
In situ

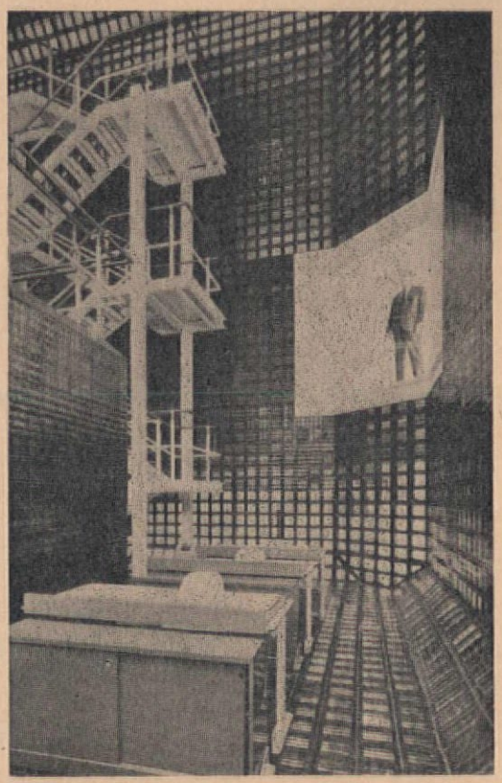
Determined to preserve its autonomy in the face of its slow sprawl into the outskirts of Milan, the town of Segrate has erected a convoluted and complex municipal centre (administrative offices, assembly hall, library, health centre and registry office all in one) that can be seen to be 'original' and 'characteristic'. The architects were Michele Achilli, Daniele Brigidini, Guido Canella and Laura Lazzari.



Gérard Ifert and Rudolf Meyer have designed this neatly packaged exhibition dome, together with an audio-visual device, for Philips. Werk 9 1968



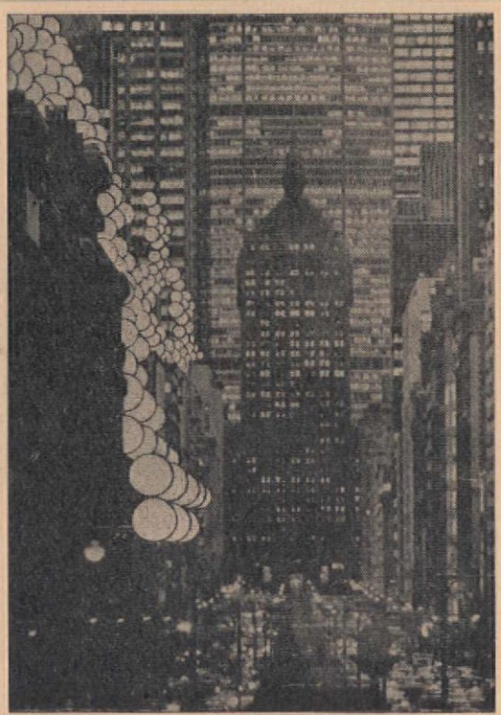


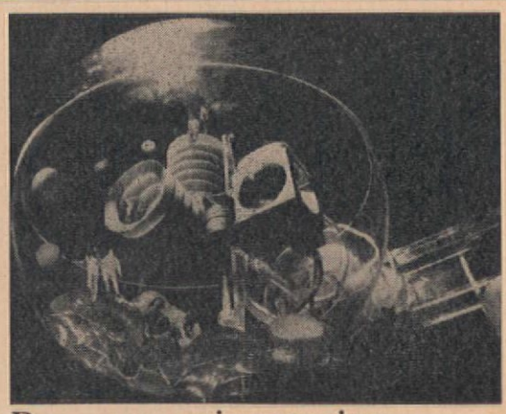


Flash

Banking is clearly a source of the most heady inspiration to the architects of South America. The concrete fantasia that Sánchez Elía, Peralta Ramos, Agostini and Clorindo Testa conceived for the Bank of London and South America in Buenos Aires is familiar to *AD* readers (AD 1/67). Similar manipulations in concrete by the same architects and their emulators have since sprouted all over the continent. Now a new vogue is likely to be initiated by a steel and glass extravaganza that Flora Manteola, Ignacio Petchersky, Javier Sánchez Gómez, Justo Solsona and Rafael Viñoly have built in Buenos Aires for the Banco Municipal. Chareau's *Maison de verre* is recalled, but is best left in a category on its own. The Buenos Aires bank is of another order of architecture (though like the Chareau house it was limited in its designing by an existing building). Everything in Buenos Aires is done for the most daring display; ostentation is at a premium. The entrance floor is of plate glass, through which visitors see the main vault on the floor below. The viewing windows along the pavement are similarly made up of vast sheets of plate glass. The walls, the floors and the ceiling are, for the rest, all of red glass bricks. This must rank as the first bank designed to ensure an effect of total insecurity.

***Summa* 12, July 1968**





Pneumacosmic morning

I am lying deep in the bulb on a yellow foil cushion,
Beyond the furniture-tree a violet helium moon is rising,
After a while it sets and becomes larger and larger
I remember XANA and that she has marvellous legs.

Laurids, Zamp and Pinter (Haus-Rucker-Co.) strike again (for earlier strikes see *AD* 3/68, p. 100, 10/68, p. 449). On this occasion Zamp offers a design for a *Pneumakosm*, a plug-in living cell which can be fixed to a space-frame or plugged into an existing building, rather in the manner of a giant light-bulb. And, like a light-bulb, it makes for a conspicuous environment.

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Calendar

Exhibitions

November 12 to 15	London	Reinforced plastics	Earl's Court
November 19 to December 22	Oxford	Pneu show, by Eventstructure Research Group	Museum of Modern Art
Till November 26	London	Lighting for living	Design Centre
Till December 29	London	Charles Rennie Mackintosh centenary exhibition	Victoria and Albert Museum
December 2 to 6	London	Engineering materials & design	Olympia
December 3 to 22	Oxford	Inflatable furniture	Museum of Modern Art
January 27 to February 8	London	Interfurn 69	Earls Court
February	London	Schindler	Inf. RIBA
February 24 to 28	London	Carpex 69	Earls Court
March 5 to 16	S. Paolo	British Industrial	International Pavilion, Ibirapuera Park
April	London	Lutyens Centenary	Inf. RIBA
April 22 to 30	London	International Engineering & Marine	Olympia
April 22 to 26	Glasgow	Envirex (environmental engineering)	Kelvin Hall (Inf. Lintex, 224 Grand Buildings, Trafalgar Square, London, WC2)
May 13 to 16	London	Decor International	Empire Hall, Olympia
July to September 1970	Rimini	International Design Biennele	Inf. Sec. Gen. 47040 Verucchio, Italy
January 24 to Feb 1	Hanover	Constructa 1970	Hanover Fairground (Inf. Schenkers Ltd, Royal London House, 13 Finsbury Square, London EC2)
March 15 to September 13	Osaka, Japan	EXPO 70	

Conferences

November 11 to 15	York	Building Economics	Inf. Institute of Advanced Architectural Studies, The King's Manor, York
November 13 to 15	London	International reinforced plastics conference	British Plastics Federation, 47–48 Piccadilly, W1
November 15 to 16	London	Technology, design & society	Inf. DIA, 13 Suffolk Street, London S.W.1.
November 15 to 17	London	Art, technology and society	Inf. DIA, 13 Suffolk Street, London, SW1
November 20 to 26	Milan	10th International convention/exhibition of automation & instrumentation	Inf. FAST, piazzale Rodolfo Morandi 2, Milan
January 2 to 4	Lancaster University	Design of Physics buildings	Inf. RIBA
February	Roorkee (UP), India	Environmetal physics as applied to buildings in tropics	Inf. Central Building Research Institute, Roorkee (UP), India
February 25	London	Computer aided building design	Inf. RIBA
March 10 to 16	Cannes	International Encounter 'Building and Humanism'	Inf. Grand Prix International d'Urbanisme et d' Architecture 48 Bis, Avenue Kléber, Paris 16e
March 19 to 22	Belfast	Regional Planning—Ireland 1969	Inf. TPI, RIAI, Royal Society of Ulster, ILA, etc.
March 26 to 27	Nottingham University	Air conditioning system design for buildings	Inf. RIBA
April 21 to 25	Southampton	International conference on structure, solid mechanics & engineering design	Inf. Concrete Society, Terminal House, Grosvenor Gardens, London SW1
May 13 to 14		RIBA Spring congress	Inf. RIBA
May 17 to 23	Amsterdam	6th International Congress of the Bureau International du Béton Manufacture (BIBM)	Inf. British Precast Concrete Federation, 9 Catherine Place, London SW1
June	Amsterdam	6th Congress of International Prestressed Concrete Bureau	Inf. Simons, Bd A. Reyers, Brussels 4
July 2 to 6	York University	RIBA Annual Conference	Inf. RIBA, 66 Portland Pl., London W1
September 10 to 12	London	6th ICSID congress	Inf. COID, 28 Haymarket, London SW1
October 19 to 25	Buenos Aires, Argentina	10th UIA Congress	Inf. UIA Secretary, RIBA, London
October	Paris	Conference of IFI (International Federation of Interior Designers)	Inf. IFI Secretary, van Nijenrodeweg 892, Amstersam 11, Netherlands

Study tours

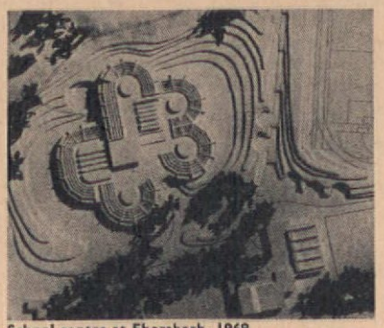
February	Brazil	From England via Zurich (£390)	Inf. Moxley, Jenner & Ptners, 7 King Street, Bristol, BS1 4EJ

Competitions and awards

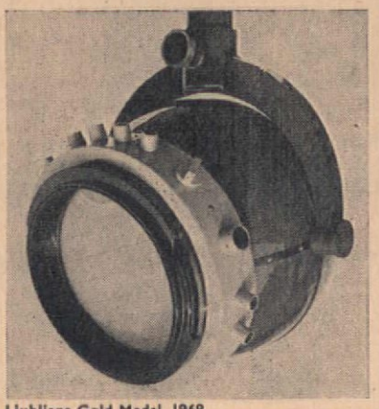
Applications now	RIBA research awards	Inf. Press offices, RIBA
Entries by December 6	16 mm films made for between 1/1/65 and 30/8/68 for construction industry	Inf. British Industrial and Scientific Film Assoc., 193–197 Regent Street, London W1; or Building Centre, London
Entries by January 15	TV centre for Tunis 1st prize 10,000 dinars	Inf. Secretariat d'Etat aux travaux publics et à l'habitat de Tunisie Tunis
Nominations by February 3	RS Reynolds Awards 1969 $25,000 award	Inf. British Aluminium Co. Ltd., Norfolk Hse, St James' Sq, S.W.1. or from the RIBA (Miss K. Hall)
Entries by March 31	Caravan design (Ralph Yablon Award) Prizes £750, £150, £100	Inf. NCC Caravan Competition, Exhibition Dept., Temple House, Temple Avenue, London E.C.4
Entries by April 30, 1969	International organisations HQ (IAEA & UNIDO), and conference centre for Vienna 1st Prize; 2, 300,000 Austrian shillings. Eight other prizes	ZIVILTECHNIKERTEAM für den internationalen Wettbewerb, Amtssitz Internationaler Organisationen und Konferenzzentrum in Wien. Architekten: Appel-Fleischer-Lintl-Schwanzer, Marc Aurelstrabe 2a/30, A-1010 Wien, Austria
Entries by July 1,	How to automate coding for the Netherlands' Giro	Inf. Director-General of PTT, 12 Kortenaer-Kade, The Hague Netherlands
Entries by July 15	Como tourist and holiday centre 20 million Italian lire for 3 prizes	Inf. Dott. Federico Nappi, via Parini 16 ,Como ,Italy

Competition winners

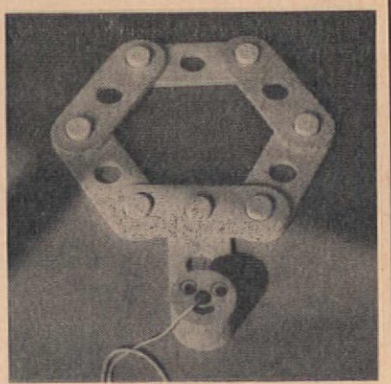
St. Charles' Hospital, Potenza, 1967
First prize awarded for the design submitted by S. Lenci, A. Lambertucci, V. Martelli, E. Micheletti and A. M. Pivetti.



School centre at Ebersbach, 1968
First prize awarded for the design submitted by Erdman Kimmig of Stuttgart—further details *Bauwelt* 41, 1968.



Ljubljana Gold Medal, 1968
River boat radar indicator, Tesla RR3, designed by M. Mira and M. Mis k, engineering by J. Janata and K. Nekut.



James Galt toy competition
Joint first prize, 'Pullalong snake', by Martin John Hornby

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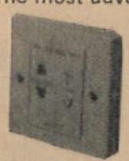

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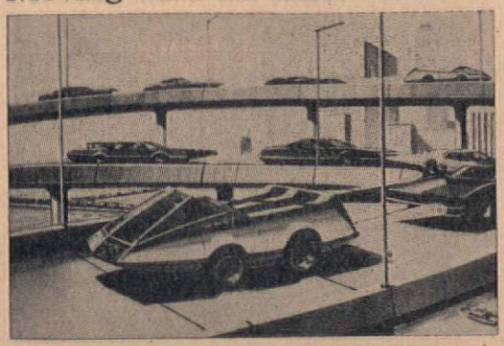


Driving consists increasingly of watching the car in front and keeping a safe distance from it; an elementary task that can be performed by a machine with relatively simple sensing equipment. It is scarcely an ideal occupation for a human being.

The Ford Motor Company is thus to start proving-ground tests later this year on two electronic vehicle control systems suitable for existing roads. The more moderate system incorporates a computerized brake and throttle governor which works as a speed control. An optical beam, outside the visible spectrum, is sent forward and reflected by the car in front. A radar technique measures the distance and informs the speed-control computer accordingly.

The second system, which has steering added to the computer's functions, takes control out of the driver's hands entirely when the road is congested. It is called Minigap. A convoy of cars will follow one another without human assistance; but 'they be blind leaders of the blind. And if the blind lead the blind, both shall fall into the ditch' (Matt., Ch. 15, v. 14). At the head of the convoy there will, therefore, have to be a leader.

New Scientist

Mr M. Forrest of the Loughborough College of Education has designed a city car (shown *left* alongside a Mini) 6ft long, 4ft 6in wide, which can take up to five people, the driver and passengers sitting back to back. The driver controls the car by means of a tiller, which accommodates steering, braking and throttle controls. Power comes from a petrol-driven 750cc engine, developing 17bhp, which will drive the car at speeds up to 50 m.p.h.

New Scientist, October 3rd, 1968

The Loughborough University of Technology has designed a two-seater electric car (*right*)—a prototype is to be built. Under the circular platform are four wheels, two of which are driven, each by its own motor. The car can thus turn in its own ground. Power is to be drawn from batteries. The plastic-domed top to the car rotates to provide access.

New Scientist, October 3rd, 1968

A 6ft hovercraft, powered by a 3hp engine, is now available for children; price £145 10s.

Fibreglass News, August 1968

How it's made

Fred Scott

Architects concerned with factory planning should be influenced chiefly by the factory's particular process. In practice, one doubts that this happens very often; indeed the current archetypal, highly serviced shed, might be construed as a break-down between the built form and the reason for it—the production mode.

Apart from the notable exception of Gropius and Waschmann—when they designed the General Panel House—there seems to have been a reluctance for architects to involve themselves in how-things-are-made. This problem is now relevant to factory design, in particular, and to architecture in general because of certain recent developments in the field of batch production—which of course involves most products with an architectural application. These developments stem from the introduction of numerically controlled machines, the combination of machine tool and computer, into the manufacturing process. The potential of the innovation is a spectacular improvement in communication within the manufacturing process. Above a certain size of factory, communication with different parts of the system becomes critical to the speed and consequently cost of manufacture. In the majority of factories, there is a large floor area with an amorphous arrangement of machinery each part myopically specialized. Obviously in this arrangement, communication is inherently anarchic, and there is a growth of queuing and waiting times on components, with a proportionate drop of percentage time of effective machine use.

One solution alleviates many of these problems—that of replacing the amorphous arrangement by a cellular arrangement where each cell contains a group of related machines manufacturing components of related function. It should be pointed out that there is no blanket rule for the optimal size of these cells; they are the result of operational considerations for a specific manufacturing process. It would seem that communications within the process is at least as important as the provision of a high level of servicing.

The application of numerical control has been developed by the Molins Machine Company to produce an integrated system controlled entirely within a communication network monitored by the computer. This has required the redesign of machine tools to produce a very high compatability with the rest of the system. The result is a highly productive and flexible production unit. A new component can be introduced and monitored throughout at any time by the computer tape, at the same time optimizing the loading of the machines. The system requires a very low level of manning: eight women, eight hours a day, feed the line for a full 24-hour operation with an overlap. Rather surprisingly, the artisan has disappeared from the production process.

The process known as System 24 is more fully described by D. T. N. Williamson, Director of Research and Development at Molins, in 'A better way of making things', published in *Science Journal*, June 1968 an excerpt from which is printed alongside.

System 24, so called because it will work 24 hours a day, was based on the use of light alloys, and also on the determination that 70 per cent of our machined components fall within a size of 300 × 300 × 150mm and that 80–90 per cent of our parts could be made in light alloy—often with functional advantages in addition to those obtained by faster manufacture. Most engineering parts are designed geometrically and can be shaped by a machine with a 'three-axis capability' (left/right, up/down, to/fro). A small amount of machining is more complex, needing a six-axis capability (two additional axes of rotation and axial movement of the spindle) if it is to be accomplished without changing the set-up and thereby losing most of the benefits of numerical control. About half our parts at present need a six-axis capability, but usually for less than a tenth of the total machining on the part.

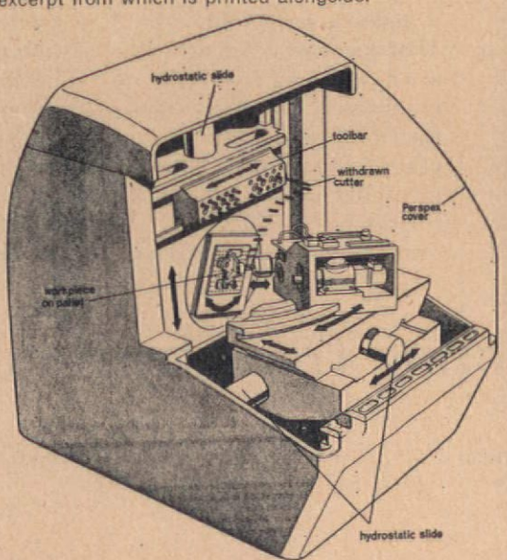
The solution is to design a group of complementary machine tools, each carrying out its own category of manufacturing operations as swiftly and efficiently as possible, and to pass workpieces through any or all of these as their complexity demands. A part requiring 50 per cent three-axis milling, 40 per cent hole manufacturing (boring, reaming, drilling and tapping) and 10 per cent six-axis milling or hole manufacturing (perhaps a small face containing two holes at an awkward angle), would spend time at each of three machines. In System 24 the effective speed of the three-axis milling machine is about four times that of the six-axis machine, because the latter's complexity and flexibility demand that many compromises be made in its design. Each machine in the group is designed to give the best possible performance in its own manufacturing area, whether it is to be the removal of metal at high speed, the boring of accurate holes, or the sculpturing of complex shapes. The system is open ended and new machines can be added when required.

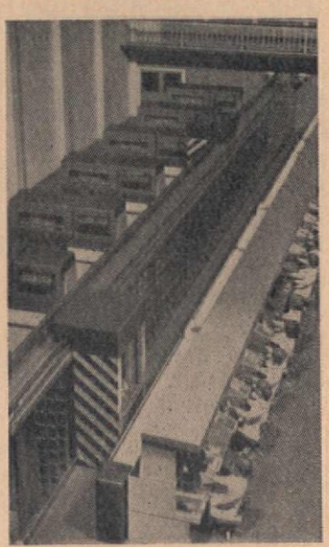
A key to the concept is to be found in the design of a 'pallet' to hold the workpiece and a method of locating this pallet to an accuracy considerably higher than that demanded of the machining process, so that the pallet and the worktable on which it is fixed become the link between the complementary machines in the group. In System 24 this accuracy is achieved by an electronic servo location system, because it did not appear practicable to design a mechanical location system which would repeat to an accuracy of —0.0025mm over long periods in the presence of machining swarf and other dirt.

A six machine System 24 installation can produce 2000–20,000 components per day. The likelihood of manually handling this amount of material and information without chaos is remote. The solution is to bring the whole process under the control of an on-line digital computer, which must not only instruct but also execute the instructions, calling for manual assistance only on rare occasions.

Further reading:

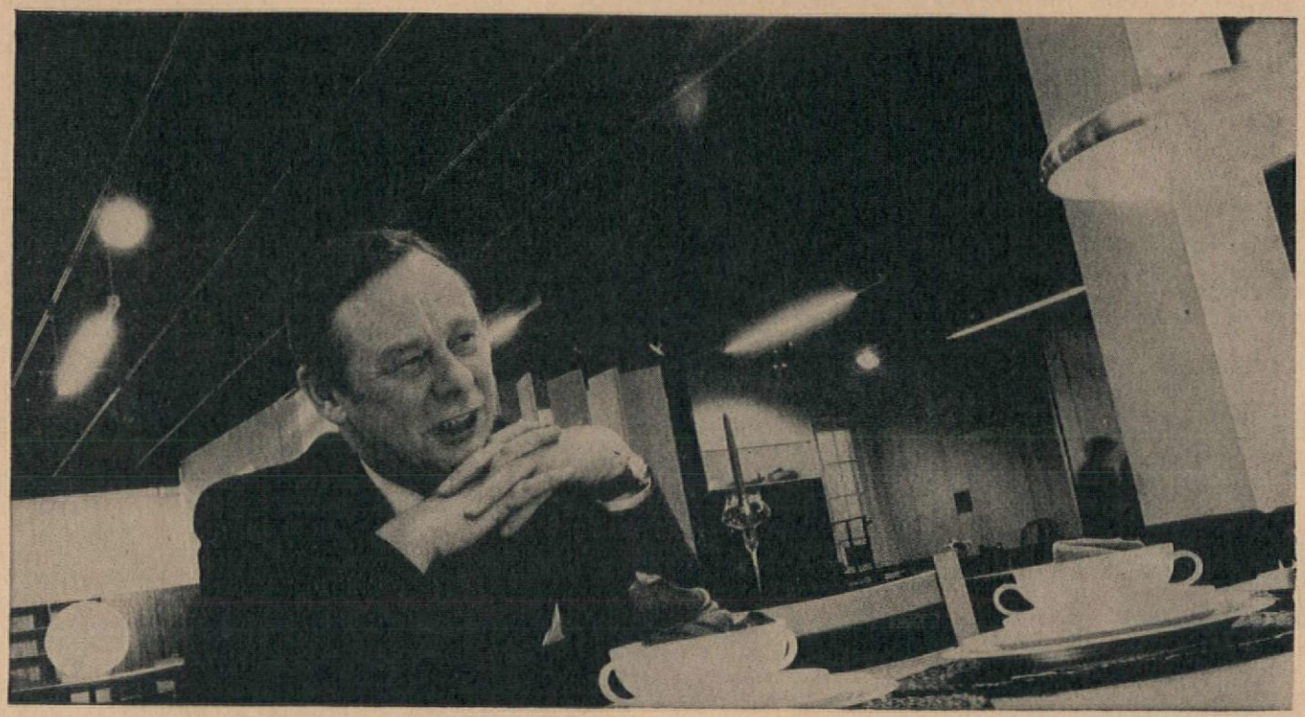
D. T. N. Williamson 'A new pattern of batch manufacture' *The Chartered Mechanical Engineer* July 1968.
Ronald Ireland 'Putting artisans on tape' *New Scientist*, 15 Feb. 1968





far left
Six Axis machine now being built for System 24 will be of somewhat different appearance from the three axis machines now in operation.
left
Model of the first System 24 installation at Deptford shows the row of computer controlled machines on the left separated by a pallet storage rack from girl worksetters on the right.

"We're putting it up at Heal's. Miles of it. I think it's the best thing that's happened to lighting since Edison."



Christopher Heal: convert

'When we were discussing the refitting of the showrooms, our design department suggested that we used Lytespan. We were very dubious because although this equipment had been known to us, we felt that it might be a bit extravagant. However, we agreed to install it in one department. That was two years ago. We are now fitting Lytespan extensively because we see that it offers something that other systems don't—extreme flexibility—and that's vital in this shop. This track system can cope with our ever-changing floor plans and displays very competently. We have used it suspended from the ceiling. It's unobtrusive, safe and well made. There is no comparable system. Seeing's believing. Come and see for yourselves. Heal's have it.'

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IFIP Conference

Roy Landau

The International Federation for Information Processing (IFIP) held its third triennial congress in August this year at Edinburgh.

The IFIP is an organization formed in 1960 as a result of the exploratory 1959 UNESCO Paris conference on information processing. It is concerned with increasing an understanding of the 'role that information processing can play in accelerating technical and scientific progress' and to spread knowledge of the latest developments in computers and computing, and for this programme it now has the support of national societies in 28 countries. The British member society of the IFIP is the British Computer Society.

This year's Edinburgh conference with its 370 speakers and over 3000 delegates accompanied by an extensive exhibition of equipment, international in scope and multi-disciplinary in range, gives an indication of the ways in which the computer revolution is taking shape.

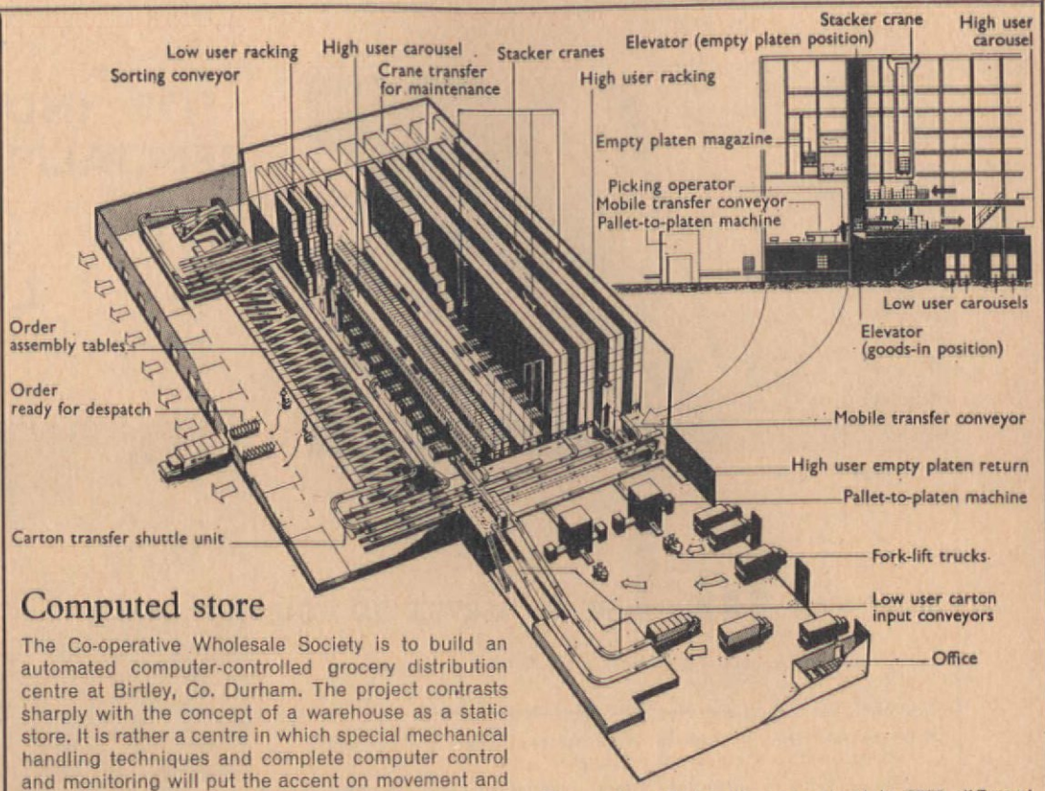
The number of papers presented by members of the architect and planning professions was small and their achievements were valuable but modest. But perhaps of greater and more radical interest were the implications for architects behind such papers as Patrick Suppe's 'Computer assisted instruction: an overview of operations and problems' with new teaching experiments concurrently involving Stanford (California), Kentucky and Mississippi; or perhaps W. R. Nugent's 'NELINET' (New England Library Information Network), the first stages in an automated information retrieval university library network, which might be expected to have a radical effect upon research libraries.

Because at this stage, not much more than an experimental use of the computer by architects has yet come about, the future of the developing computer availability has become a crucial issue. Earl C. Joseph (Univac Federal Systems Division) in his paper 'Computers: trends toward the future' points to a factor which demands to be recognized. The biggest problem for the present-day computer user is programming. In the USA programming costs, as a proportion of total data processing costs (including hardware, programming and maintenance) have risen from 5 per cent in the early 1950s to around 50 per cent in 1965, and are expected to rise to 80 per cent in 1970. This is in spite of the unit cost per instruction coming down to one quarter of what it was in the last decade. Developments in Large Scale Integration (LSI) of components by which elements of software can be replaced by hardware will effect economies, but the growing demands upon computer programmers, both on their ingenuity and on their numerical capacity to meet the new needs, is a matter in which user professional organizations have a special responsibility. This question must not be left to sort itself out.

The machines that are ever increasing in size and complexity provide the spectacular events in the computer world, but the importance of the smaller, inexpensive (a comparative term), and less versatile machines, capable of handling a high percentage of routine tasks is becoming more evident.

Considered at some levels the conference exposed and perhaps encouraged a direction which is worth careful scrutiny in order to see whether it is consistent with an acceptable credo for an information disseminator. The direction concerns the problem of specialization. At the conference the papers were presented around their particular specialist topic, and at any one time there would be five separate specialist presentations taking place, and it would be hardly unjust to surmise that each particular meeting was being conducted in its own 'language'. Already the gargantuan world-supported computer enterprise has become micro-specialist in its approach with diminishing concern for the possible benefits which might be derived from inter communication between different areas of study and application.

Although the IFIP would claim to be directed towards all possible participants in the information processing world, it clearly has a responsibility to encourage information disseminators to disseminate their own findings in such a way that they may satisfactorily communicate with each other as well as with all other possible users.



Computed store

The Co-operative Wholesale Society is to build an automated computer-controlled grocery distribution centre at Birtley, Co. Durham. The project contrasts sharply with the concept of a warehouse as a static store. It is rather a centre in which special mechanical handling techniques and complete computer control and monitoring will put the accent on movement and flow. Goods will come in from the suppliers in wholesale quantities and go out in the form of orders made up to meet the requirements of individual shops. It will be possible for goods to be accepted at the rate of one ton every 30 seconds, and for them to be sorted automatically into shop orders and despatched at rates approaching 5000 cartons per hour.

On entering, goods will be transferred to special platens and keyed into the computer. They will then be transferred by conveyors, elevators and stacker cranes to storage locations selected by the computer. At an appropriate time, again determined by the computer, particular platen loads will be transferred automatically to carousel conveyors. Here they will be indexed to picking stations where the quantities shown on computer controlled indicators will be picked manually and placed on take-away conveyors. After this brief manual intervention, the cartons will pass to a computer-controlled sorting conveyor where they will be discharged via transfer conveyors for despatch.

The centre will handle approximately 3500 different lines (as opposed to the 10,000 lines sold at present). The demands for the 3500 lines will by no means be the same. The variation will be so great that no one method of handling will be suitable. The lines will therefore be divided into three categories: high user, low user and small lines.

High user lines will be handled on 'standard' platens measuring 48in × 40in and will be subjected to a very high degree of automated handling. On average 9 out of 10 lines will be picked during each gather.

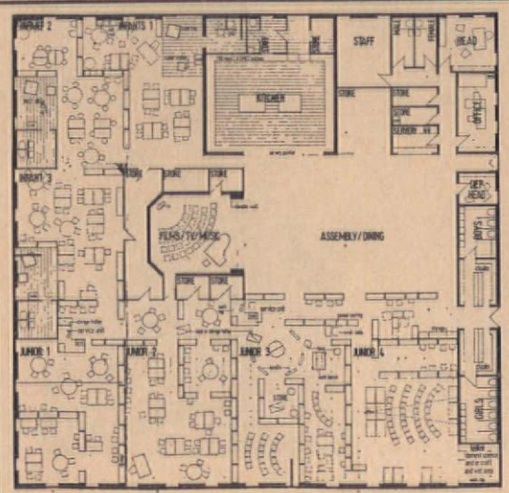
Low user lines will be handled on 'half' platens measuring 24in × 40in. On average 3 out of every 10 lines will be picked from during each gather. They also will be subjected to automated handling.

Small lines will be stored in conventional bins and will be dealt with entirely manually.

The goods handling, control and data processing equipment is to be built by Simon-MEL Distribution Engineering, at a cost of £1½ million.

Carpeted factory

The first factory in Britain to be carpeted not only in the offices and administrative areas, but also under the production line has been built for Computer Technology at Hemel Hempstead. The architects were Foster Associates.



Carpeted school

The first primary school to be planned in England along the lines suggested by the newest North American schools—and relying heavily on the use of the Lennox air-conditioning unit that made the SCSD schools possible (*AD* 7/65, 11/67)—is the proposed Redbridge school by Scott, Brownrigg and Turner. Their design has been approved by the Redbridge education authority, and will be built if it is accepted by the Department of Education and Science. Air-conditioned and carpeted throughout like the American prototypes, it aims at an unusual degree of flexibility—though the partitions will not be so readily moved as the pupils might wish. The wet-service areas, apart from the detail design and fixing of the heavy 'furniture unit' partitions themselves, will ensure this. Similarly the 'stage' and store in the centre of the school area appear ominously like 'fixes'. But more important, perhaps, is a certain failure to emphasize the desirable immediacy of *personal* guidance in primary education.

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Dunlopillo Design Award 1969*

Open to all practising designers and students, the competition for 1969 covers three projects: 1) item of "all-foam" furniture; 2) all-plastics bed of inexpensive construction; 3) low cost, low weight passenger transport seat.

Prize money totals £1,050, including the Dunlopillo Design Award of £350 for the most outstanding design submitted in any class. Rules and entry form from: The Secretary, Dunlopillo Design Award, The Dunlop Company Ltd. (Dunlopillo Division), Pannal, Harrogate, Yorkshire.

Closing date for enrolment: 2nd December, 1968.

Dunlopillo

*** Successor to the well-known Aeropreen Award established in 1961 to promote good design in upholstered furniture.**

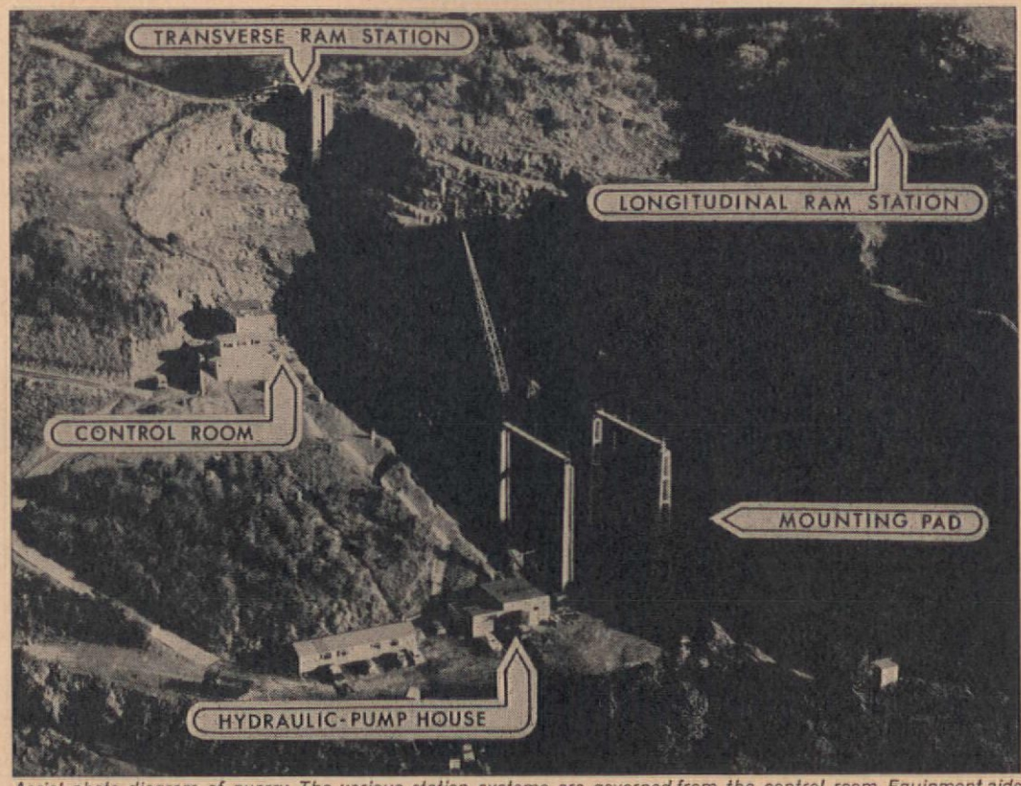
An anti-building

An excerpt from New directions in British Architecture *by Roy Landau, to be published this month, by George Braziller, New York and Studio Vista, London.*

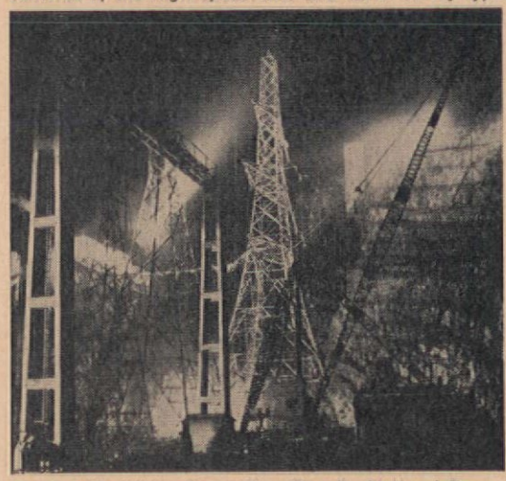
A testing laboratory completed in 1966, which uses the 'full integration of problem with environment' principle in an ingenious way, is the National Tower Testing Station, in Cheddar, Somerset, built and owned by the Central Electricity Generating Board and operating as a commercial testing laboratory.

Although quite unconnected with any recent architectural theorizing, it is a classic anti-building in the best Cedric Price tradition. It was designed by a team under W. R. Box of the Central Electricity Generating Board as a facility for the full scale testing of electrical transmission towers and other types of structures. W. R. Box's programme was for a station with a limited 25-year life, capable of simulating environments on probable ranges of tower structures to be expected during this time.

The testing laboratory programme called for a mounting pad of 100 sq ft on to which structures for testing could be anchored, and which would take vertical load points, plus two elevated horizontal loading points at a height of 200 ft above the pad (the transverse ram station and longitudinal ram station are shown here). The loading points would use highly exacting (one per cent maximum error at full load) hydraulic rams in conjunction with a closed loop servo system which allows loading to be regulated in a precise proportion. To achieve these conditions in a built structure which would have to be over 200 ft high, would have involved excessive costs and would not have been as full of possibilities as the chosen abandoned-quarry solution. The Cheddar quarry was able to provide two cliff faces, 200ft high and at right angles to one another, and the necessary floor area, with rock faces of suitable compaction. The location gave reasonable physical access, and good links with the required servicing needs. The quarry concept produced a laboratory with a continually increasing facility. Each new test situation could necessitate the use of the rock faces in a new way, thus increasing the equipment and the scope of the laboratory. If required, the quarry could be roofed over for bad weather or round-the-clock testing, and it is of such a nature that it can be adapted, adjusted, and, when no longer needed, just abandoned without affecting the countryside, for the low initial investment of £400,000 encourages an exploitable and expendable attitude towards it.



Aerial photo diagram of quarry. The various station systems are governed from the control room. Equipment aids include closed-circuit television, a digital data logger for strain gauge scanning, talk-back radio communication and cameras of the high speed cine and aerial survey type



Central Electricity Generating Board's National Tower Testing Station, at Cheddar, constructed in 1966 and designed by W. R. Box and team

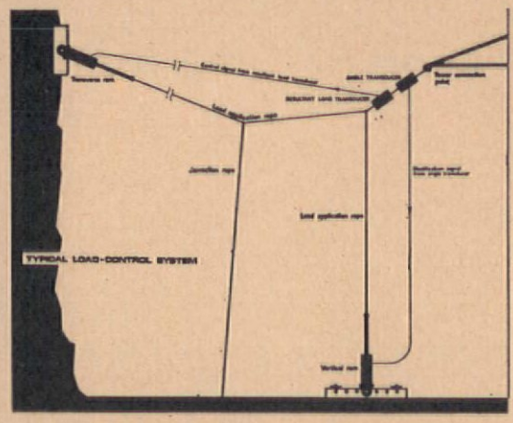
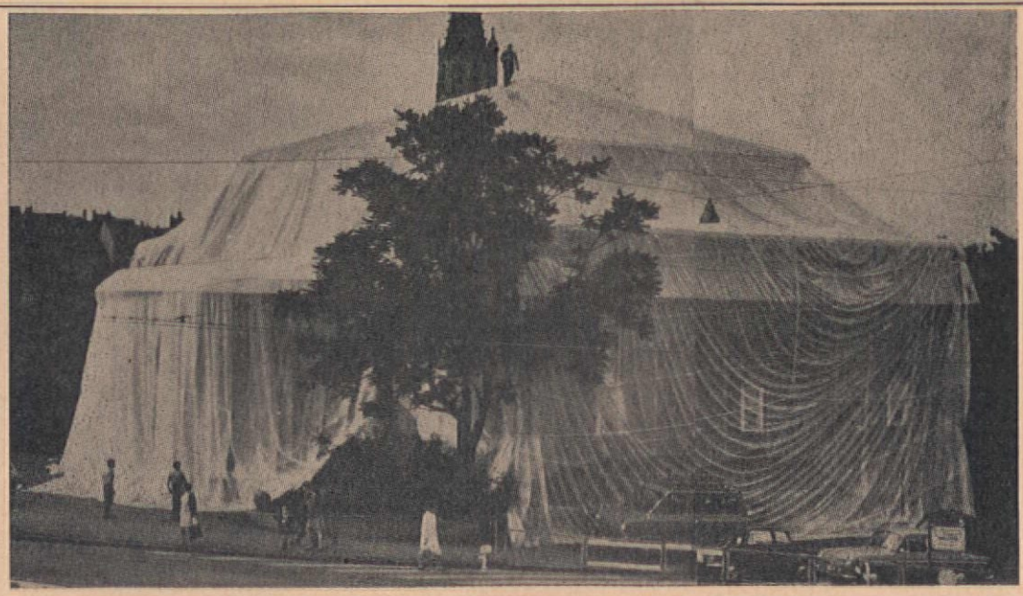


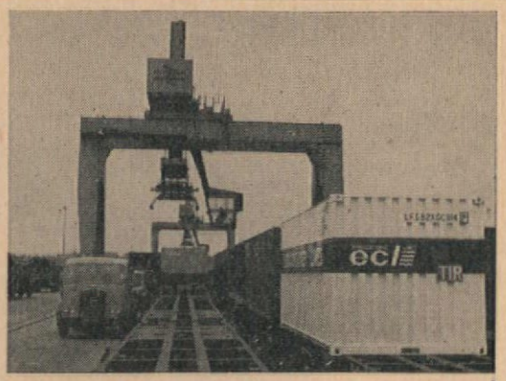
Diagram showing a wire rope arrangement with the transverse load force being modified by a vertical load from a ram at the foot of the tower. The transducers measure the load and determine the angle



Wrap it up

Christo, who began his career as a Bulgarian Social Realist painter, has been wrapping up objects ever since he arrived in Paris in 1958. From chairs and tables he graduated to bicycles and cars and—as a temporary expedient—nude girls. But he has longed to get his hands on something really big. For the Documenta exhibition at Kassel this year he designed the most upright inflatable ever (5600 cubic metres). For a showing at the Museum of Modern Art in New York he proposed to wrap up the whole museum. At Berne he had his way. For six days he worked at the plastic packaging of the Kunsthalle, on the seventh day the wrapper was taken off because visitors were overcome by the stagnant air and the heat inside. At Spoleto he wrapped up a mediaeval tower and a church façade with more success. But his ambitions are still unrealized; he aims at two Wall Street towers.

Life, September 30 1968



2

3

1 The Elizabeth Port Authority Terminal, New York, where more than 2500 containers can be handled in the 50 acre marshalling yard. *Fox Photos*
2 Morris Crane at Stratford *Photo: British Rail*
3 Container Terminal, Grange Dock, Grangemouth Docks *Photo: Forth Ports Authority*

Flatscape with containers *

Reyner Banham

It's amazing how many educated minds' eyes still visualize docks in the imagery of, say, Quentin Hughes's *Seaport*—tall craggy warehouses, masts, cranes and funnels silhouetted against the sky, picturesque Trotskyites in silk mufflers toting that box, lifting that bale, getting a little drunk and landing in Tower magistrates' court. But this is now an iconography of death; all the standard images of rich clutter belong to a world that has had it.

The wealth of nations no longer piles up storeys high, tight under the crutch of Thames. Docks, growing inexorably bigger, slip down round the ankles of estuaries. Thus, Mersey operations no longer pack snugly into Jesse Hartley's Albert Dock, but have slipped down the whole length of the Dock Road and are about to fetch up in a new giant installation in front of the pretty marine terraces of Crosby. The Port of London is growing like crazy down at Tilbury, but Telford's St Katherine Dock is now no more than a candidate for the Michael Young playport.

And when you get to Tilbury, for instance, you see little to recall the typical imagery of ports. What you see, more than anything else, is acreage of flat tarmac or concrete. Literally acreage; single areas of ten acres, hardly broken by a lamp post or sign, are chicken feed in the new world of freight handling that includes not only ports, but also railway freight-liner yards, and even parcels depots. It's all part of the 'container revolution' about which we are getting so much PRO-chat, but it is important to realize that the container bit is not an extraordinary and unprecedented event, but simply the most recent stage in a revolutionary process that has been going on since about the time Telford and Hartley built their masterdocks.

Their monumental warehouses stood tall at the water's edge, with cranes bracketed off their facades for a very good reason. If you had winched a bale up from the bottom of a ship's hold to deck level, you might as well go on moving it vertically to the umpth floor, rather than put it down and start moving it about horizontally, because that was a good deal more difficult before railways and mechanical power. But by the time these heroic schemes were completing, the railway age was already beginning; horizontal movement on land was becoming handy and economical; and the next full generation of docks, like the Royals on the Thames, ceased to look like any part of civil architecture. They started to slip down the estuary, the buildings began to shrink in height and pretension, and were moved back from the waterside to accommodate rail tracks and travelling cranes.

Old Albert and Katherine were thus the first victims of what now appears to be an inexorable law of design for transportation—that by the time you have finally found an architecturally acceptable format for any type of transport, it's obsolete. Bert and Kate finally found the canonical form for a dying mediaeval concept of goods handling; St Pancras Station became obsolete on the day it opened; Idlewild, the perfected propeller-driven airport, is overrun with jets.

And now that the rubber-tyred vehicle can rush about horizontally in all directions without benefit of railway lines, the railway age dock of two-storey warehouses and luffing cranes has had it too. The most conspicuous, because invisible, victim of this phase of the goods-handling revolution, is architecture. At Tilbury or Rotterdam, or the BR freightliner terminals, buildings are of little consequence, look temporary, survive on sufferance at the margins of the action. And for a very good reason: insofar as buildings existed to keep the weather off the merchandise, they aren't much needed now. The essence of both containerization and roll-on-roll-off techniques is not only that the goods reach the terminal in neat packages, but that the packages provide as much of the right kind of weather protection as the goods need—pork in refrigerated containers, stout in tanks, timber in steel-strapped parcels.

But if buildings are not needed, the one thing that the trailers, straddle cranes and fork-lift trucks must have is vast areas of more or less ideal flat surface on which to roll around. When No. 34 berth at Tilbury was (rather hurriedly) converted to handle packaged timber, its shed had a 72ft clearance punched through the middle of it, to connect the dockside with 11½ acres of tarmac hard-standing behind it. This can be used indiscriminately as a surface on which to stack, or a kind of omni-directional roadway on which the fork-lift trucks can whizz around with the packages of timber.

And that is the scale of the new dockscape, dictated by the rubber-tyred vehicle. The same rubber-tyrant fixes the wide flat form of practically everything else around. A roll-on-roll-off terminal, for instance, is effectively a motorway intersection, from which two or more of the roads run straight into large holes in the sterns of ships. Or, at the York Way freightliner terminal behind King's Cross station the thing which strikes the eye is that, in spite of the fact that this is a railway facility, the Drott Travelift (no, I didn't make that up) cranes run up and down the 1000ft interchange on large diameter road-wheels, not railway tracks.

At the Stratford terminal the effect is really spectacular. The given landscape is wide, raw, flat and sandy under the expanse of sky that would make poets rave if it wasn't the southern end of Hackney marshes. Nothing stands more than a truck's height, except where containers have been stacked two deep along the side of the terminal, and beside them the outlines of the two big Morris straddle-cranes dominate the sky. In the first week of August 1967, one was still a bare four-legged skeleton; orange-red in its lead-oxide underpaint; the other fully equipped with its lifting tackle and control cab, in its final livery of yellow, with men busy painting diagonal fright stripes on its lower extremities. (Query: in a scene where nearly every visible thing is covered in yellow and black fright-stripes, how do you know which one to beware of next?)

It's one of the great sights of London (and its a pity it's not open to the public, though you get a fair view of it after the kink in Temple Mill Lane). But what are architects going to do with situations like this? As a profession they claim the right and duty to design 'the complete human environment,' but one thing they cannot bear to contemplate is large flat areas of anything at all; they whimper in their campari-soda about airports, supermarkets, 'prairie planning in the new towns' and—above all—car parks. Hence the constant attempts to sweep parked cars up into monumental multistorey heaps, even where there is no great need. At Cumbernauld, Geoffrey Copcutt tried to make cars

disappear by tucking them under the skirts of his town-centre megastructure, above ground-level.

But they have fallen out again, and are beginning to spread over the surrounding ground. And the logic of transportation seems to say yes. The logic of airport operation says: bus the passengers straight to the plane on the tarmac, and scrap the buildings, and the logic of freight handling—logical enough to compete with Europort/Rotterdam, that is—says acres of hard-standing with nothing on it that can't be moved out of the way.

This logic is already beginning to make a transitional kind of sense, visually. Where buildings—roofed volumes with side enclosures—persist, they seem to grow naturally as lightweight shells unencumbered by massive masonry or cultural pretensions. In a portscape where corrugated asbestos and ribbed aluminium sheet are not cheap substitutes but the very stuff of building, a brick looks as pompous as rusticated masonry does elsewhere (the passenger hall at Tilbury, with its coat of arms and barrel vaults, would look pompous anywhere, and attains a positively nightmare quality there). And these shed shells, stiff tents almost, can be perfectly adequately designed by engineers without any interference from architects, and usually are.

Architects, at the moment, probably don't mind too much about this, because it doesn't impinge on their chosen scene, the city. No, that's not true—thanks to an unforeseeable series of crossed directives from various higher echelons, the goods-handling aesthetic of horizontal spread and aluminium cladding gets one very good showing, within a few minutes of the British Museum and Regent's Park. After the freeze on office building in central London, Euston station was deprived of sundry architect-designed superstructures, and the upper deck of the surviving rump of the scheme is just a huge parcels-depot shed, single-storey and covering most of the extent of the station below. It's very good, too, especially the long, aluminium-clad side elevation on to Cardington Street.

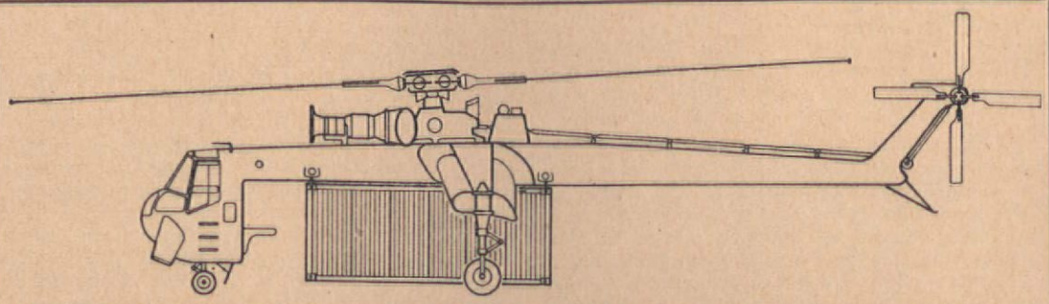
Curiously enough, credit or blame for this intrusion of the goods-handling aesthetic into central London lies partly with architects. Some of the design decisions affecting its shape and arrangement can be traced back to Theo Crosby's Euston design team at Taylor-Woodrow's, and are all that remain of their original grandiose project. But then, that was a rather remarkable set-up, since it was where the Archigram visionaries met one another for the first time.

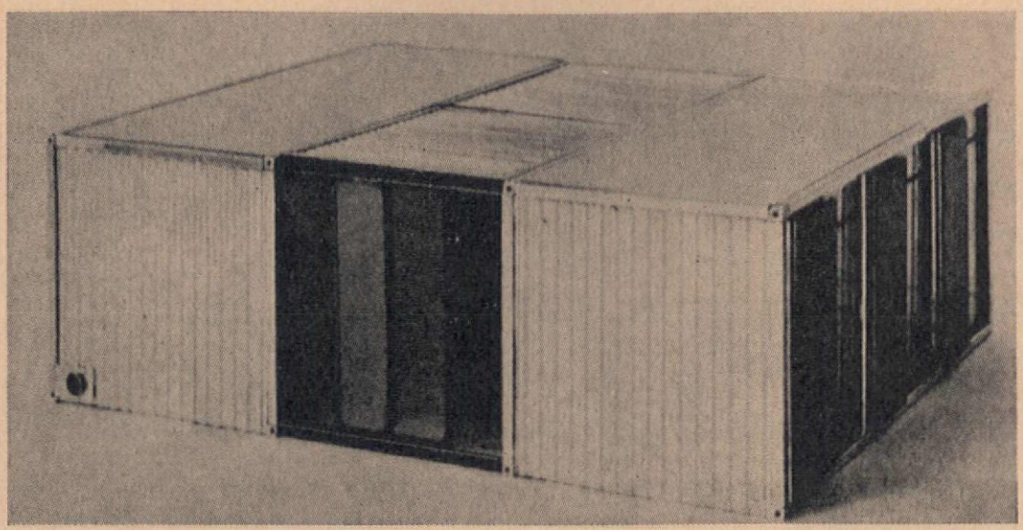
And the Archigram vision, as I have indicated here before, is something that many thinking members of the profession don't wish to know about. Personally, I doubt if even Archigram could do the real Tilbury stuff with any enthusiasm. The only architect who might, in fact, is Cedric Price, who applied container technology, near enough, to university teaching in his Thinkbelt project (*AD*, 10/66). For this he has recently been attacked, not by some doddering old architectural knight, but by one of the profession's esteemed younger intellectuals, George Baird, arch-priest of the cult of 'values' (rather than human service) in architecture. According to Baird, the Thinkbelt's avoidance of showy monumentality (for which 'structuralism' is the current flip synonym) will lead to practically every fashionable evil in the book, from contemptuousness to bureaucracy (read all about it, if you can stomach the prose 'style', in the June 1967 issue of the *Journal* of the Architectural Association).

The working profession will find ways of by-passing such intellectual dead-ends—it has to, or it would go out of business—and architects will eventually compose themselves into a frame of mind where they can design a few almost value-free buildings for almost building-free sites, and the architectural magazines will find ways of making the photographs look suitably handsome, and will bring out special issues on 'The Architecture of Megasurface,' or some such.

But by then, of course, hovercraft will have made even the *water* in docks obsolete, if multi-function pipelines haven't made hovercraft obsolete, and architects (to make a suitably J. M. Richards-type joke) will have missed the boat again.

* *This article appeared originally in* New Society, *August* 17, 1967.





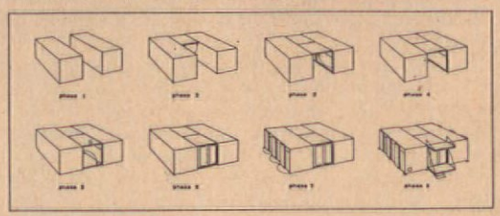
Containerscape with flats

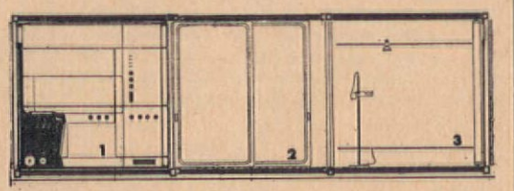
Cedric Price suggested first in his Potteries Thinkbelt (*AD* 10/66) that the housing units of a mobile society need not be regarded as intrinsically different from any other large objects requiring transportation—the house and the container could be identical in size. The idea has been developed by Wolfgang Rathke and a group of students under Heinz Behrendt and Wilfrid Lubitz at the Krefeld Technical School. The result is the 'Home-tainer', made up of steel-framed, aluminium clad units, 8ft wide, 20ft long, that can be despatched and moved like any goods container. The containers can be transported by helicopter, truck or ship; they can be handled and stacked with a fork-lift truck.

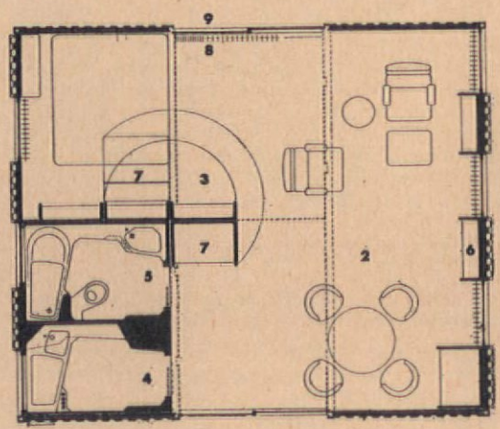
The basic living unit is made up of two containers, the sides of which fold out to provide a total floor area of 480 sq ft. The kitchen, bathroom and all services (including air-conditioning) are built into one container, the other serves as the living area. At present the 'Home-tainer' has to be connected on site to water and electric mains and to drains, though it is hoped that development of the sewage and waste disposal unit will make this last unnecessary.

As yet there is no manufacturer for the 'Home-tainer'. The designers themselves evidently regard it with some trepidation; they recommend it only for temporary accommodation on building sites or trade fairs. But for that growing horde of migrant workers and even holiday-makers it might be a comfort.

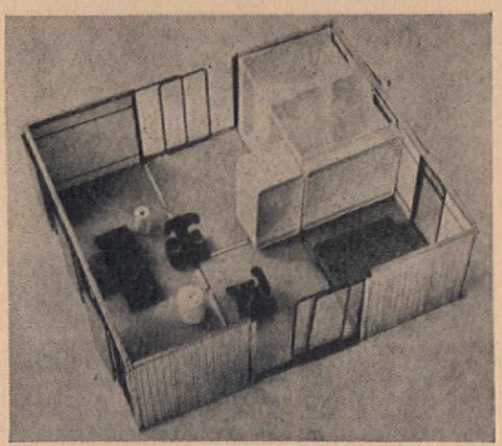
Bauwelt, 37 1968, *Deutsche Bauzeitung* 9, 1968







Section key
1 'cook-pit'
2 sliding window
3 electrical supply
Plan key
1 entrance
2 living room
3 sleeping area
4 'cook-pit'
5 bathroom
6 cupboard
7 hinged cupboard
8 blind
9 sliding door



books

Taming Megalopolis

Volume I: What is and what could be. Volume II: How to manage an urbanized world. Edited by H. Wentworth Eldredge. Frederick A. Praeger, Publishers, New York, Washington, London: 1967. 1166 *pp.* $9.25 *per volume.*

American planners are less powerful than European planners and much more philosophical. Titles of some articles in *Taming Megalopolis* are: 'The planner as value technician: two classes of Utopian constructs and their impacts on planning'; 'Advocacy and pluralism in planning'; 'Planning—and city planning—for mental health'; 'Toward equality of urban opportunity'; and 'The aerospace project approach to building new cities'.[1]

This, granted, is a slanted list, chosen to suggest interesting directions which American planning has taken in the last decade: 'decade', not 'year', as one might gather from the English press. Today science (sometimes scientism) vies with social concern (sometimes free-floating anti-establishmentism) for the mind and heart of the planner, in a battle as futile as is the older and still unresolved one between 'physical' and 'non-physical' planning, i.e. between the architect and the rest. It is futile because the approaches should be mutually reinforcing; but it's interesting to see where the lines are drawn, and for this purpose *Taming Megalopolis*, a compendium of essays, mostly reprints from journals and planning reports, will be useful. The sixty 'experts from many disciplines', as the blurb calls them, are not all planners, though they do read like a roster of contributors to the *AIP Journal* (a pompous polysyllabic periodical to be taken seriously by architects seriously interested in urbanism) and they include most of the young, bright planners who are pushing the profession in new directions and its members into precarious positions in the civil rights movement and the computer laboratories.

The work has the advantages and disadvantages of its format. An anthology allows a quick sweep over a wide horizon, and reprints are easier to collect quickly than commissioned articles. But there are gaps where articles do not exist, and the material is uneven—compare McHarg's restatement of his 10-year-old theory, hardly further developed, with the new ideas in the report by Mayor Lindsay's Housing and Urban Renewal Task Force; or Buchanan's simple views on traffic with Gakenheimer's scholarly attempt to see transportation planning rigorously as the engineers do, yet broadly and within a social context as planners should. Although Professor Eldredge introduces each section, no thread ties the articles together and comparative examination of the different viewpoints is sadly lacking. This would have been extremely valuable, especially between 'scientists' and 'humanists' and even more so between European and American contributors.

The articles on Urban Design are disappointing because here the bright young thinkers have been omitted, largely one suspects, because Professor Eldredge, who is a sociologist, does not know of their existence. This too is symptomatic of a split in American planning; and this split will not be remedied until some architect-planner takes the rest of what's in these volumes and forges it into a broader theory of Urban Design than the one European and American architects now work with. *Denise Scott-Brown*

[1] By Thomas A. Reiner, Paul Davidoff, Herbert J. Gans, Bernard J. Frieden and John H. Rubel, respectively.

The pedestrian in the city, Architects' year book XI

Edited by David Lewis. Elek Books, London. 300 *pp.* 6 *Gns.*

The Architects' Year Book XI has a new format, a single concentrated subject and contributions ranging from world-wide authors.

It is entirely concerned with town planning, essentially the underrated theme of safe pedestrian mobility. The layout is copiously illustrated with photographs and sections and covers the subject admirably.

Included are projects and ethnological studies from primitive societies which provide strong contrast to our mechanized life.

A richly informative production covering much essential information and, though expensive, it is a basic testament. The Pedestrian in the City is an apt title and the subject more deserving of our present and future attention. *John Killick*

Architecturology

I. M. Goodovitch. Allen & Unwin. 42*s.*

Mr Goodovitch began his architectural pilgrimage in 1953 in Israel (by deduction, perhaps at Tel Aviv's Technion) and ended with an interim report from the Ministry of Housing. Like all of us, he has become a planner, disillusioned perhaps, but dogged. His history is a splendid demonstration of the release mechanism provided by grants, foundations, study tours and so to the more talented young, to unfit them for the task of happily barbarizing their environment.

He was in Japan in 1961, working with Tange on the swimming pool; with Niemeyer in the Negev; in Pittsburgh in 1967 (with David Lewis?). In each situation he comes up with an ingenious, practical solution which no one will accept, and goes away embittered, and depressed. Such is the planner's life; such the creator's role in a philistine society.

The Pittsburgh solution was to build new apartments over the roads in the slums and then pull down the slums, leaving nice green areas in between (and everybody two floors up). Yet the slums there are actually very reasonable dwellings, and much prettier than any possible economic replacement. They need, mainly, a little money and a lot of love, and to be left alone.

Though Mr Goodovitch is quick to condemn the planner with the bulldozer, his own creativity demands an architectural intervention. In an urban situation, architectural quality is usually irrelevant. What is required is a mode of growth which is operable by and acceptable to the inhabitants, as a natural growth.

But perhaps Mr Goodovitch really prefers the world of council houses, of estates of prefabs 25 per cent cheaper, that he illustrates.

Or perhaps the fat 'enemy' with the cigar was right not to 'understand'. *Theo Crosby*

A dictionary of ancient Greek civilization

P. Devambez, R. Flacelière, P. M. Schuhl and R. Martin. London (Methuen). 1967. 492 *pp.* 90*s.*

According to its foreword, this book is meant for cultivated students, not specialists. It is small and erratic compared with the admirable Classical Dictionaries written in the nineteenth century. For instance, only one Phrynichus—and he is misspelt—is given an entry. The vase-printer Douris is mentioned, but not the historian. Calauria is mentioned only because of Demosthenes, and the early Calauric league is omitted. Neither Periander nor even 'Sage' wins a mention. Nor does Troizen, nor Naupactus, nor even the fashionable Perachora. Pausanias' famous guidebook receives ten lines.

One could forgive all this if actual entries were clear and correct, and contained references to accessible books, thus offering the chance of further study. But there are no such references, nor even cross-references. Under 'Luxury', for instance, nothing is said of Demetrius of Phalerum, though his famous laws do appear in his own entry. Neither 'Acarnania' nor 'Ambracia' carries a reference to the fifth-century Demosthenes; while under 'Cleon' this Demosthenes is described as the general who *failed* to take Sphacteria. There are too many slips and downright errors. Under 'Paestum' the fall of Sybaris is postdated by a century. Olynthus is said to have been destroyed by Sparta in 379 B.C., not by Philip in 348 B.C. Nonnus, one of the latest Greek writers, is called 'an early epic poet'.

No single master editor is named, and the publishers seem to take responsibility. R. Martin may have attempted some conflation for the earlier French edition. But he was far too timid. The present English version is marred by translators' errors—'Antiphon, *after* Thucydides, was the main inspirer of the digarchic revolution of 411', and the *dado* of the Ionic Column base—and by pure slovenliness, as in 'Ephorus: historian of the 4th century B.C., born at Cyme'.

The work is very weak on art and architecture. Some photographs are attractive. But too many have their backgrounds cut away, according to a time-honoured but vicious French practice. Under 'Myron' a very bad Discobolus is figured, with the head stuck on the wrong way. Under 'Architecture', the Myceneans are said to have attached great importance to funerary architecture, *in contrast to the Cretans* (my italics). No mention is made of the continuous timber courses in palace-walls of the Bronze Age. The clamps used in Classical Greek masonry are imagined as streams of molten bronze which congealed in the clamp-holes and pour-channels provided. Actually, they were of tempered steel and were dropped cold into molten lead, the overflow of which was transmitted by the pour channels. Under 'Order' the Doric Order is illustrated by a mocked-up entablature from Selinus, in which the cornice does not project as it should. The important variations between early schools of Ionic are omitted. The meagre entry on the Hellenistic Age omits its town-planning achievements, but would continue it to the fourth century A.D. It ignores the striking differences introduced under Augustus—Neo-Classicism, Corinthian colonnades and axial planning. The Trajaneum at Pergamum, for instance, was thoroughly Roman and provided an 'architectural bismuth' amid the jumble of earlier, Hellenistic buildings.

But it would be rash to expect a dispassionate assessment of, say, Pergamene tastelessness in a book as meagre and groping as this. It does not observe even the minimal requirements. One can only mutter, in Louis Robert's famous words, 'tout à refaire.'

Hugh Plommer

Publications received

Historic churches preservation trust
Annual Report 1967. *Booklet* 40 *pp. Historic Churches Preservation Trust, London, SW*6.

Home fires burning: The history of domestic heating and cooking
Lawrence Wright. 219 *pp. Routledge & Kegan Paul, London.* 15*s* (*paperback*).

Planning for play
Lady Allen of Hurtwood, 140 *pp. Thames & Hudson, London, WC*1. 42*s.*

Escuela de Arquitectura de Madrid. Elementos de composicion año 1968
Estudio de Arquitectura Antonio Alba, Madrid.

British Airports Authority Report and Accounts 1967/8
*British Airports Authority, London, SW*1.

Motorways and industry
Report from University of Newcastle-upon-Tyne. Booklet 12 *pp. British Road Federation, London W*1.

Cumbernauld 67. A household survey and report
Prof. A. J. M. Sykes, Dr J. M. Livingstone, M. Green. University of Strathclyde. Booklet 67 *pp. Cumbernauld Development Corporation, Glasgow.*

Hostel user study—BRS Current Paper 50/68
Phyllis Allen. Booklet 20 *pp. Building Research Station, Garston.*

The University of Reading. A development study
Bickerdike Allen Rich & Partners, London. Booklet 15 *pp.*

The co-ordination of components for educational building
Dept. of Education & Science. Booklet 42 *pp. HMSO* 5*s* 9*d.*

Bauen ein Prozess
Lucius Burckhardt and Walter Förderer. 72 *pp. Verlag Arthur Niggli AG, Niederteufen, Switzerland. S Fr.* 9.80.

Construction indexing manual
Royal Institute of British Architects. 158 pp. *RIBA* £3 15*s.*

Coberturas em Terraco (flat roofs)
Ruy José Gomes. Booklet 56 *pp. Laboraturio Nacional de Engenharia Civil, Lisbon.*

BPCF data sheets
*British Precast Concrete Federation. Cement & Concrete Association, London, SW*1. 2*s.*

The detailing of reinforced concrete
*Report of Joint Committee, Concrete Society Ltd, London, SW*1. *Booklet* 31 *pp.* £1.

Abstracts: selected patents on refuse handling facilities for buildings
Ed. John A. Connolly. 240 *pp. US Public Health Service, Dept. of Health Education & Welfare. Cincinnati, USA.*

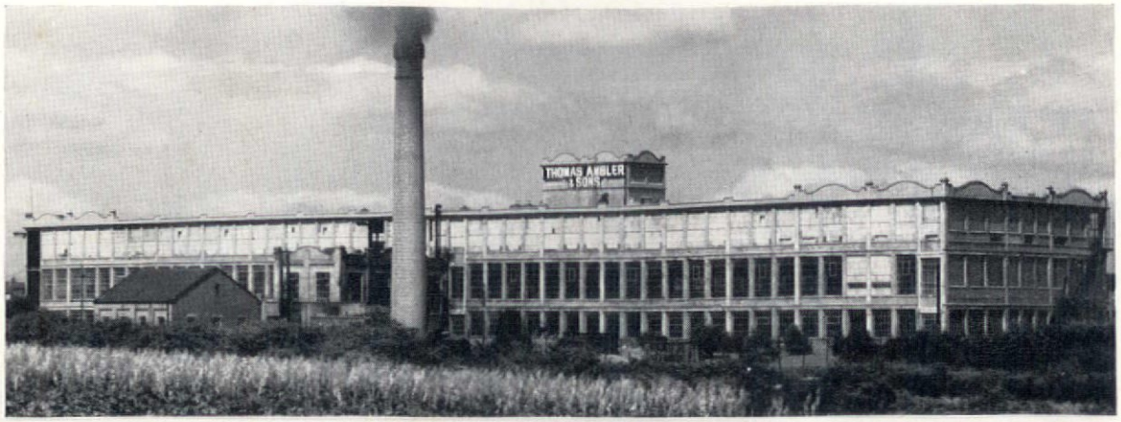
Design for security
Richard J. Healy. 309 *pp. John Wiley & Sons, Chichester.* 94*s.*

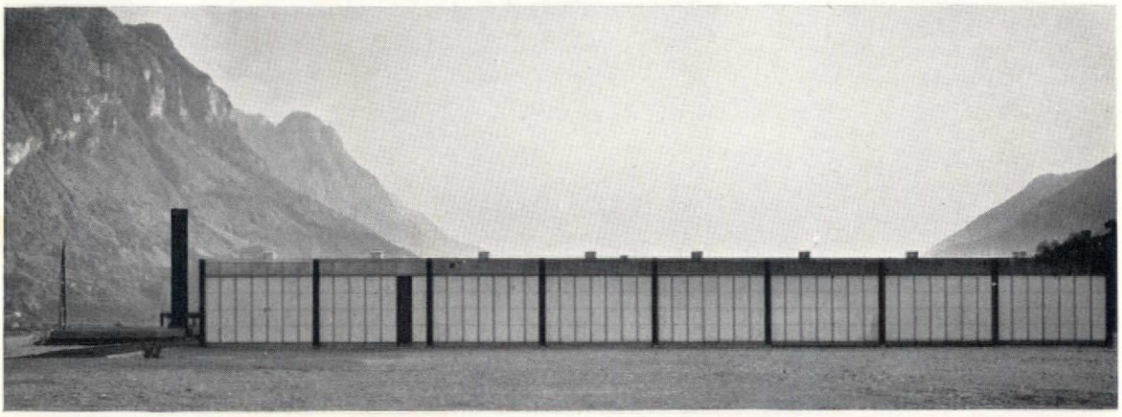
Modern glass
Geoffrey Beard. 110 *pp. Studio Vista London.* $1.95, 12*s* 6*d* (*paperback*), 25*s* (*hardback*).

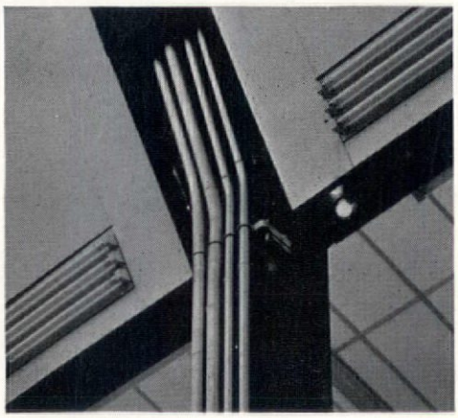
Primo annual—Art Directors Club, Milano
Ed. Paolo Bellasich and Roberto Bossi. $17. *Centro DI, Florence.*

Pop Art: Object and Image
Christopher Finch. 168 *pp. Studio Vista, London.* 12*s* 6*d* (*paperback*) 25*s* (*hardback*).

THE ANATOMY OF THE FACTORY







an analysis by Derek Sugden, dealing primarily with single storey factories in which the structural framework is used to support the roof and services to machinery.

It is significant that nearly all the industrial and mill buildings of the nineteenth century were of multi-storey construction. They were based on rectangular or square grids of between 9ft and 12ft span. They were long and narrow, often three or four bays wide and between four and seven storeys high.

The form was certainly not dictated by any shortage of land at that time and certainly not dictated by the structural principles involved but by the motive power and servicing of the mill or factory. This was invariably steam or water and the power was distributed by vertical and horizontal shafting.

The other big influence on the development of the structure was fire resistance. Floors were of segmental brick arches, strengthened by wrought iron tie-rods to take the thrusts, and springing from heavy timber beams. The timber beams were protected by plaster and supported by external load-bearing brick or masonry walls and usually by two rows of cast-iron columns internally. The timber beams were eventually replaced by cast iron, thus creating the first multi-storey iron frames.

The mills of William Strutt and Boulton & Watt clearly illustrate the development of structural and servicing principles involved which lasted throughout the nineteenth century whilst water and steam were the main prime movers.

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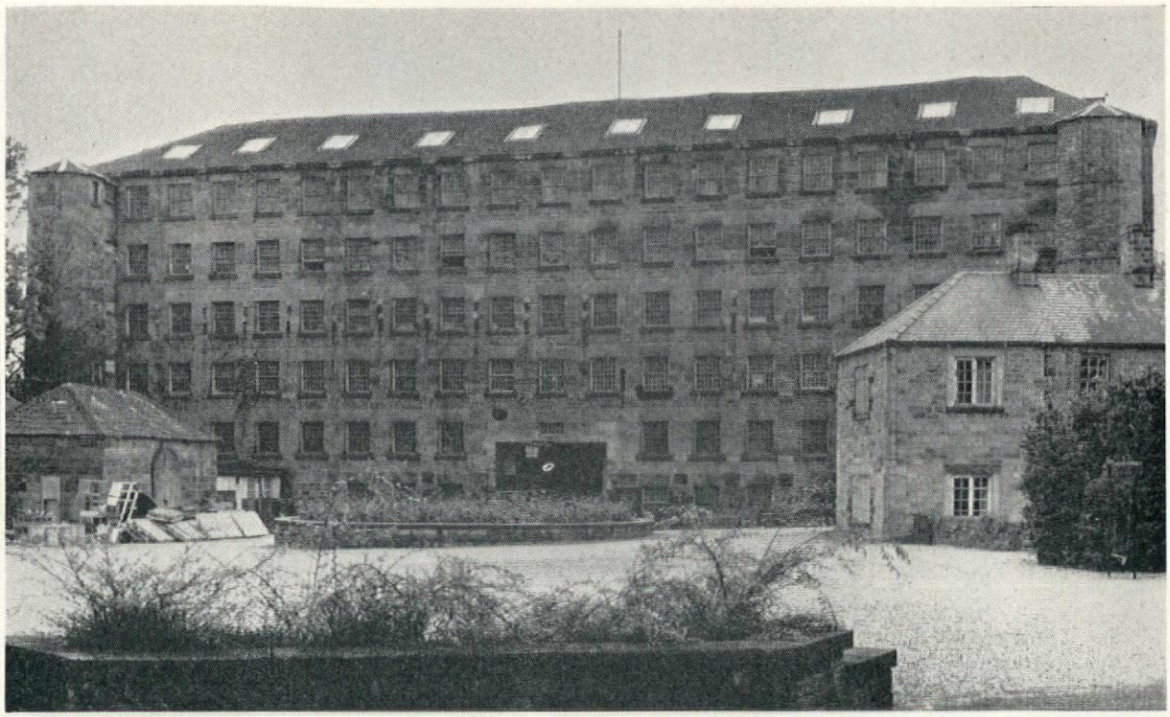
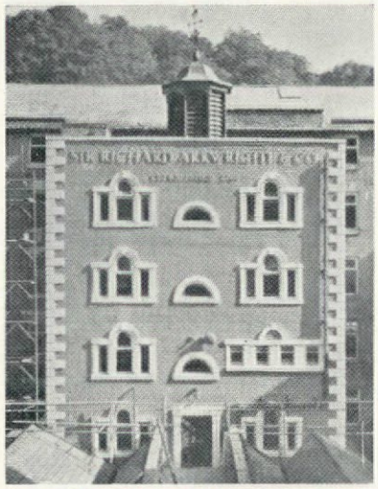
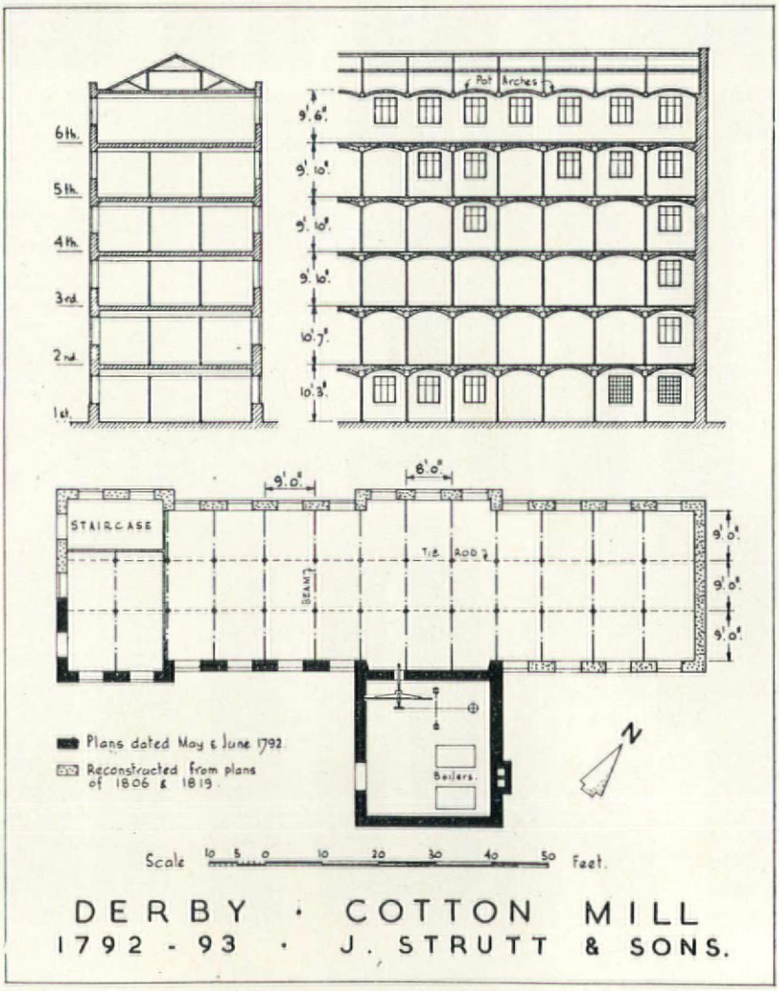


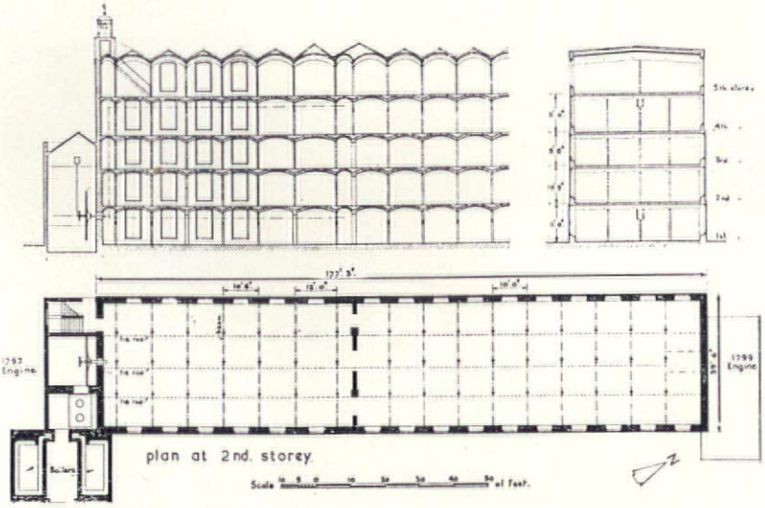
Calver Mill, Middleton, Derbyshire. 1785. One of the great early cotton mills of 6 storeys with 3ft thick walls at the base and an internal structure of cast iron columns supporting wooden beams now replaced by steel
Photo: *The Functional Tradition* J. M. Richards, 1958



Arkwright's Masson Mill at Cronford, Derbyshire, built in 1783, shows the naïve variations of the Georgian style used in the earliest of industrial buildings
Photo: *The Functional Tradition*

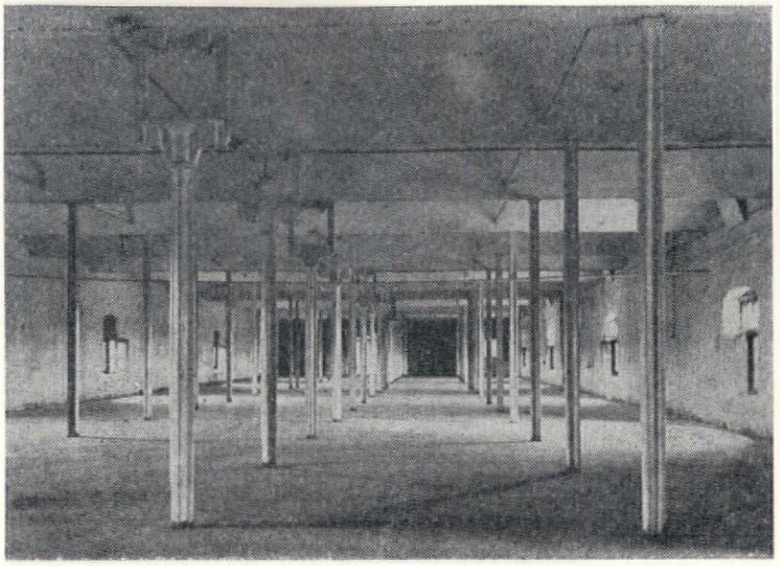


Derby cotton mill by William Strutt. 1792-3. The first of the 'fire proof' mills with cast iron columns, brick arch floors of 8ft and 9ft span and with timber beams protected with plaster
William Strutt's Cotton Mills 1793-1812. H. R. Johnson and A. W. Skempton. Excerpt from Transactions of the Newcomen Society, Vol. XXX 1955-56 and 1956-57

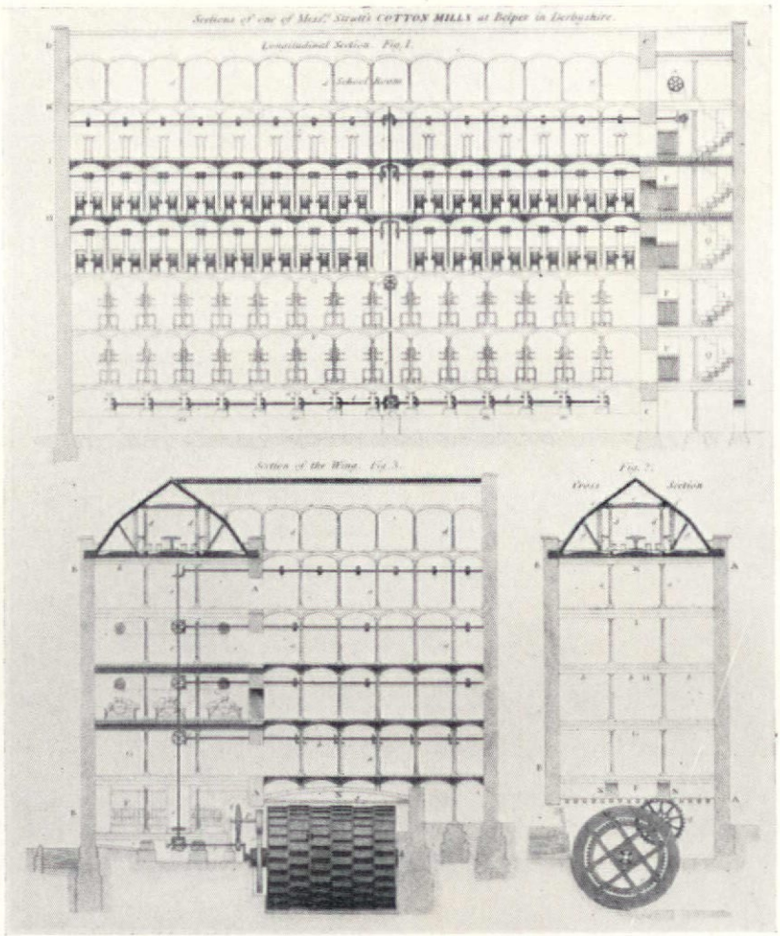


Shrewsbury mill by Charles Bage. 1796-97. Plan and section of Bage's Shrewsbury Mill. The first multi-storey building with an interior of iron frame-work
Architectural Review March 1962

Exterior view from south. During conversion in 1897, most of the windows were blocked up. Steam engines in the end blocks were linked by shafts and gearing to the machines on each floor
Photo: *Architectural Review* April 1950

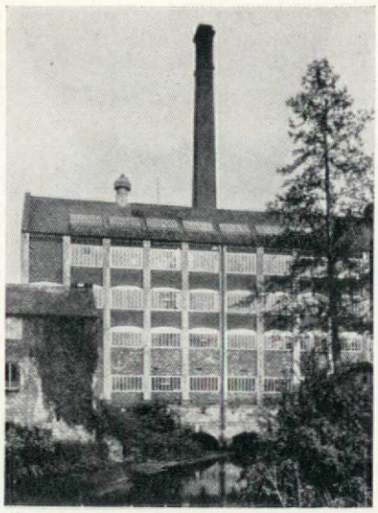


Detail of a typical bay
Photo: *Architectural Review* April 1950



Belper North Mill by William Strutt. 1803-4. Sections of Belper North Mill showing horizontal and vertical shafting
Johnson and Skempton *op. cit.*

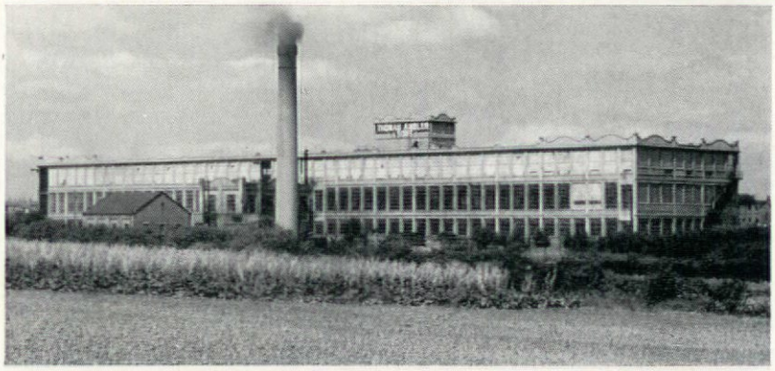
View of Belper North and West Mills
Johnson and Skempton *op. cit.*

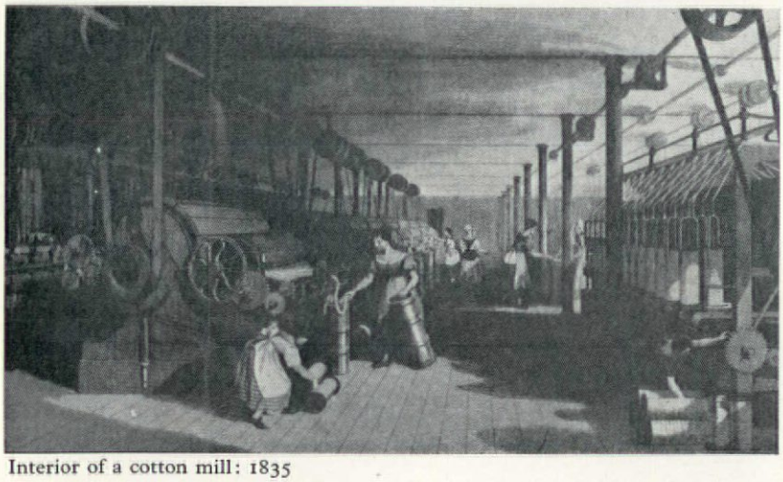


◁ Stanley Mill, Stonehouse, two miles below Stroud, built in 1813 using water power for machinery and dyeing processes. The elevations have great affinity with modern industrial building
Photo: *The Functional Tradition*

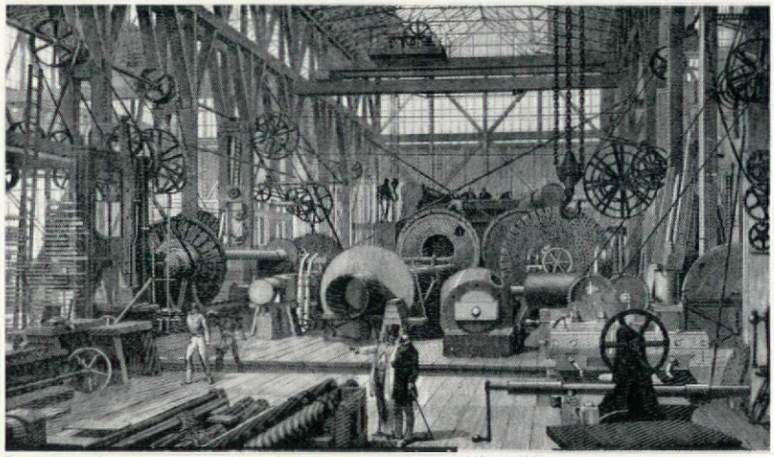
Ardsley Mill, near Wakefield, 1912; interior and exterior of this early *in situ* reinforced concrete mill, still retaining the form of the early nineteenth-century mills
Photo: Harrisons Studio, Bradford ▽

◁ Interior of Stanley Mill showing the unusual cast iron structure. This mill combined with its functional elevations some refined Georgian style detailing
Photo: *The Functional Tradition*

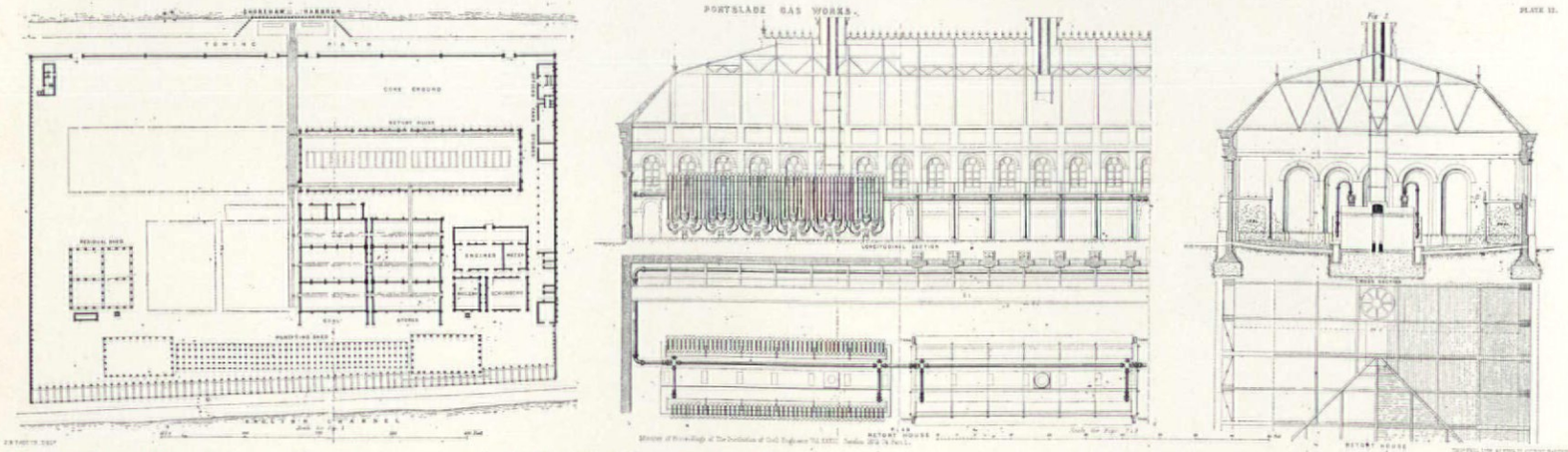




Interior of a cotton mill: 1835



Interior of a marine engineering factory, Greenwich: 1865
Jackdaw No. 13: *James Watt and steam power* (Jonathan Cape)



Portslade Gas Works: Retort House. 1873, an early single-storey factory with 84ft span warren roof truss
Minutes of the Proceedings of the Institution of Civil Engineers: Vol. XXXVIII

The 20th-century shed

◁514

The end of the nineteenth century and the beginning of the twentieth century saw the development of the single-storey shed-type factory.

This was invariably a pitched roof factory of single or multiple span, based on the fink or warren roof truss. Outlook was provided by industrial metal sashes but daylight was provided by patent glazing in the slopes of the roof which usually had an east-west orientation.

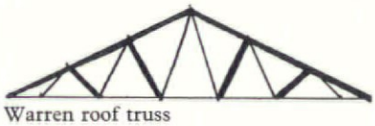
The other common roof form associated with the single-storey factory was the north light or saw-toothed roof. This avoided the problems of high heat gain associated with glazing in the slope of the pitched roof. It did, however, provide very uneven daylight within the factory compared with the pitched roof.

The development of the single-storey factory came with the replacement of steam and water by electrical power, the use of electrically-driven overhead cranes for mechanical handling, and industry's need for continuous flowlines necessary in mass production.

The grid of columns, roof trusses and overhead cranes controlled in one direction by purlin economy and in the other direction by clear span requirements provided a natural grid for carrying factory services from roof to floor.

The mechanical handling grid was formed by the overhead electrical travelling cranes and railway sidings which crossed the factory normal to these cranes to enable loading and unloading in any bay.

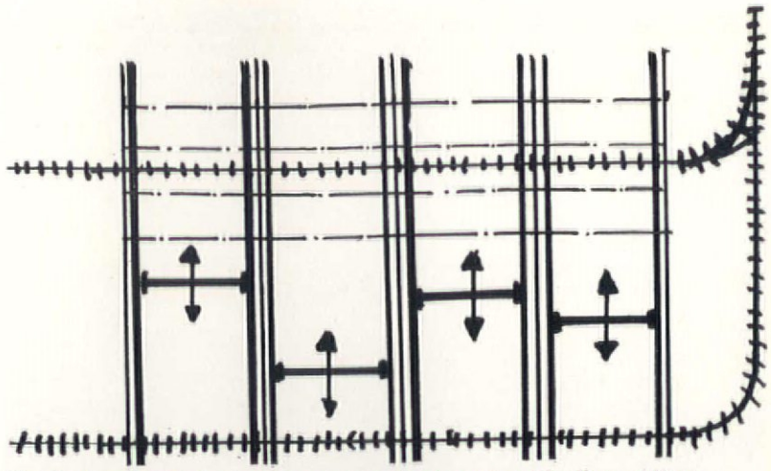
Fink roof truss



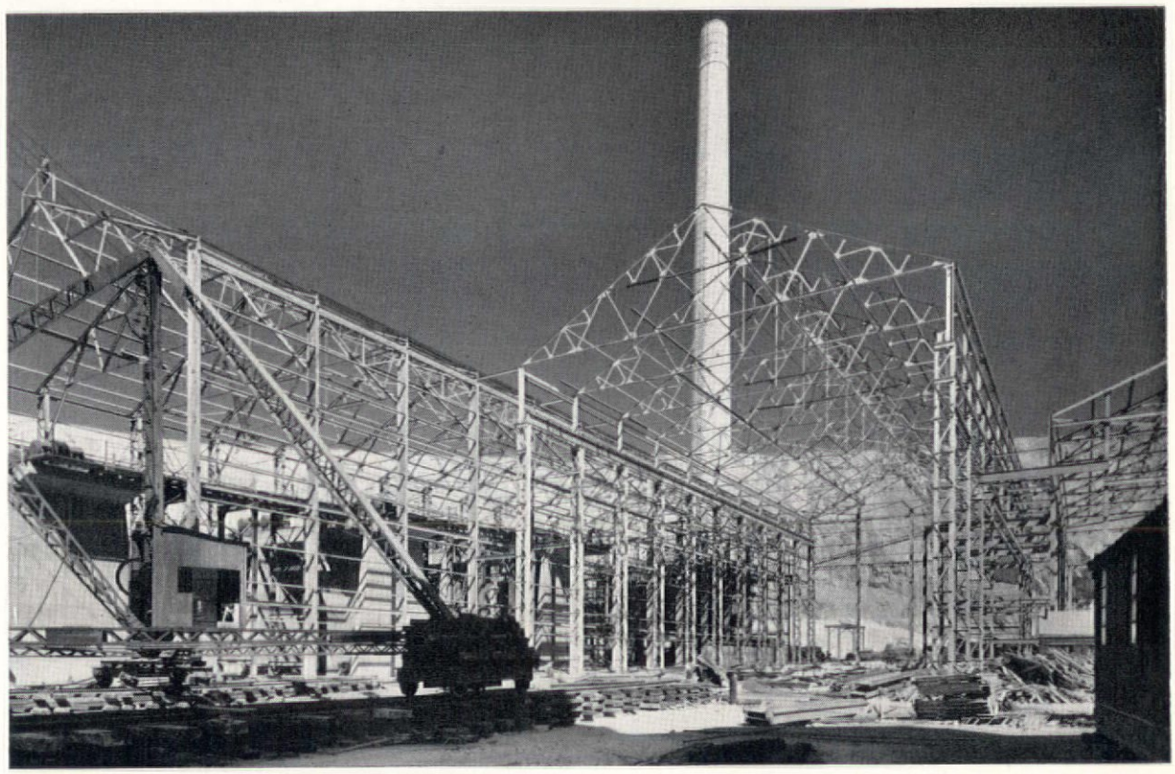
Warren roof truss

N-girder truss—early form with vertical ties

N-girder truss—twentieth-century form with vertical struts

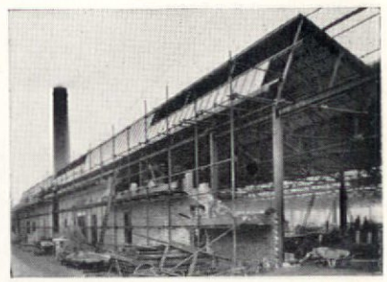


Sketch plan of typical arrangement of overhead cranes and railway sidings

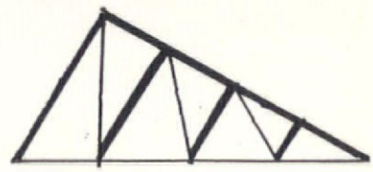


Typical pitched roof with fink roof truss
BCSA Photo: John Maltby

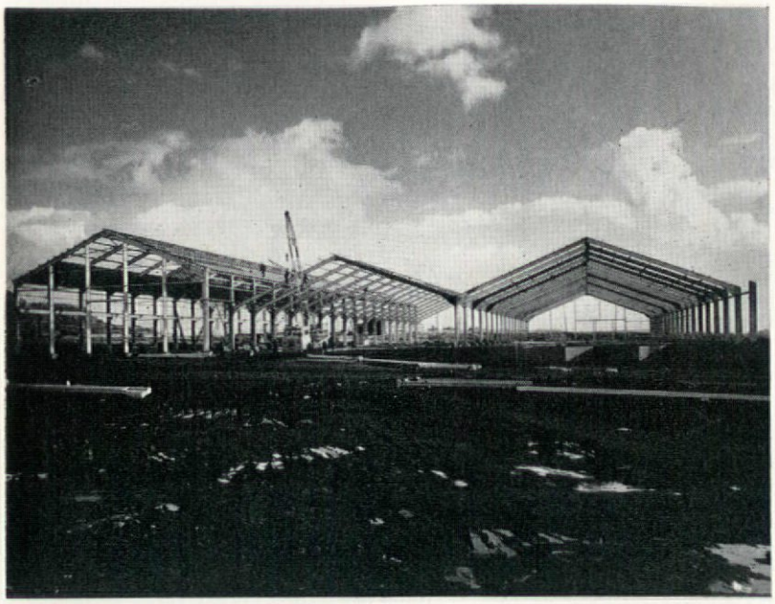
Edison Swan Electric Co. Typical multi-bay factory. Pitched roof with 'N' girder truss



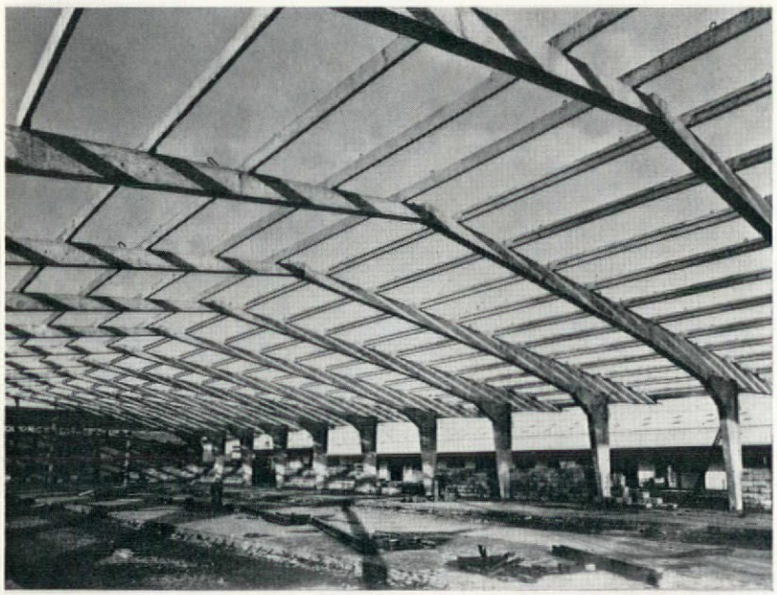
Typical north light roof truss roof
Photo: Raleigh Industries, Nottingham



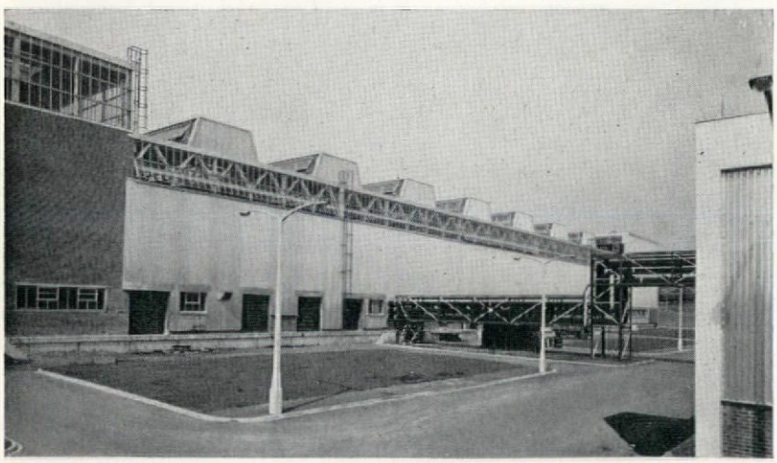
N-light truss



NCB Workshop and Stores. Typical pitched roof with welded steel rigid frame



Bristol Warehousing and Storage Co. Pitched roof with pre-cast concrete portal frames
Photo: C & CA



BMC New Press and Assembly Shops. Flat roof with monitor construction
Photo: E. D. Chrish:p & Roy Dixon

The post-war factory

The post-war factory saw the further development of the single-storey factory with particular developments in the roof form.

The rigid frame, which in steel resulted from the development of structural welding techniques and in reinforced concrete from the development of pre-casting techniques, became an economical alternative to the fink or warren roof truss.

The rigid frame was also used in the north light form.

Factory users became more aware of environmental problems and the distribution of factory services and both of these factors had important effects on the design of factory roofs.

Planned daylight with even illumination led to the development of the monitor roof light. The flat steel roof, which gave an excellent grid for distributing services and carrying artificial light, became a real competitor with the pitched roof or north light, monitors being added when planned daylight was required from the roof.

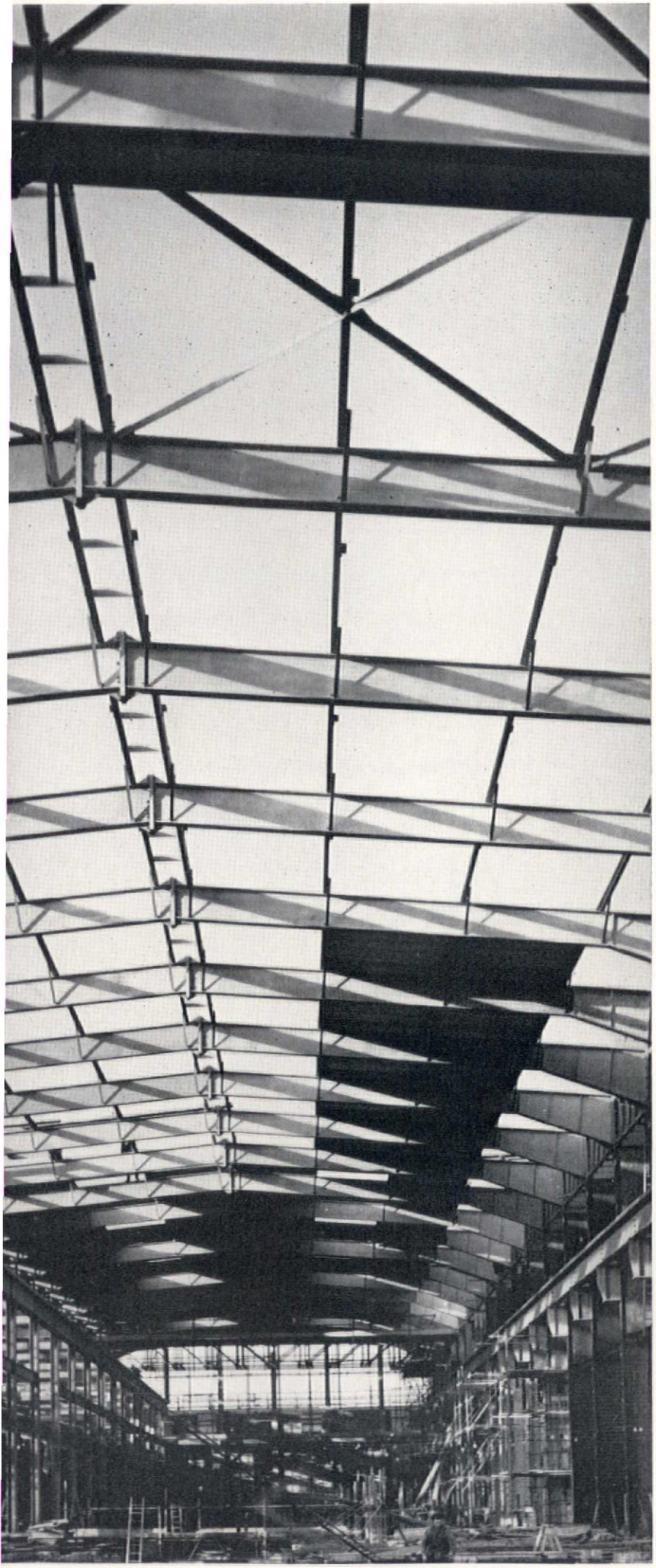
The windowless factory was the next natural step and, although there were a few examples in the immediate pre-war period, it did not really become a serious consideration until the more sophisticated product, especially of the electronic industry, required the environment which was much easier to control in a windowless box.

The rectangular grid roof, with whatever roof form, provided the service distribution system and, as services became more complicated, the flat roof with the flat bottom ties of the lattice girders was naturally preferred for control and supporting factory services and artificial lighting.

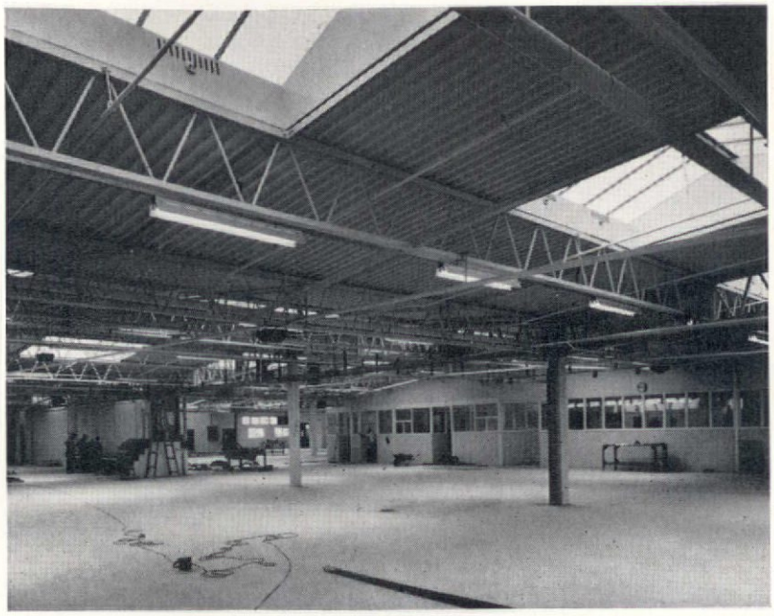
Electric overhead cranes developed with more sophisticated floor and cab controls but the post-war era saw the development of more slung mechanical handling systems hung from the roof structure, giving more handling flexibility than the traditional column-supported overhead electric travelling cranes.

The sidings of the pre-war factory were replaced by either direct lorry access or, more usually, the forklift truck.

Thames Board Mills. Typical welded ri



ne with overhead electric crane beams Photo: Frederick Snow & Partners



Broadwater Press. Atcost Standard Flat Roof using warren girders with isolated pitched roof lights

Condor Frame. Standard welded portal frame with small floor-controlled slung crane suspended from roof
Photo: A'Court

Large suspended crane installation
Photo: Acrow Demag

Factory services

A factory is primarily a service package. Its success is wholly dependent on the way the environment is controlled and the way in which the factory services, as well as the environmental services, are distributed.

The nineteenth century saw the development of the multi-storey factory around the concept and disciplines of steam and water power, the horizontal and vertical shafting being one of the primary disciplines in the planning.

The pioneer engineer, R. E. Crompton, famous for his road steam trains to which he had devoted his early life, was the first man to light the factory with electricity in this country. He was engaged by his cousins, the Crompton brothers, to lay down a new foundry for casting iron pipes for their Stanton iron works in the Erewash Valley. The installation was a new conception and it took some months to develop the details. The Cromptons' impatience led them to urge their cousin to work nightshifts which involved major lighting problems. Portable lamps and gas lighting being inadequate, Crompton investigated the generator or dynamo machine developed by the Belgian engineer, Theophile Gramme, for electrical lighting. This situation determined his real fame as an engineer. He turned to electrical engineering at just the right time and, in Rolt's words, 'was whirled to fame and fortune with bewildering speed'. Perhaps his most well-known 'first' was not a factory but the installation of electric lighting in the Vienna Opera House in 1885.

Electric lighting and power became the big influence on the form of the factory. It coincided with the emergence of mild steel as the leading structural material and so involved the electrically lit and powered factory of single-storey construction, where power could be easily distributed to overhead cranes and in simple conduits and trunking and therefore not requiring the compactness of the multi-storey mill.

The modern factory, with its more sophisticated products, now requires such factory services as gas, special waters, compressed air, steam, vacuum, special liquid conveying systems and normal and special waste and disposal systems in addition to the traditional ones of power and light.

Environmental services

Although, consciously or unconsciously, all buildings have considered man's requirements for light and air and tolerable temperature, they have generally only been considered in a more sophisticated way because of the products that require the environment. Man is only prepared to give his fellow men a good environment to work in as a by-product to making more profit. The UGC, for instance, will always grant extra money on their buildings for air conditioning things such as computers but never any extra money for air conditioning an environment for people.

It is against this background of man's obsession with things that the environmental services in factories have slowly developed.

Steam and hot water

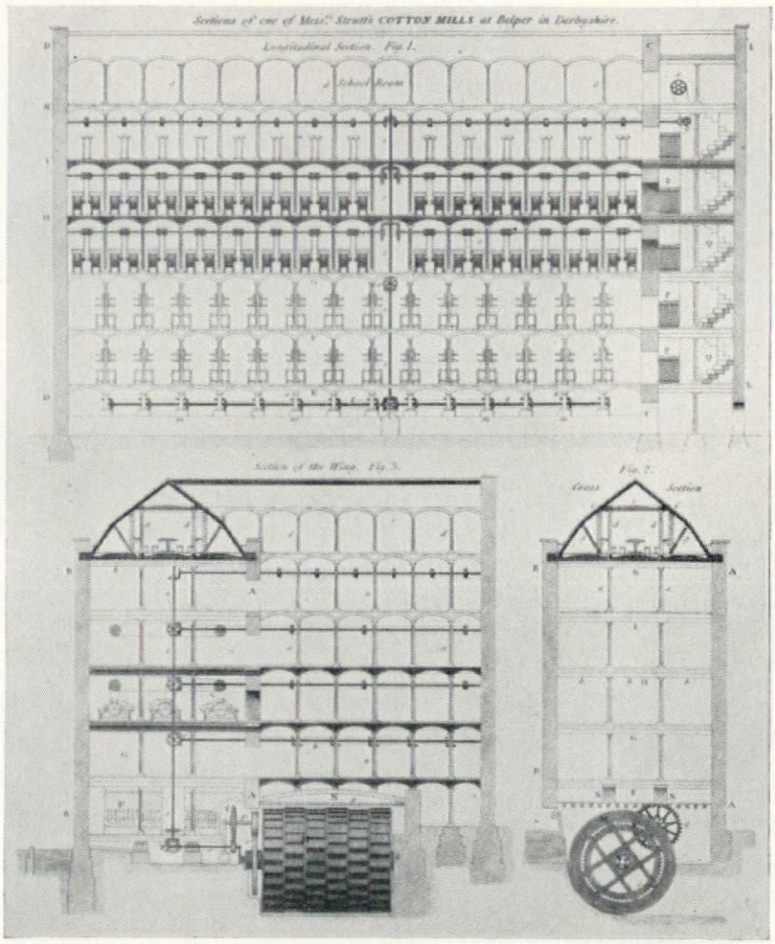
The earliest methods of space heating were by means of steam and hot water distributed in pipes terminating in some surface providing radiant or convected heat.

Air or mechanical ventilation

In the English temperate climate, opening lights and natural draft roof ventilators have been the basis of most factory ventilation. Only in the more recent post-war period where, once again, the products have required more controlled environments, have more sophisticated methods of mechanical ventilation been used. These have naturally been incorporated into air handling heating systems using the suspended unit heater.

Artificial light

The first real dependence on artificial light in factories came with the development of electric lighting. The earliest Tungsten installations were designed to provide lighting for certain activities within the factory without any consideration of the environmental qualities. The flat roof with no, or very limited, natural light meant total dependence on artificial



Belper North Mill by William Strutt. 1803. Sections showing horizontal and vertical shafting
Excerpt Transactions of the Newcomen Society; Vol. XXX. *op. cit.*

light for the working environment and, as the fluorescent tube developed, lighting design became concerned as much with lighting the whole factory space as with the job to be done.

Daylight

The multi-storey mill depended mainly for its lighting on the traditional window in the external load-bearing wall which, of course, meant a severe limitation on the width of the factory.

The great advantage of the single-storey factory was to provide good natural daylighting of high intensity in a very even pattern over the whole of the factory floor.

Glazing in the pitched roof created problems of high heat gains which were avoided by the use of the north light or saw-tooth roofing. The north light roofing, however, sacrificed the even daylight very necessary to flexibility in the layout of machinery which required good lighting standards.

The inferior lighting distribution of the north light roof led to the development of the monitor light where a small south light was introduced to provide even illumination.

Air conditioning

Industrial cooling was very much a factory service and this can be usually said of the air conditioned environment where the product needs the temperature and humidity control. The improved environment for the worker is the by-product.

Structure to support the roof

The emergence and development of particular roof forms for the single-storey factory was, as in most building elements, a result of many different functional requirements. A typical chicken-and-egg situation. It was certainly expected to stay up and keep out certain aspects of the English weather but there was seldom much delight in the equation and it was mainly modified by the requirements of natural lighting essential to the industrial process.

The most common forms evolving during the early twentieth century being the pitched roof and the north light roof.

The pitched roof with patent glazing in the slopes allowed more flexibility in plant layout than in the north light roof, which severely limited the position of production lines. Because of the fixed relationship of natural roof lighting to the structure, this type of factory was very limited in its orientation on the site. The structural grid evolving from the requirements of natural daylighting were related to plant layout which, in turn, controlled spans and bay size. The development of artificial lighting had initially very little effect on the structural grid because of the use of hung tungsten lamps lighting the particular job or process. The fluorescent tube and planned artificial lighting began to influence the structural grid which, of course, provided a natural support for the fluorescent lights.

Structure to carry, define and control the factory and environmental services

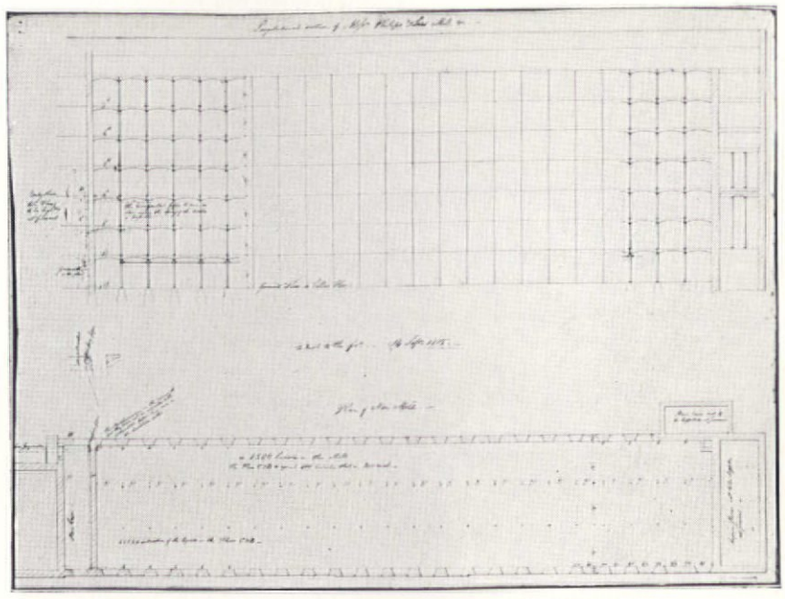
Natural lighting was certainly the biggest factor, other than structural economy, which had an important effect on roof form and design. Artificial lighting and power distribution, because of its small demand on space in the form of conduits and trunking, could be virtually hung or fixed anywhere and was invariably a service which was just added to an accepted form controlled by other requirements.

The slow but increased rapidity of growth in a multiplicity of factory services and environmental services have introduced other important parameters into the structural form and have produced roof designs which pay more regard to the disciplines necessary to carry these services and distribute them to the factory floor.

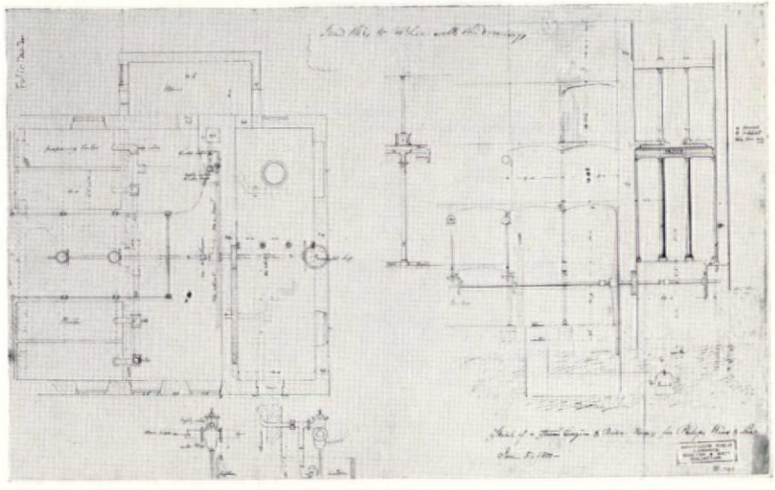
The biggest influences have resulted in the departure in the immediate pre-war period from the pitched or saw-tooth roof to the flat roof sometimes associated with monitor lights or flat lights in the roof plane, but, in more and more cases, in the unlit flat roof depending entirely on artificial lighting.

Service planes

The planning grid for services presents no fundamental problems provided there is a careful relation of this grid to the disciplines of the structure which must, of course, be



Salford Twist Mill. Plans and sections showing details of gas lighting installation
Boulton & Watt Collection. Birmingham Public Library



Salford Twist Mill. Sketch of steam engine and boiler house showing connections to horizontal and vertical shafting
Boulton & Watt Collection. Birmingham Public Library

related to the main machine or production planning grid.

It is the level or plane of this service planning grid which presents the fundamental problem which it is very necessary to resolve. It is probably one of the most important parameters in the design of any factory space.

The floor

The problem of the service plane is certainly not common to the factory problem. Laboratories of all sorts, physical, chemical and biological, require a multiplicity of services to a work bench and they require a high degree of adaptability.

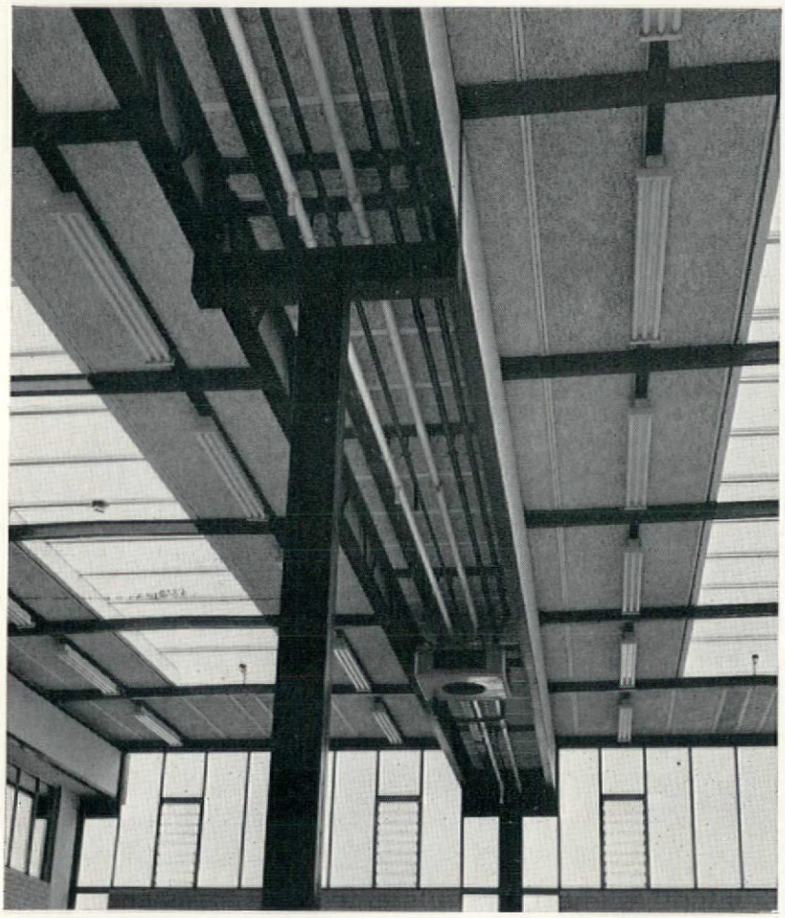
There has always been something very Victorian and old-fashioned about the modern movement in architecture. Although not spelt out, the modern movement has always believed that cleanliness comes next to godliness.

Architect-designed factories have usually been concerned with clearing up the 'spaghetti' of roof trusses and services and one of the solutions is to bury the problem regardless of expense and adaptability. This has certainly been so in laboratories where the users have often been well disposed to this approach. Attempts have been made to serve factories from the floor by means of ducts with removable covers. Even with this system and the cleanliness and free spaces it creates above working level there remains the problem of the penetration of the duct cover and its adaptability, apart from the major problem of the limits that the presence of floor ducts places on the adaptability of the layout of plant.

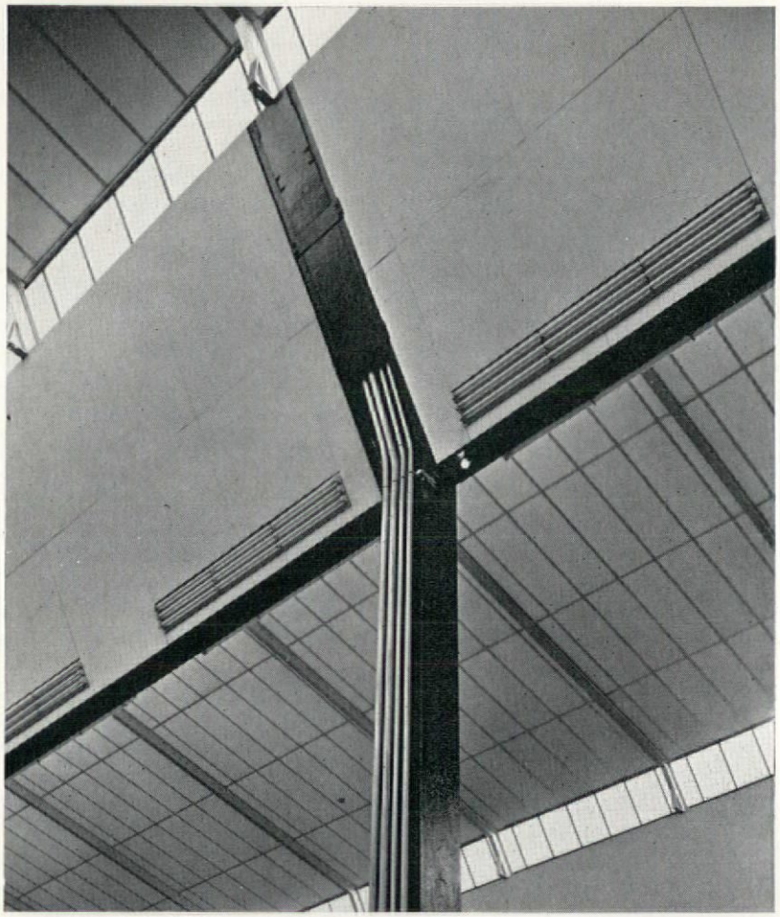
A good example of this approach is in the Danfoss factory in Nordberg in Denmark where, in later stages, the distribution of services in floor ducts was discontinued.

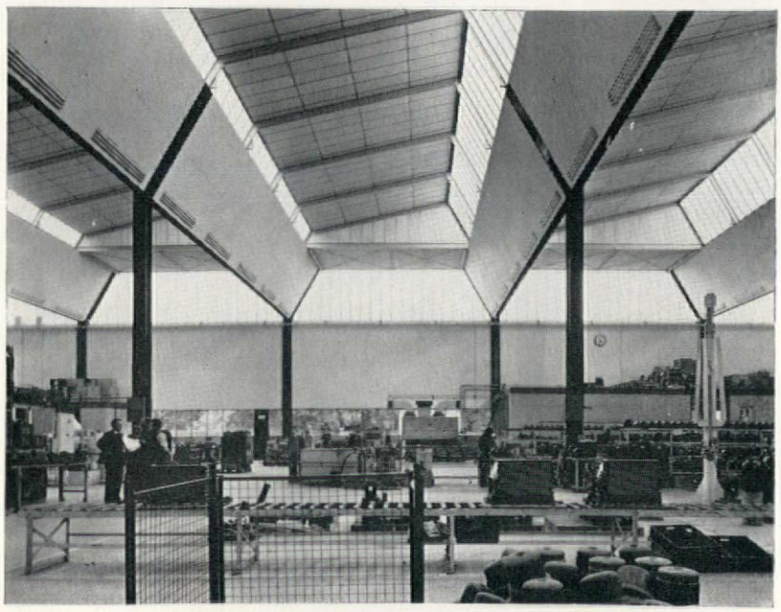
The roof

The longer people are involved



△ **Walter Jones Factory.** Services duct formed by main roof girders to house factory and heating services showing relationship of artificial and natural lighting. Arup Associates, architects and engineers
Photos: Colin Westwood





▷ **York Shipley.** Power lighting and factory services distribution. The lighting, designed as a reversible unit accessible from inside the space frame/services duct. Power distribution by pre-cut pyrotenax terminating in specially designed boxes fixed to the columns. Arup Associates, architects and engineers
Photo: Colin Westwood

in the design and construction of buildings and begin to wrap their minds round the total problem, the more they are inclined to realize that the immensity of the problem defies any rational or detailed analysis and begin to rely on rather glib proverbs, one or two of which are, nevertheless, very good guidelines, such as the old adage that 'when you buy concrete, you buy the cracks that go with it' or 'a hole in the air is cheaper than a hole in the ground'. It is, of course, not only much cheaper but holes in the air are much more adaptable than holes in the ground. It is the design of the hole in the air, with no real boundary conditions, that gives the designer his real problems. It is, of course, the cheapness and the infinite adaptability of the air space that has led to the distribution and servicing of the factory from the roof.

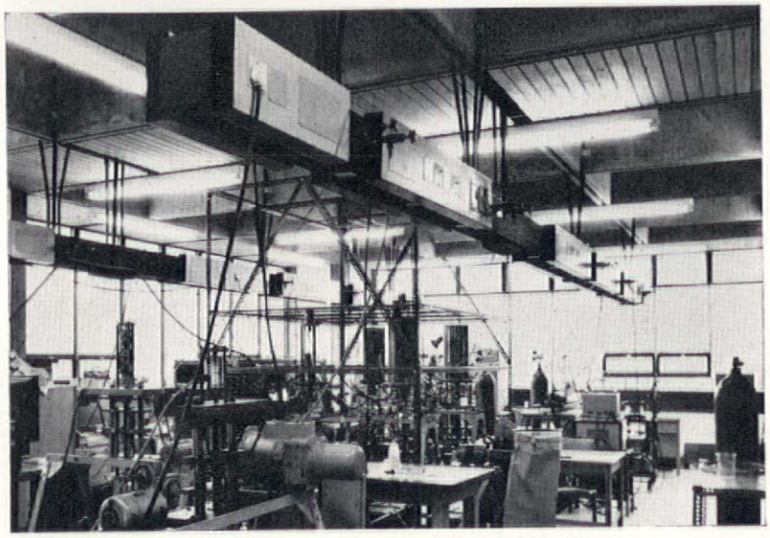
The design problem lies in integrating this on some accepted disciplines in conjunction with the roof structure and compatible with the preferred planning of the factory production.

It is significant that these principles can be applied very successfully to the laboratory problem, so providing infinite adaptability of the laboratory bench which can then be treated as a free, moveable table, such as the laboratories in the Department of Mining & Metallurgy at Birmingham

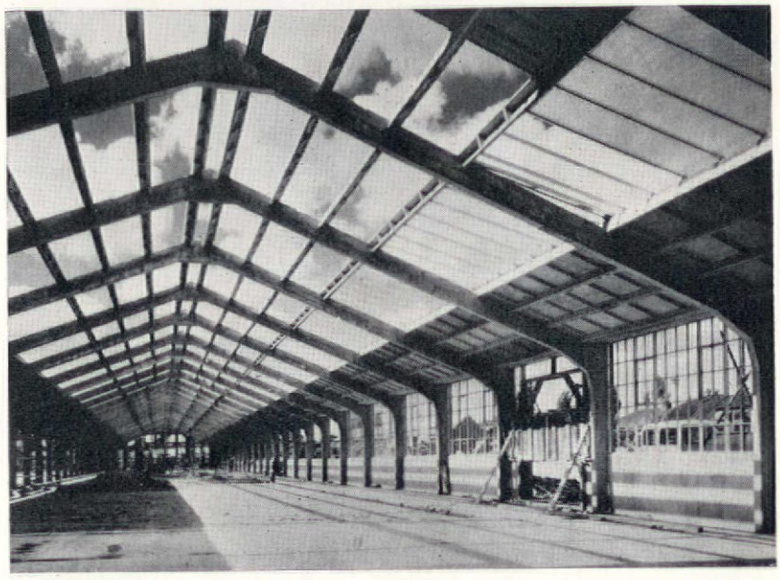
Steel and concrete

Many design groups spend an enormous amount of energy in discussing marginal problems. It is, of course, the designer's disease that often the importance of the problem is inversely proportional to the amount of time spent on it.

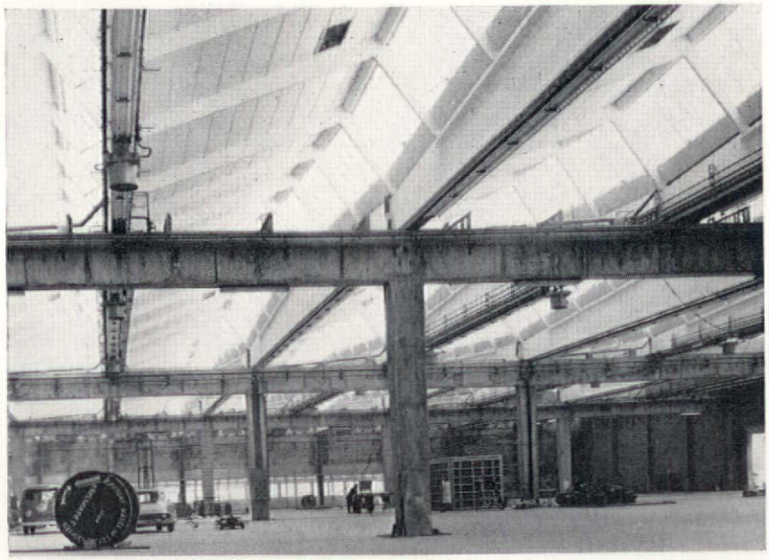
This is certainly so for steel and concrete. Although the decision on material will influence enormously the formal aspect of the solution, it is not really concerned with the solution in itself.

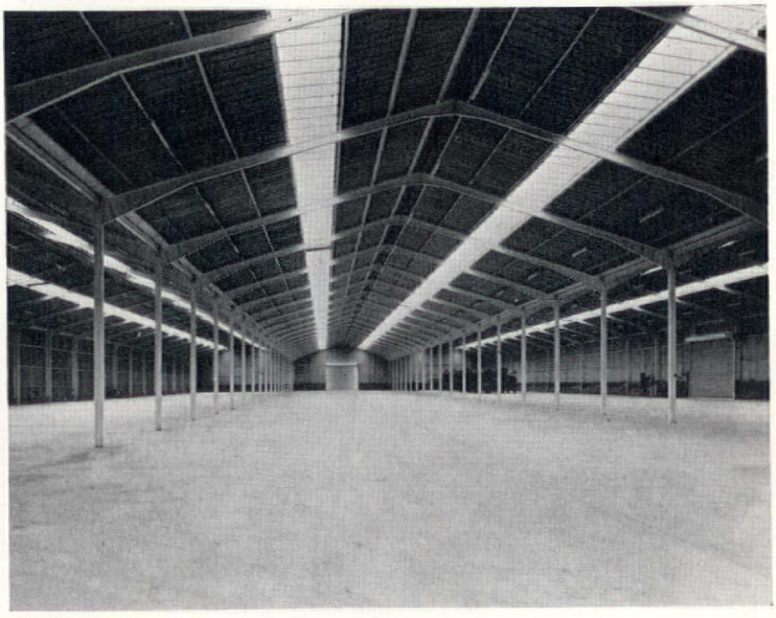


Birmingham University: Department of Mining & Metallurgy. Laboratory Service booms
Photo: John Donat

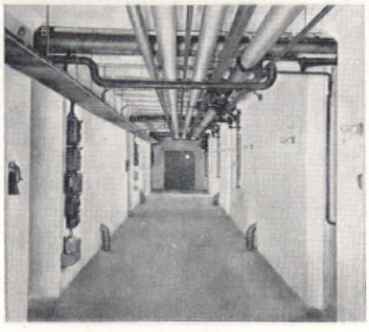


Pre-cast concrete portal. Apart from the ability to make simple fixings to the frame, the disadvantages and advantages of either material are marginal
Photo: C & CA





Steel portal
Photo: Condor



Danfoss factory, Nordberg, Denmark

△
One of the latest Danfoss factories in which the floor service system has been discontinued. Latest plans show the service distribution from roof level.

◁
Danfoss 'Elsmark' factory, 1951. The main duct for underfloor services. A subsidiary duct can be seen connecting to the main duct and serving the whole factory floor.

The impressionist painter
MONET
Did a haystack three times in one day;
He explained; 'My delight
Is the change in the light,
I'm not terribly keen about hay.'

J. Gordon
Art ain't all Paint

Roof lighting in the pitched roof

Patent glazing in the plane of the roof with an east-west orientation has had probably the longest innings of all industrial methods of natural lighting. It was cheap and efficient in terms of providing high and constant levels of natural light at factory working level.

Its only limitation was heat loss in winter and high heat gains associated with direct entry of sunlight in summer.

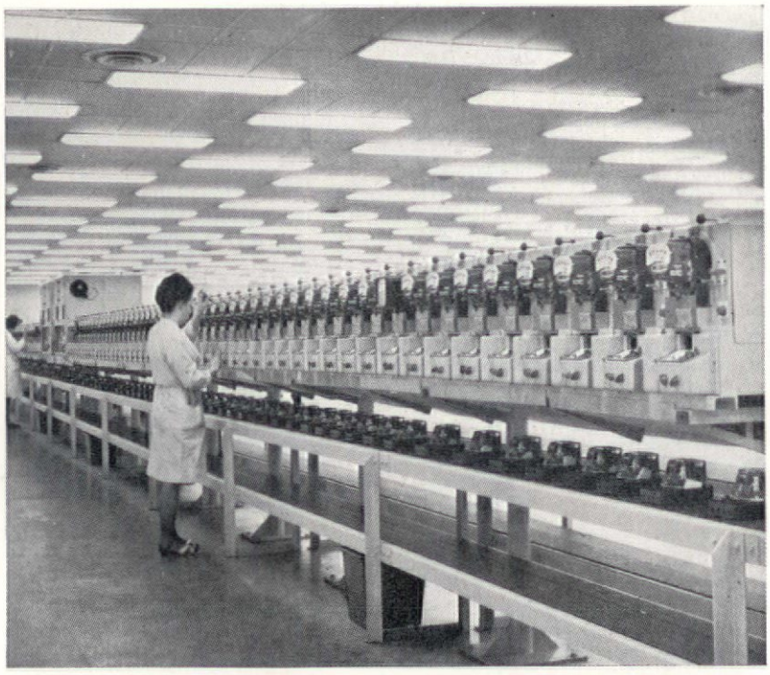
Because of the English temperate climate with its lack of extremes, neither of these problems have, with the normal industrial product, created any serious problems and only on occasional days in the year has this system caused serious discomfort to the workpeople.

Clydesdale Bank Printing Department Glasgow. Roof lighting in the saw-toothed roof
Photo: Arcon

Kirby Tube Mills. Roof lighting in the pitched roof
Photo: Stewart Bale

Factory at Hemel Hempstead. Roof lighting in the pitched roof
Photo: C & CA

Webley & Scott Ltd. Roof lighting with a monitor roof
Photo: Arcon



Sangamo Weston Ltd., Felixstowe. The air-conditioned windowless factory Interior view of final calibration and test in 'white area'
Photo: GLC Research Paper

Chemical Building Products. Roof lighting in the flat roof
Photo: John Pantlin

Ford Motor Company Limited West Thurrock The unlit flat roof
Photo: Arcon

Roof lighting in the north light

The most common alternative to roof lighting in the plane of the pitched roof is the saw-toothed roof with patent glazing on the north face only.

This method of natural lighting avoided both problems of direct sunlight penetrating the factory and consequent heat gains.

It had the great disadvantage of very uneven light distribution with strong shadows which was very limiting in plant layouts.

Roof lighting in the flat roof

The flat roof development provided a grid in the right plane for distributing services without additional members or long suspension systems associated with pitched and north light roofs. It reduced the heating and air handling load in the mechanically ventilated and heated factory.

In the English factory, roof lighting was invariably retained by the use of monitors associated with flat roof construction or flat continuous lights in the plane of the flat roof. The monitor light, usually with larger areas of north light glazing than south light, combined the advantages of the north light and the pitched roof, but never achieved the constant level of intensity provided by glazing in the plane of the pitched roof.

The flat continuous roof light gave identical illumination to the pitched roof continuous glazing but had the same disadvantage of direct sunlight and high heating gains. These were partially off-set by the use of diffusing glass or plastics.

The unlit roof with vision strips

In the flat roof, roof lights complicate the building process, are expensive, difficult to maintain and invariably leak. They add to the heat load in summer and heat loss in winter.

In the more extreme climate of North America, all these factors consequently led to the almost universal adoption of the unlit flat roof. The rapid growth of services which tended to obscure natural lighting have also accelerated this development in the United Kingdom.

The windowless factory

The windowless factory is essentially an American development. Although there were isolated examples built just before the war, it was the second World War which required speed and efficiency in factory production on a large scale, which emphasised the advantages of adaptability of plant layout and servicing associated with the windowless factory. It was during this period that the concept of the windowless factory was recognized as providing high levels of adaptability, controlled interior climate, high qualities of interior illumination and consequent reductions in capital and maintenance costs. All these factors became associated with a standardised flat roof construction of structural steel with grids of 40′–60′ span, with main beams of lattice construction and roll-steel joist purlins.

The windowless air-conditioned modular sealed box

Jacques Barzun doubts C. P. Snow's 'two cultures' and maintains we live in a scientific culture where everything is analysed and measured. If it can't be measured, it is ignored.

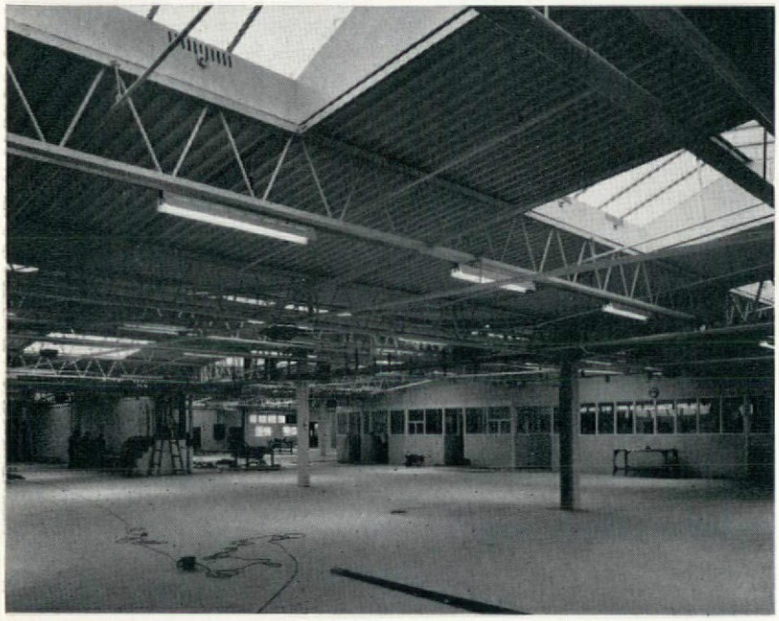
All the measurements of flexibility and adaptability, initial cost and cost in use lead, in factory design, to the windowless box. They are built up from the parameters we can isolate, measure and cost. The parameters of human reaction are infinite in number, highly variable and highly subjective and, because of this, very difficult to identify and quantify.

Because of these difficulties, they are left out of the question.

There have been, and are, a number of rather scattered research projects on the effect of the windowless environment but they are not sufficient in number or in depth to enable any real conclusions to be drawn.

In view of our lack of knowledge, it is surely a very serious step to remove all contact with the outside until we can include human factors in our costings.

William Clarke. Atcost Series F.2. Frame
Photo: Atcost Ltd.



Broadwater Press. Atcost multi-4 system frame
Photo: Atcost Ltd.

The building process systems and methods

The need for flexibility for factory buildings is often stressed. It is easier, however, if a distinction is drawn between adaptability and flexibility.

In building design, and particularly in factories and laboratories, both exist but have an important difference in meaning. Flexibility applies to decisions. In a building, it applies to planning.

A set of planning principles which allows a variety of real possibilities is flexible. A building, when constructed, is not.

If, however, it is well designed and incorporates certain disciplines, it is then adaptable to new conditions. This adaptability is, of necessity, limited by various fixed major components such as structure, the removal of which amounts to demolition. A good development plan should aim at a proper balance between flexibility, giving room for manoeuvre in the future, and a definition of a level of adaptability which is necessary to ensure that a building does not become prematurely obsolete.

The rectangular grid

The rectangular grid is a universal planning system for factories, whether associated with pitched or flat roofs. Because the roof construction has been such a dominant factor in single-storey buildings, structural economy has been the main factor in arriving at the size of the grid. The requirements of adaptability in the layout of plant, combined with the fact that structure is a small proportion of the total cost of a building, has led to increased spans which have resulted in an accepted range of between 40′ and 60′, especially in the American single-storey factory.

The standard systems

The factory systems available in the United Kingdom today are usually nothing more than standard roof frames, usually of portal construction, or developments of some trussed or lattice girder system. They cater for many of the traditional systems of natural roof lighting but pay no regard to the total requirements and disciplines necessary in adaptable factory space, especially those disciplines concerned with the distribution of factory and environmental services.

The tyranny of systems

Most available factory systems are the product of the 'can of baked beans' philosophy. In itself, it is a highly controlled product and immediately available for immediate consumption. You can either eat them straight from the can cold or warm them and have them on a piece of toast.

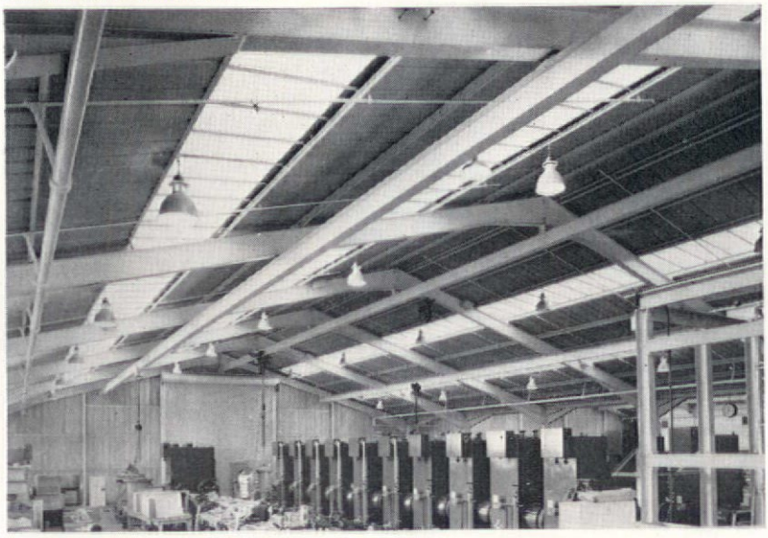
The factory systems, in trying to be all things to all men, are rather like the can of baked beans. They answer none of the real problems of adaptable space required by the modern factory and are especially deficient in providing adaptable systems for the incorporation of a multiplicity of mechanical and electrical services.

The reward of methods

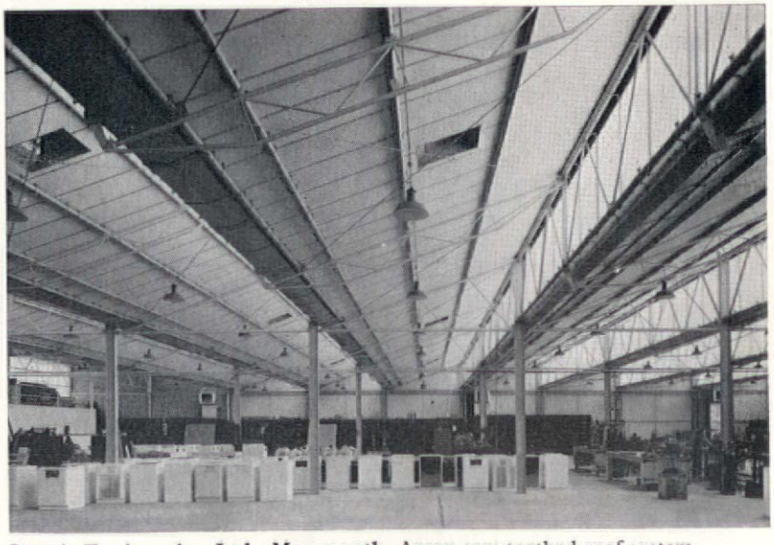
Systems, whether concerned with factories or our political institutions, are invariably only answers to intellectual problems and never real ones. Their adherents apply them, willy-nilly, to try and answer problems that never even existed in the minds of the people who evolved the system. Clasp is a perfect example of this. A very good idea for schools of single- and two-storey construction in areas of mining subsidence, it is now being bent in every conceivable direction to try and produce our new universities and anything else you can think of.

If we apply methods of construction to a given set of criteria and pursue the ideas of adaptability, the real problems of the factory and any other sort of building will begin to be solved.

W. & G. Fricher. Condor portal frame with monitor lighting
Photo: A'Court Photographers Ltd.



Savage & Parsons. Condor portal frame
Photo: A'Court Photographers Ltd.



Scott's Engineering Ltd., Monmouth. Arcon saw-toothed roof system
Photo: Arcon

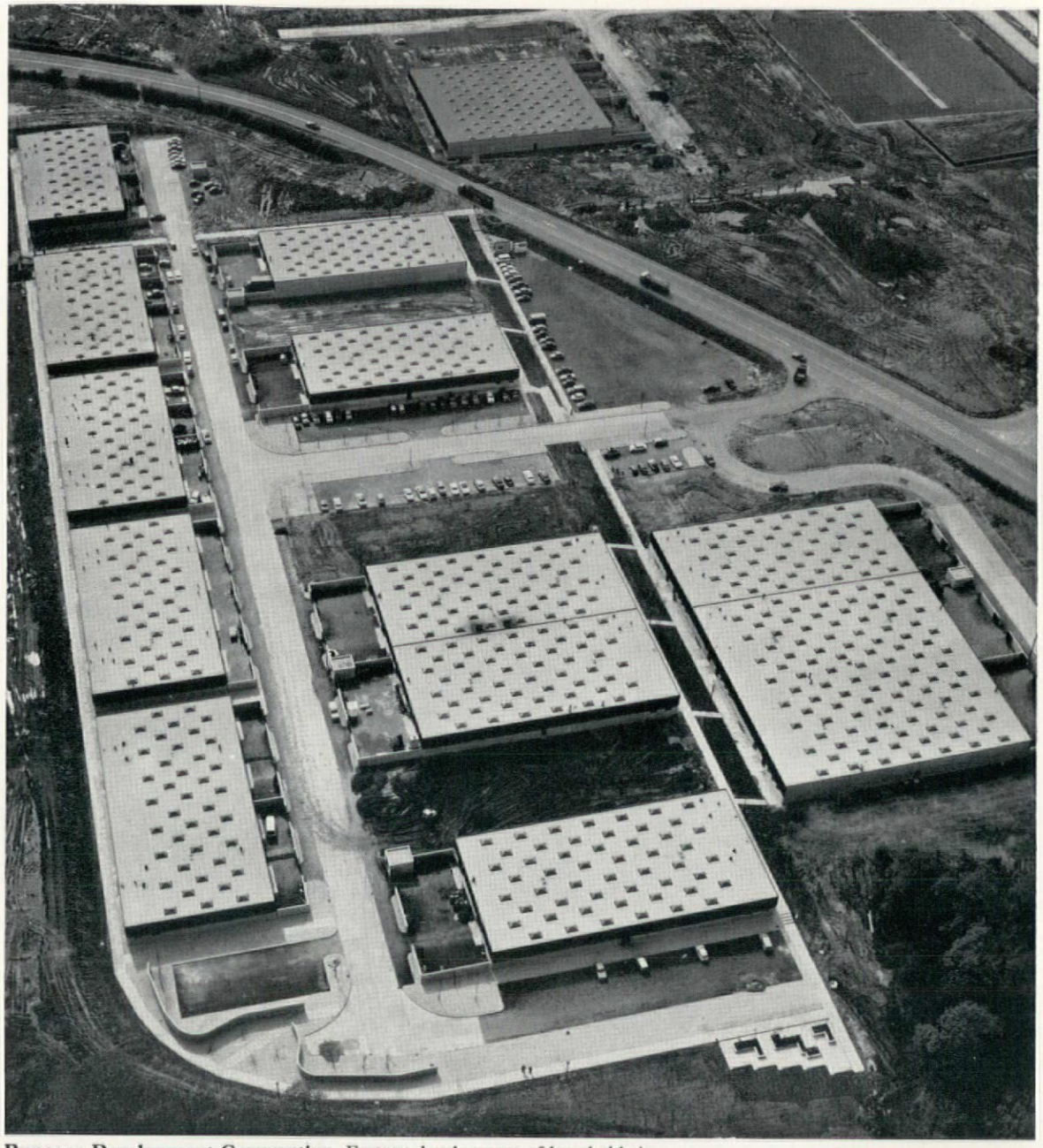
The industrial estate

The last 20 years has seen the widespread development of the factory or industrial estate. The move of population out of the city and town centres coincided with the escape of the small industries from the hopelessly inadequate premises in the towns and the new towns themselves have produced the trading estate.

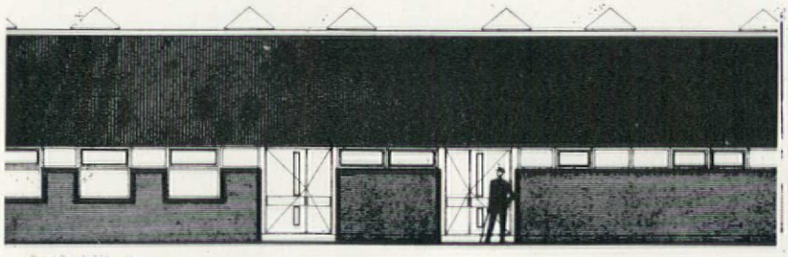
Not only the architecture and layout of these estates, but the idea itself, fit in with the mid-twentieth century attitude to work. Work has been so debased in its content that it is looked upon as something that has to be endured to provide money to enjoy the few hours left over. This is exemplified by the industrialist and, invariably, his employees who want a factory at rock-bottom cost to ensure that they live in a sordid atmosphere for eight hours of the day but are very concerned about the qualities of their cars in which they spend very short periods of their lives. The idea of collecting the work places together and tucking them away out of sight and out of mind, is another facet of this attitude and, at the same time, hardens and confirms it.

Flatted factories and nursery factories

There have been isolated cases, notably in Birmingham and London, where flatted factories for rent have been built to house the small industries within the city and to provide high standards of accommodation and yet maintain the connection with the city. There have been similar developments within the industrial estates of the new towns.

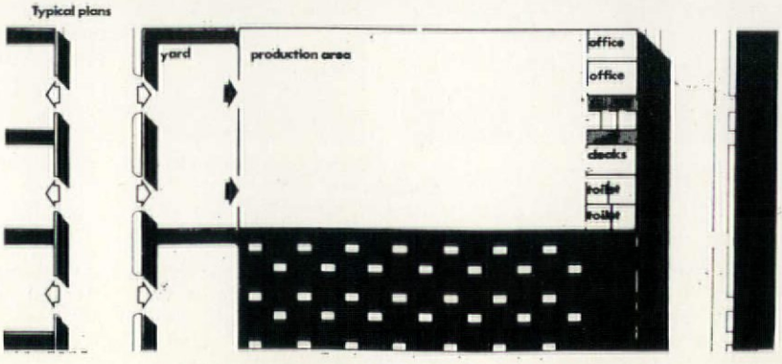


Runcorn Development Corporation. Factory development of leasehold sites
Photo: John Mills



Part Back Elevation

Runcorn Development Corporation. Factory development
Photo: John Mills



Left
Plan and elevation of standard factory

The photographs and illustrations give no real indication of the internal arrangement of the spaces, structure and systems available for the services

The place of work

In the single-storey factory, it is in the total design of the roof that the problems of integration of structure and services must be solved. It is now generally accepted that most factories are served from roof level and not from the floor. The roof must therefore cater for all the following requirements: structural stability, with the added ability to carry, in many cases, overhead cranes and always the ability to lift small loads of up to two tons at various well-defined points; a systematized method of carrying the services for the heating and ventilating of the working-space below; a systematized and flexible method of bringing factory services to all parts of the building, including power and lighting, gas, compressed air, water and coolant; planned daylighting and artificial lighting. The solution of heat loss and fire resistance have also to be considered. These requirements are additionally complicated by the needs of regular maintenance and modifications to meet changing production needs.

Often these requirements are nearly mutually exclusive and it is a great temptation to the designer to sacrifice the *quality* of the environment in which we spend two-thirds of our waking lives.

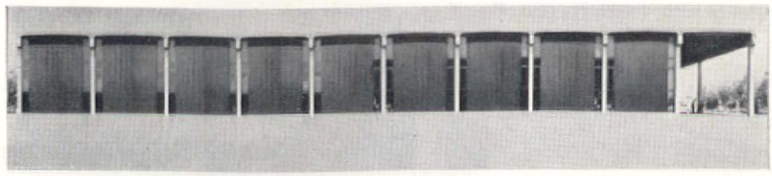
This approach can lead to the windowless factory where the flexibility of factory services and maintenance is given priority over working conditions. Because precious little or no natural daylight filters through the 'spaghetti' of pipes overhead with the artificial lighting adding to the confusion, it is thought that the case against planned daylight has been proved.

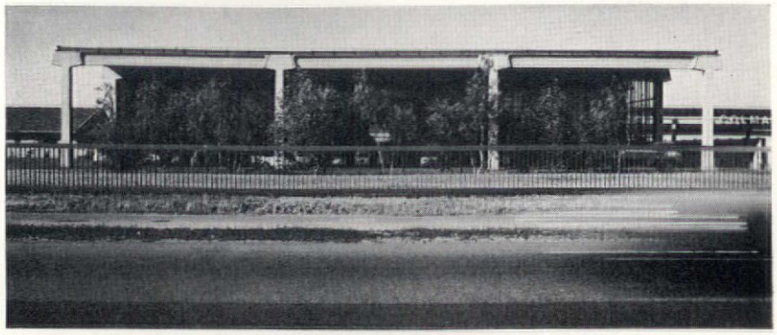
The first priority must always be the conditions in which we work. This does not discount the windowless or artificially lit flat roof solution; but neither type must become a standard which is built without a really careful analysis of what we lose by being unaware of the 'change in the light'.

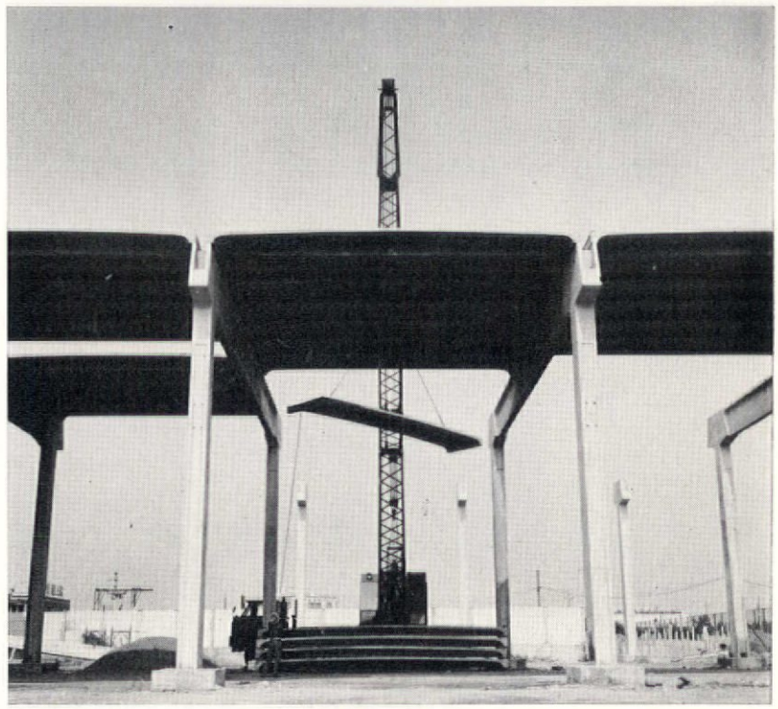
The factories illustrated on the pages that follow have attempted to solve some of the problems and produce a fine place in which to work.

Factory at Lissone, Italy

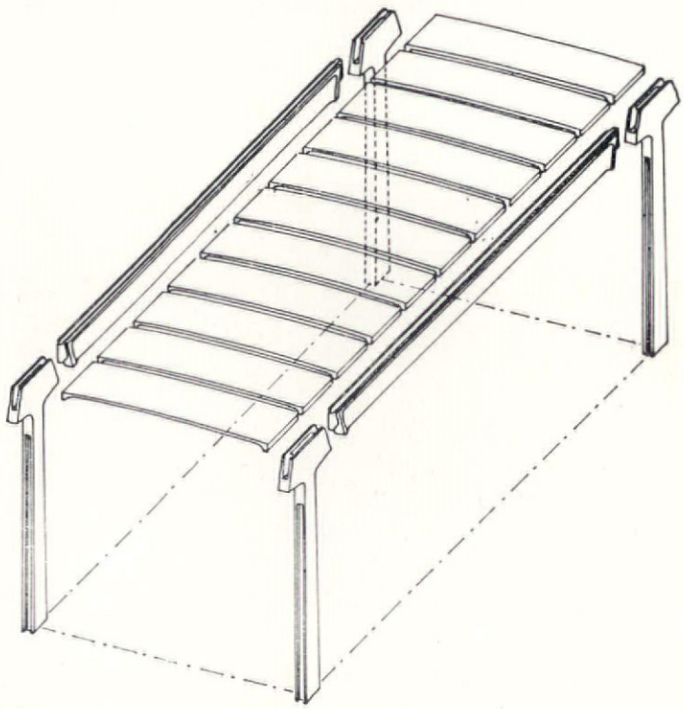
Architect: Angelo Mangiarotti
Engineer: A. S. Fioretti





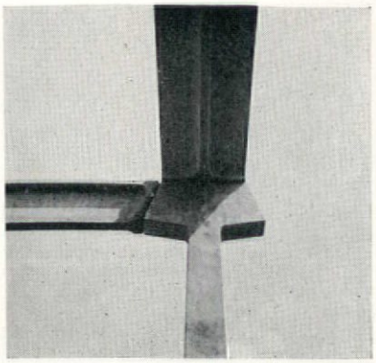


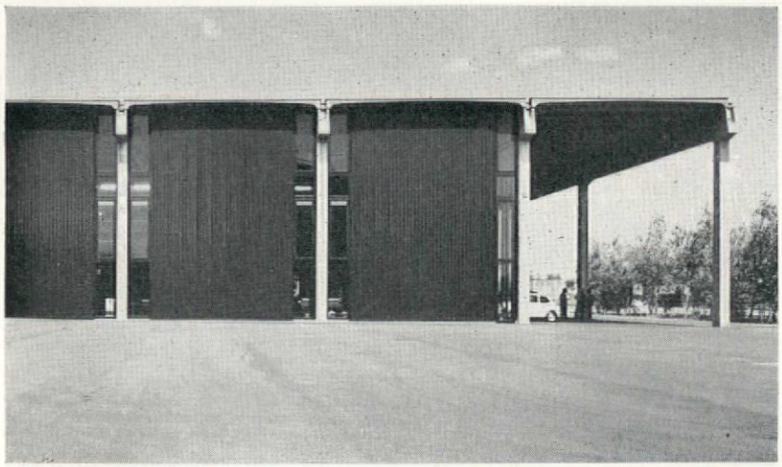
A beautifully designed and detailed flat roof frame. A building system rather than a solution of the single-storey factory.
The internal photographs (overleaf) show how the services fit where they touch ▷

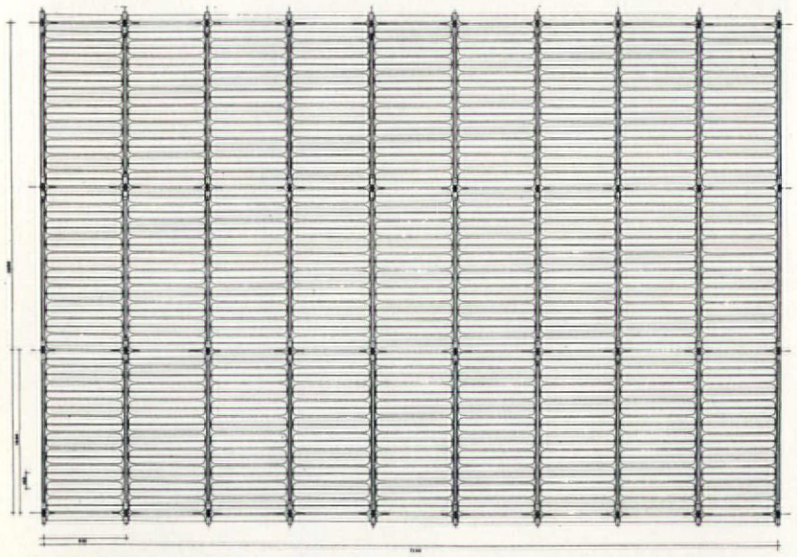


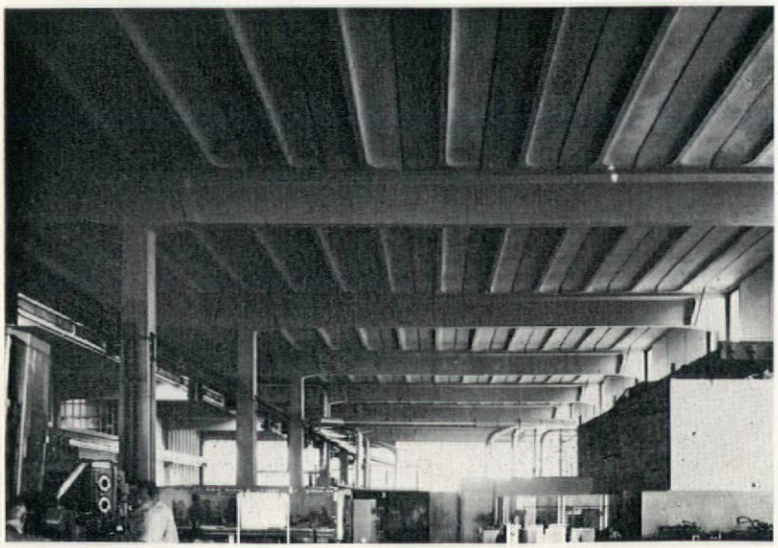
Factory at Lissone, Italy

◁529



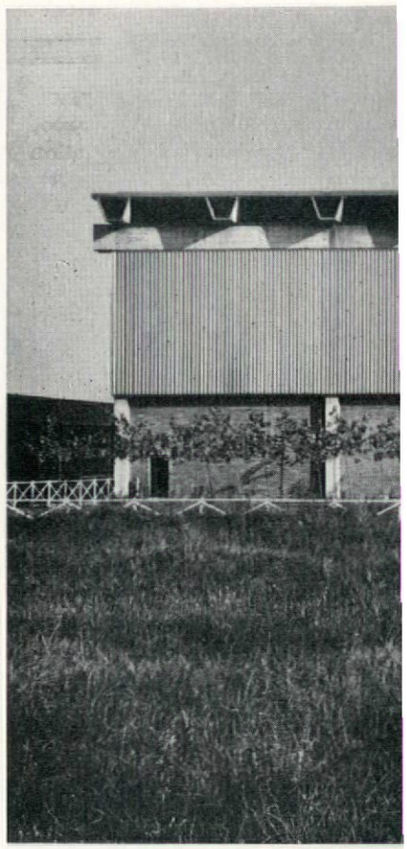




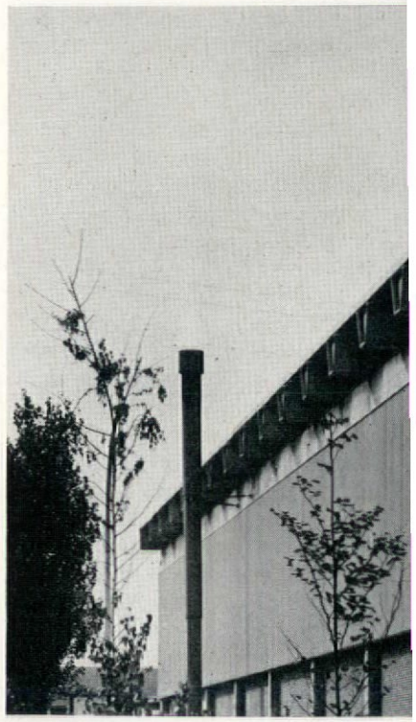


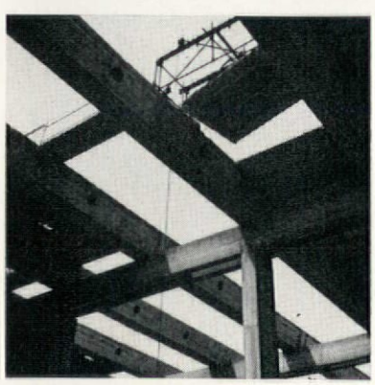
Entrepôt Pirelli, Verona, Italy

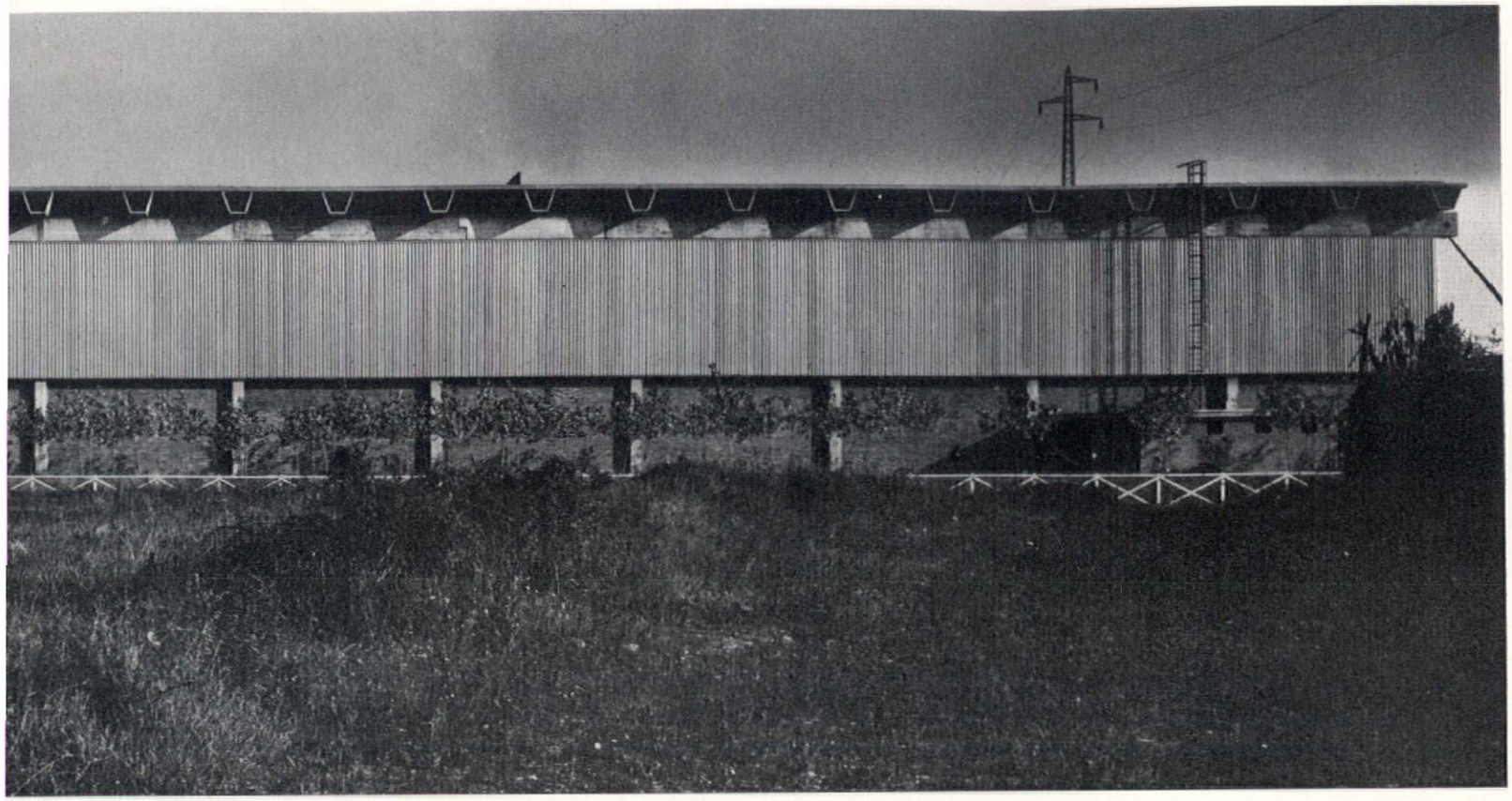
Architects: V. Borachia, C. Santi
Engineers: Finzi and Nova

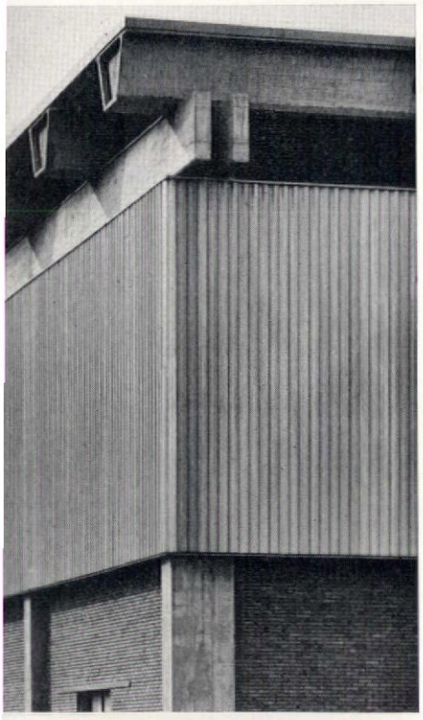


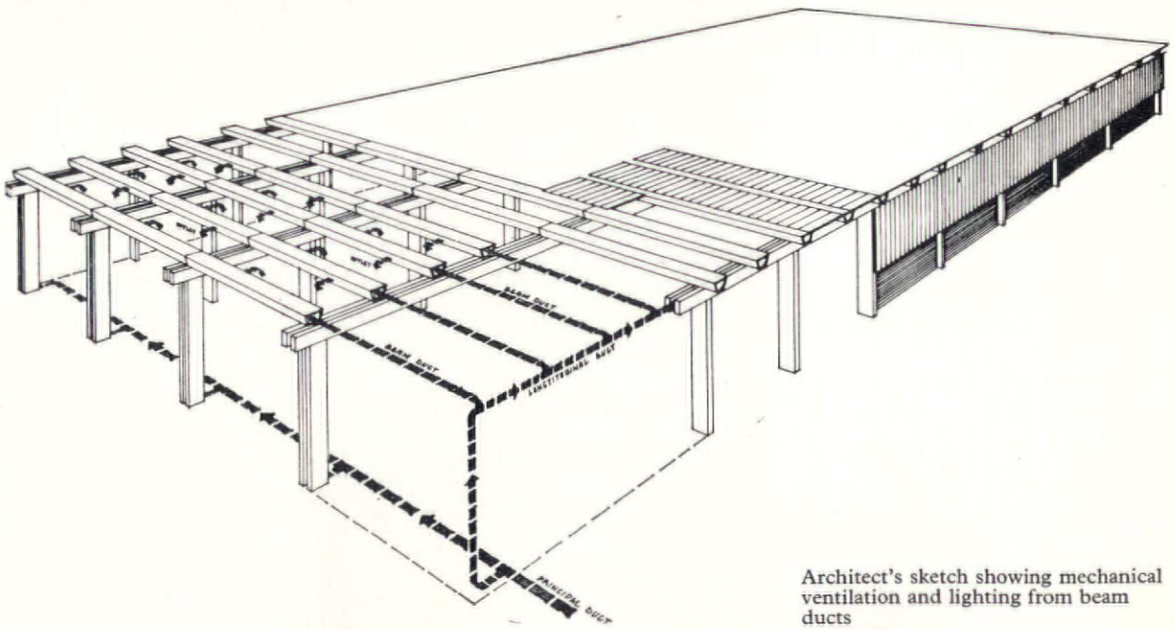
An interesting structure incorporating the fixed environmental services of artificial lighting and mechanical ventilation. It would be interesting to see how the factory, when in production, deals with factory services, the systems for which are not clearly shown in the drawings
Photos: L. Gorzegno



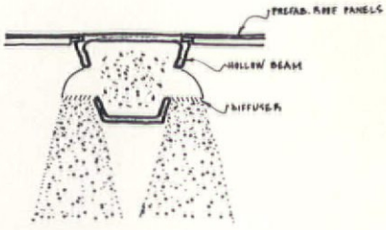


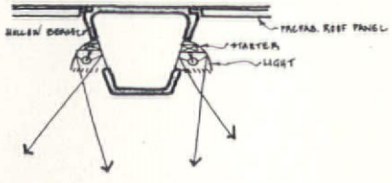


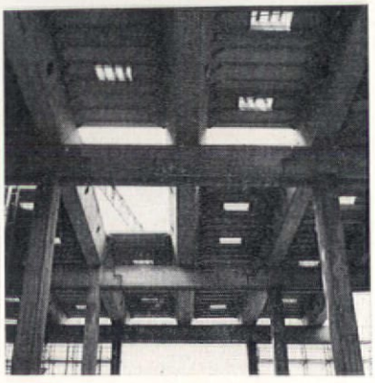




Architect's sketch showing mechanical ventilation and lighting from beam ducts

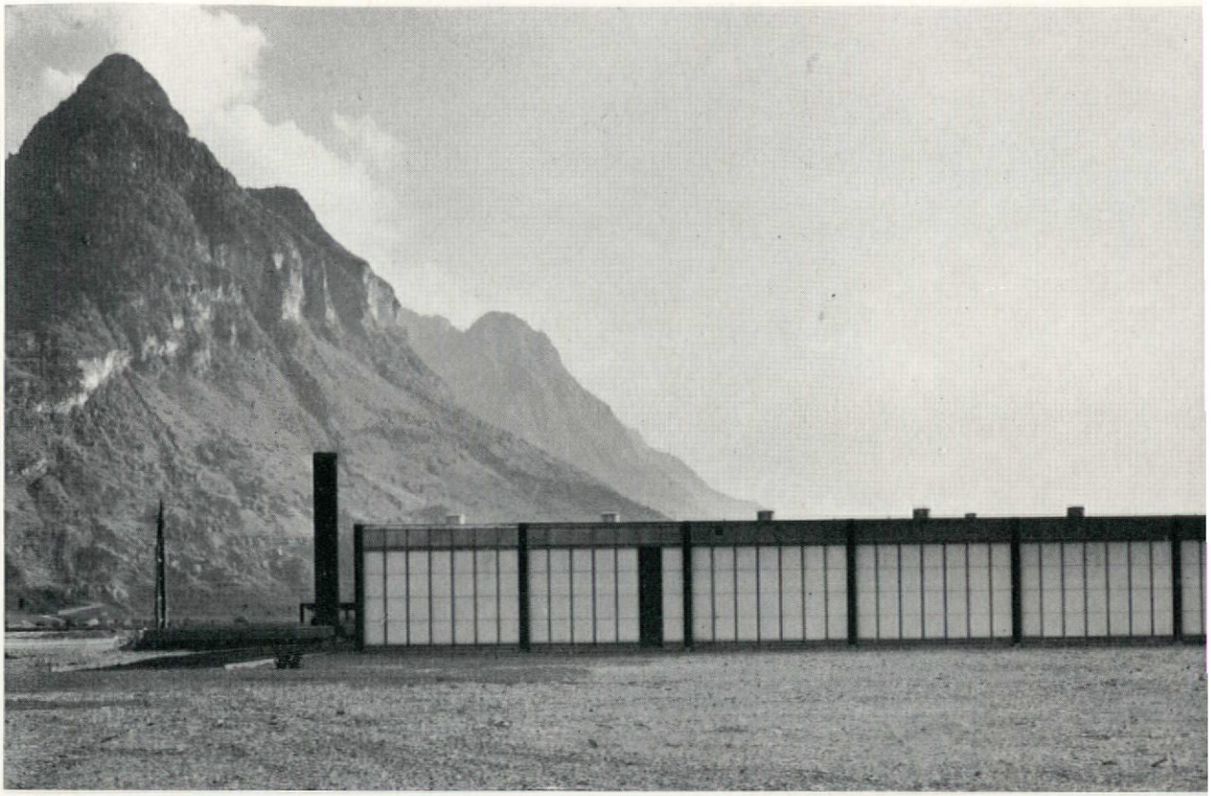




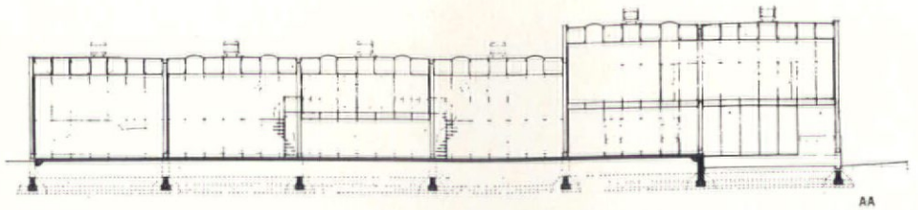


Factory at Longarone, Belluno, Italy

Architect: Bruno Morassutti
Associate: A. Powers



An interesting structure having many similarities with the system developed for the Mining and Metallurgy Building at Birmingham University. (See p. 523 and AD4/67.)
It does not appear that the potentialities of the system have been developed to control or house the mechanical and electrical services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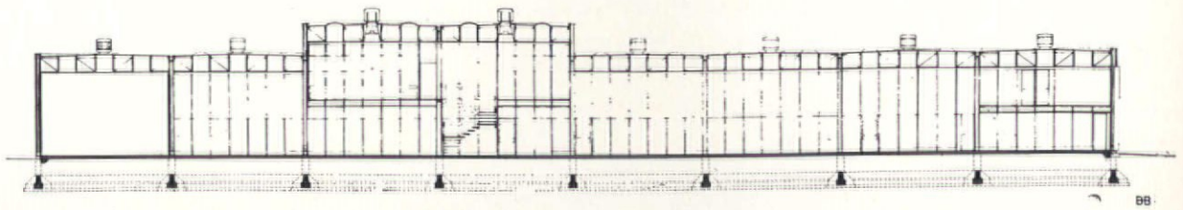
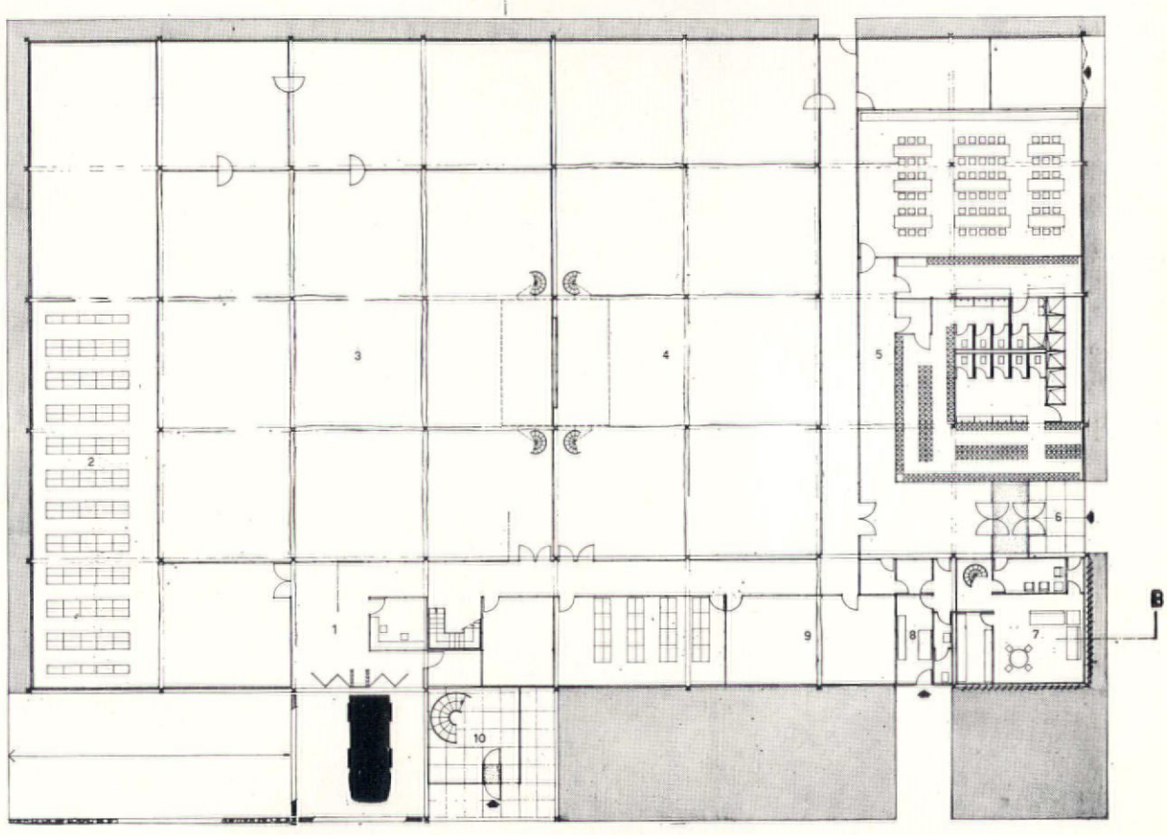

BB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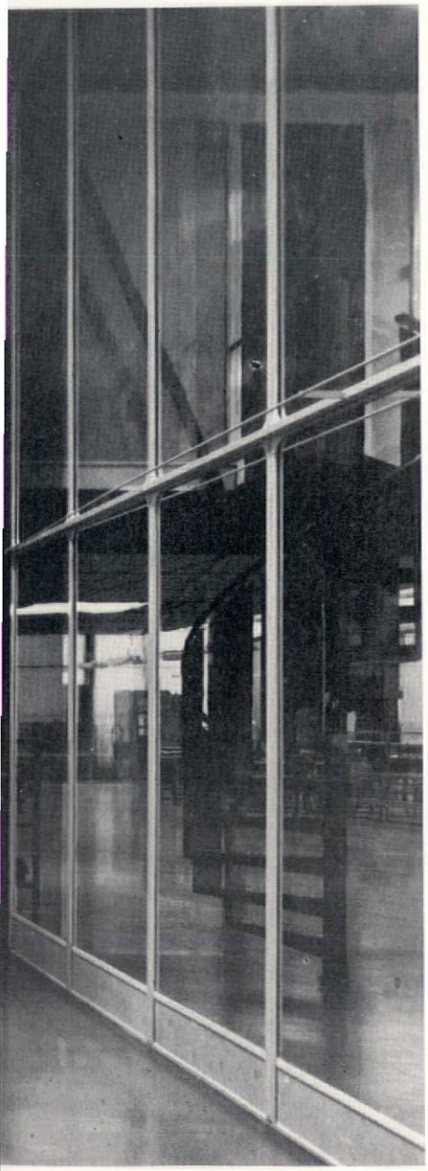
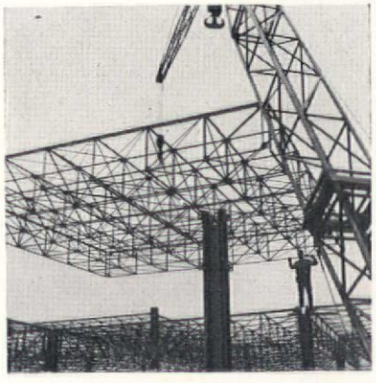
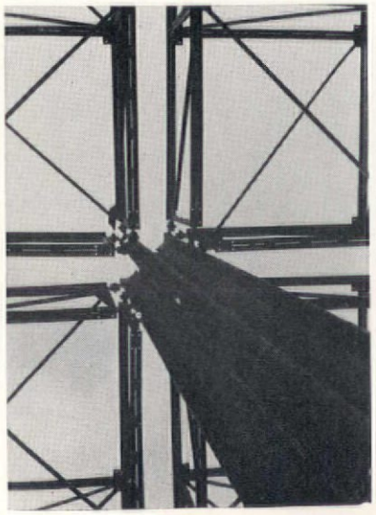
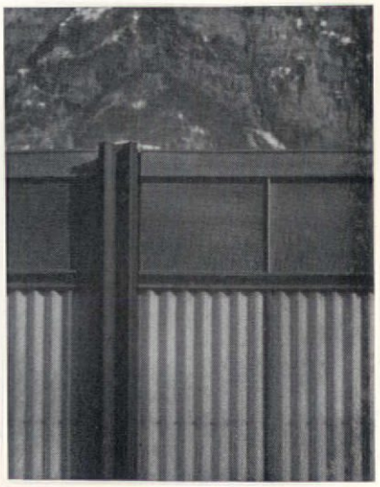
B



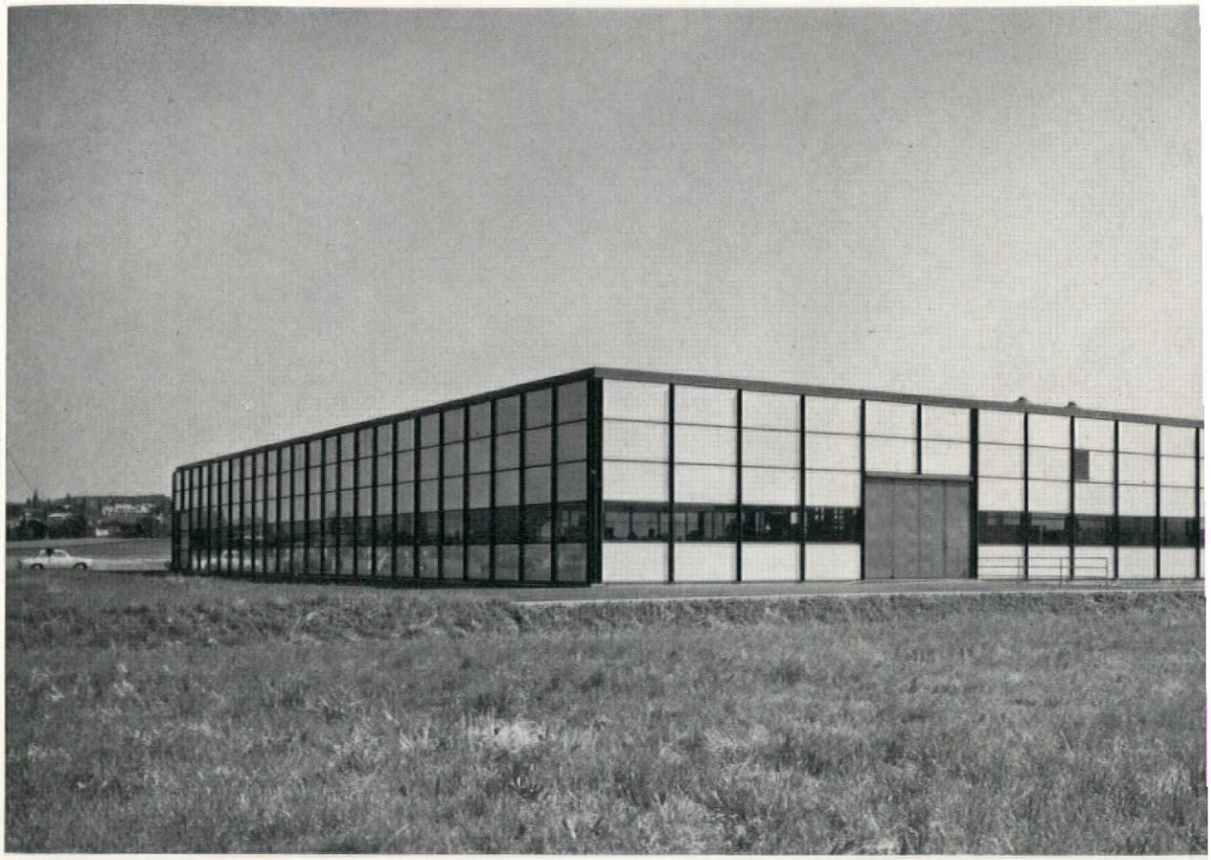






U. Schärer Söhne Factory, Münsingen, Switzerland

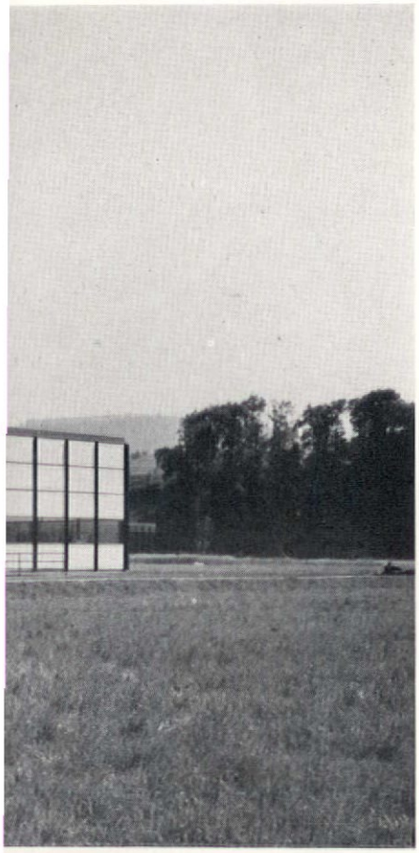
Architects: Bruno & Fritz Haller
Engineers: E.M.C.H. and Berger

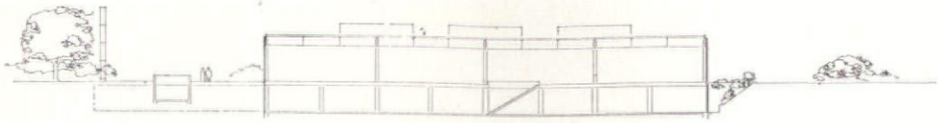


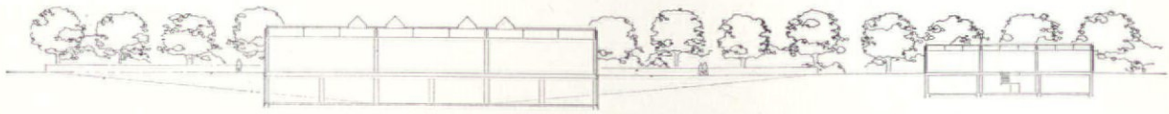
When an undercroft or basement area is required for certain ancillary activities in a factory development, then a service distribution system on the soffitt of the factory floor can produce a very adaptable factory space. This has certainly been achieved in this excellent factory which carries only the fixed lighting in the roof. All the other factory services are distributed on the floor soffite and serve machines through a system of holes cast in the factory floor at centres which allow very adaptable plant layouts.

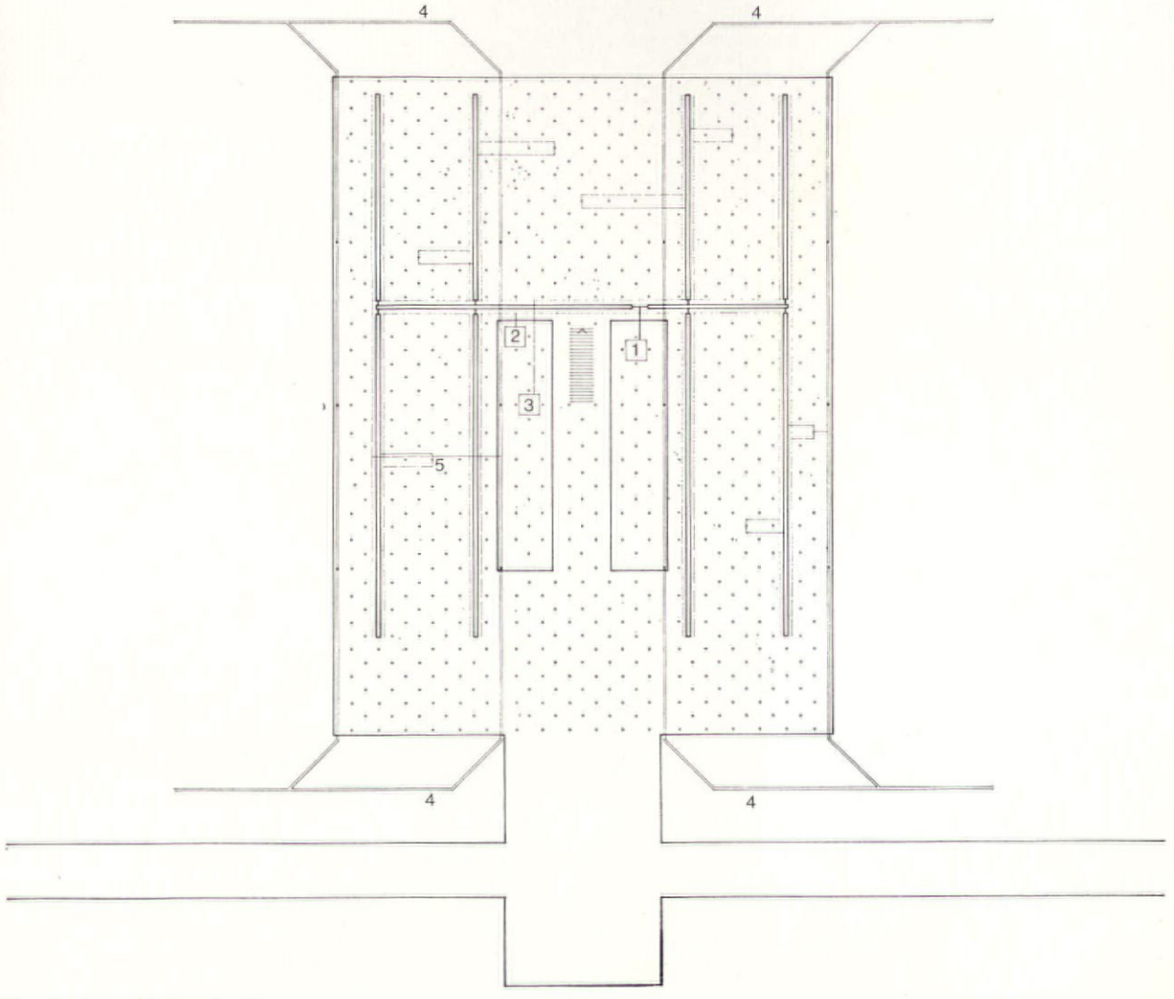
The offices for this factory were illustrated in *AD* 5/67 p. 229

Photos: C. Moser and B. Moosbrugger

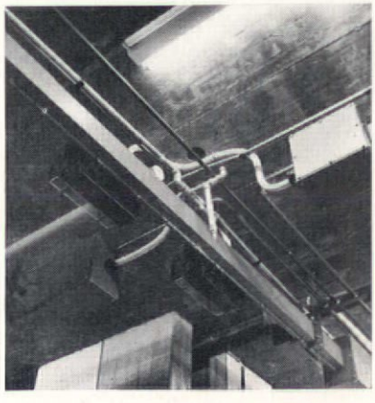


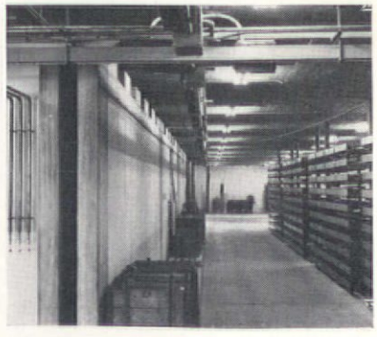






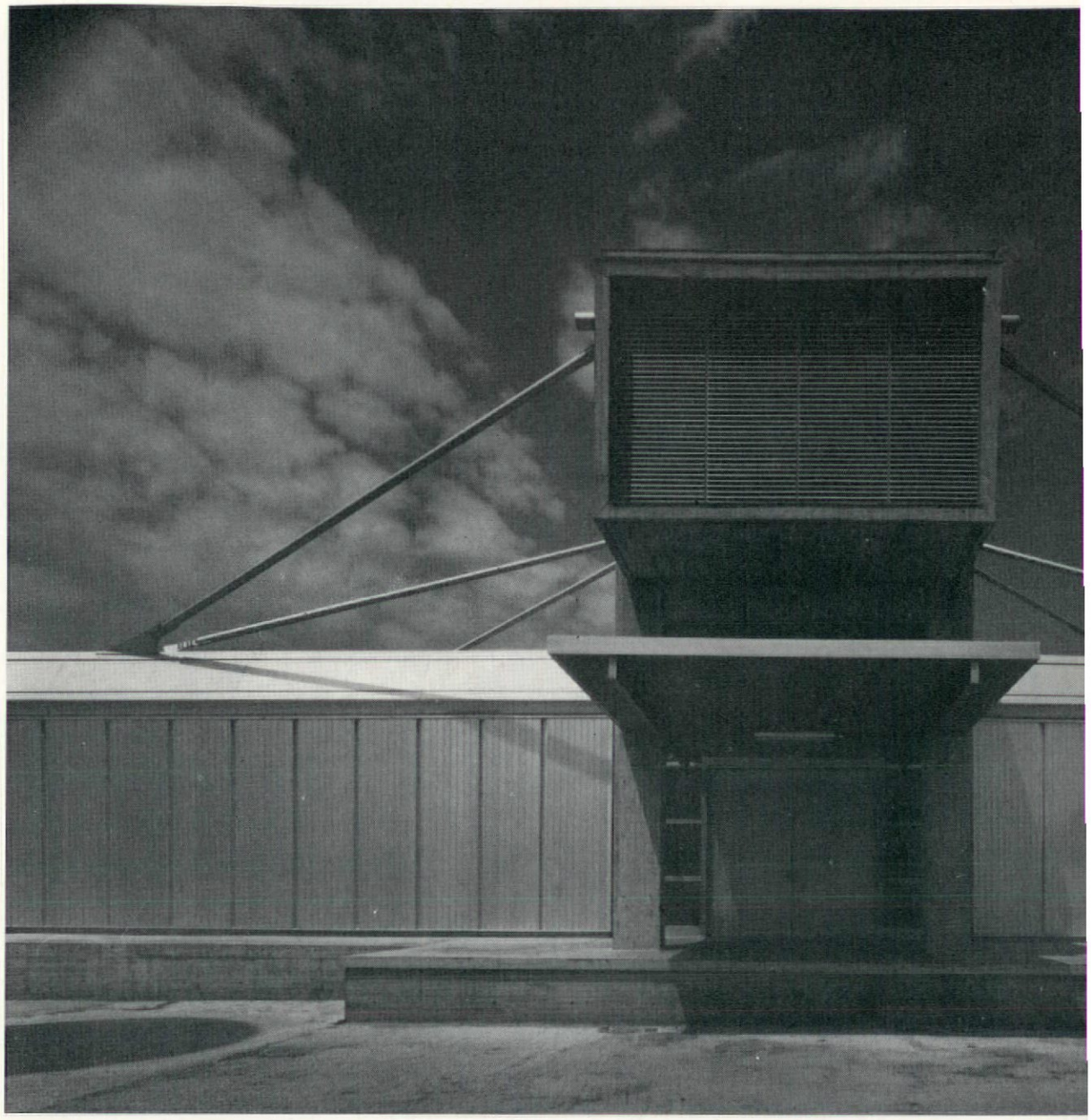
Plan showing positioning of services:
1 electrical conduits
2 compressed air pipes
3 water pipes
4 waste runs
5 roof connections for positioning of machinery



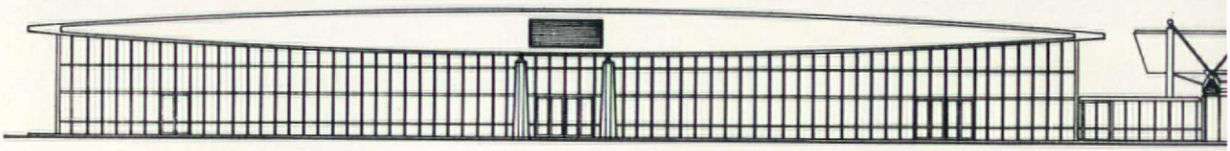


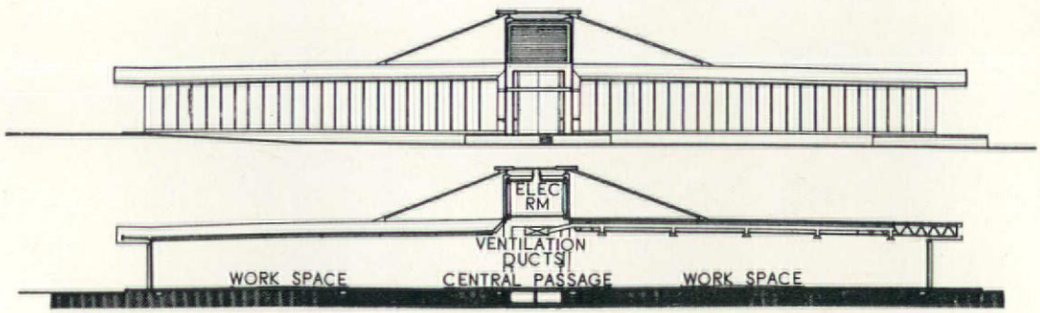
Tosho Printing Works, Haramachi, Shizuoka, Japan

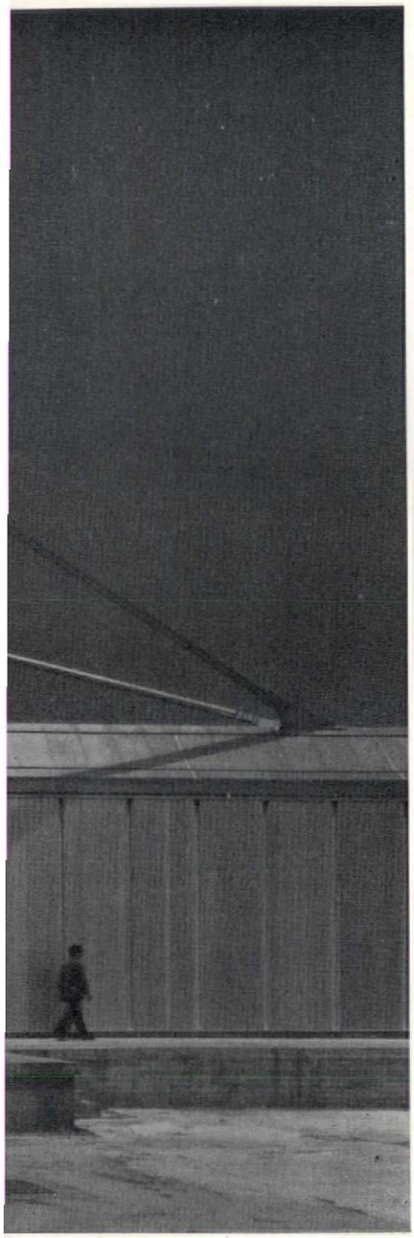
Architect: Kenzo Tange
Associates: URTEC
Engineers: Yokoyama Structural Design Laboratory

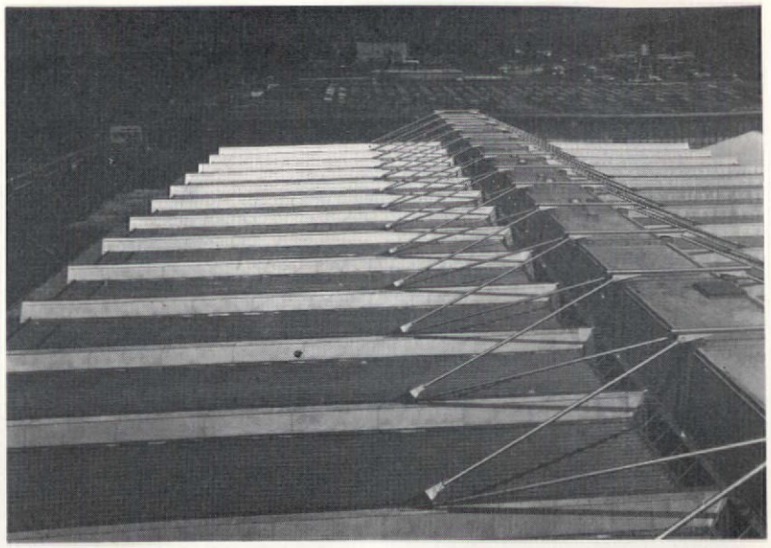


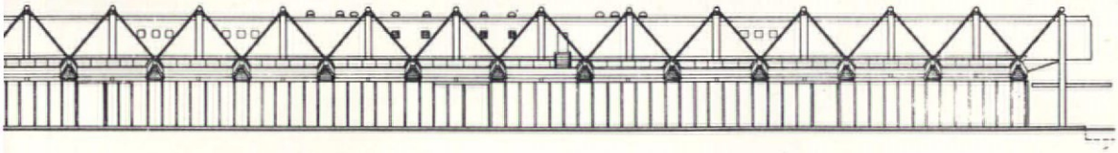
This fine factory is a typical spine duct solution with a structural system based on the air handling and distribution. The spine duct at high level obviously houses the air handling plants, and the steel space frame roof beams suspended from this concrete duct enclose the primary air distribution ducts. There is no apparent system for dealing with the factory services in a similar organized way.
Photo: Osamu Murai

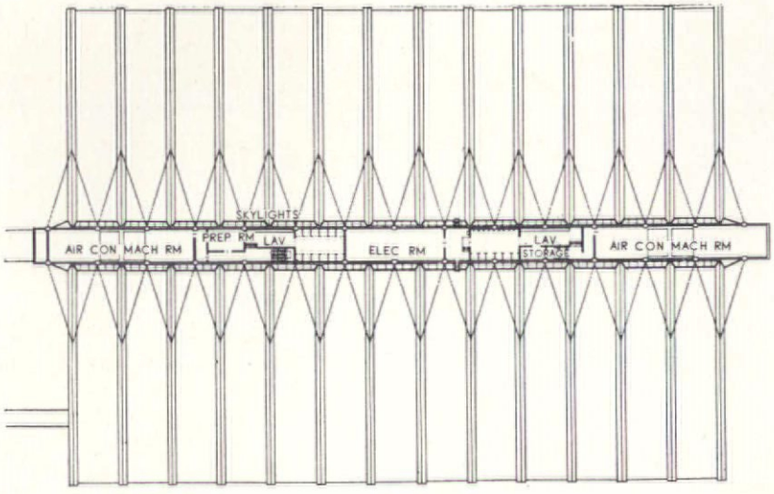


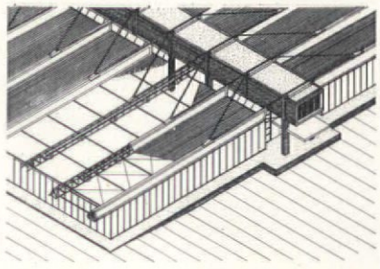









SKYLIGHTS
AIR CON MACH RM
PREP RM
LAV
ELEC RM
LAV
STORAGE
AIR CON MACH RM

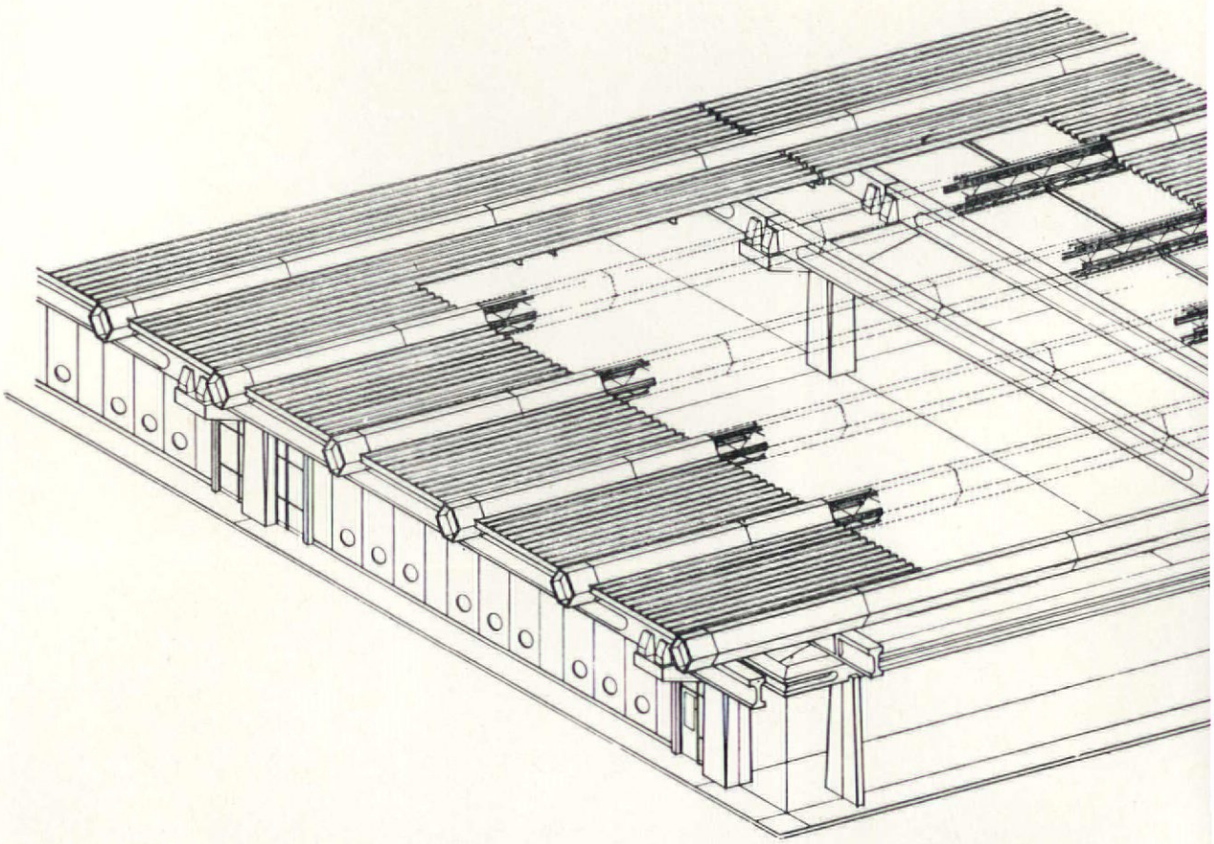


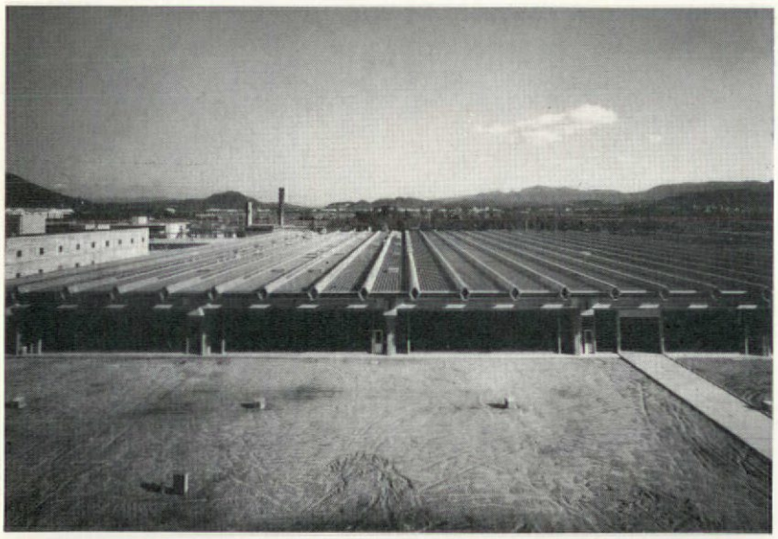
Nihon Vilene Co., No. 2, Shiga, Japan

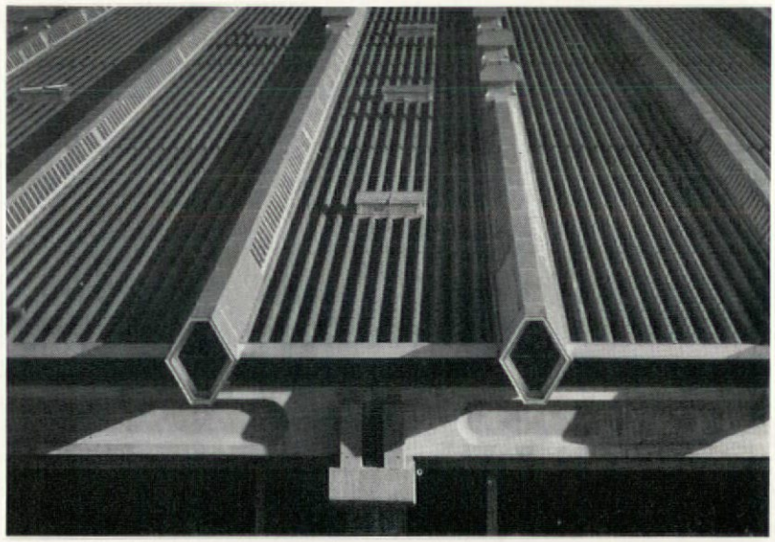
Architect: I. Ebihara and Associates

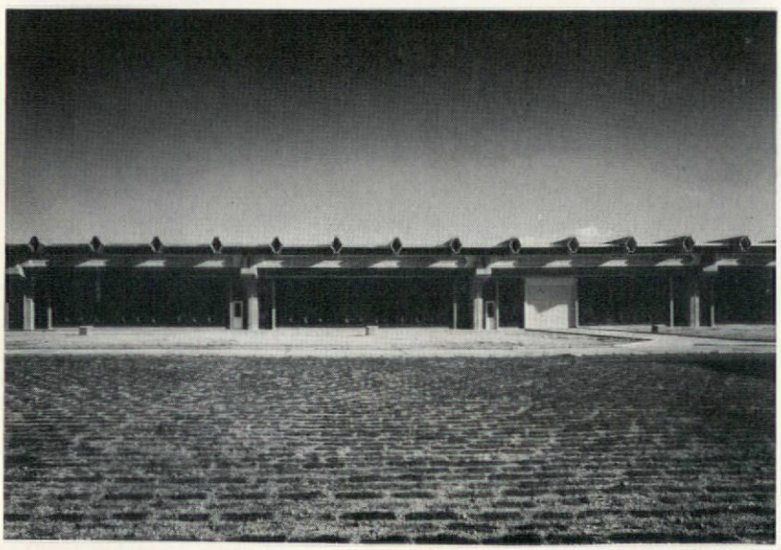
The main structural elements form a strong discipline for the factory and environmental services. The secondary roof beams of steel space frame construction define and support the roof lighting which will provide very even daylight factors over the whole of the production space

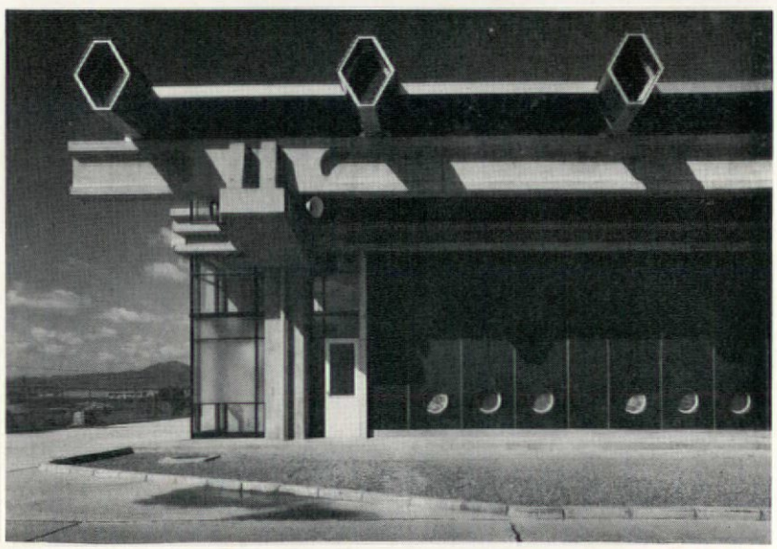
Photos: Tomio Ohashi

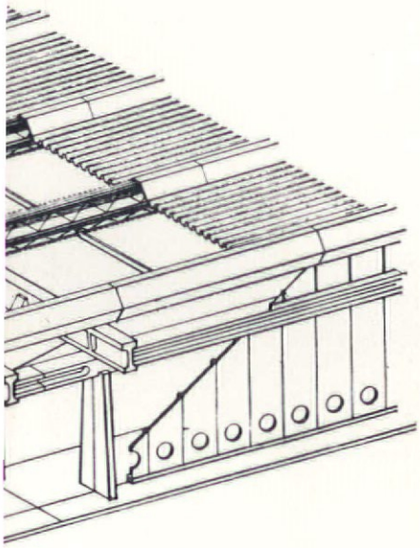


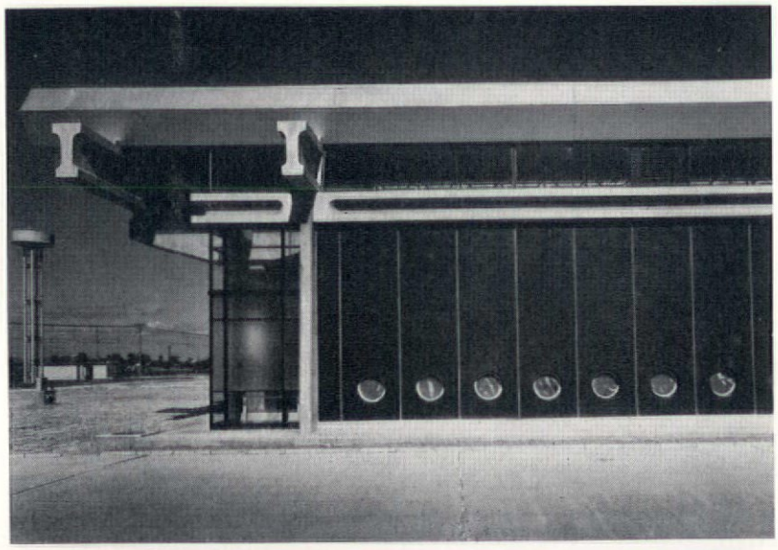


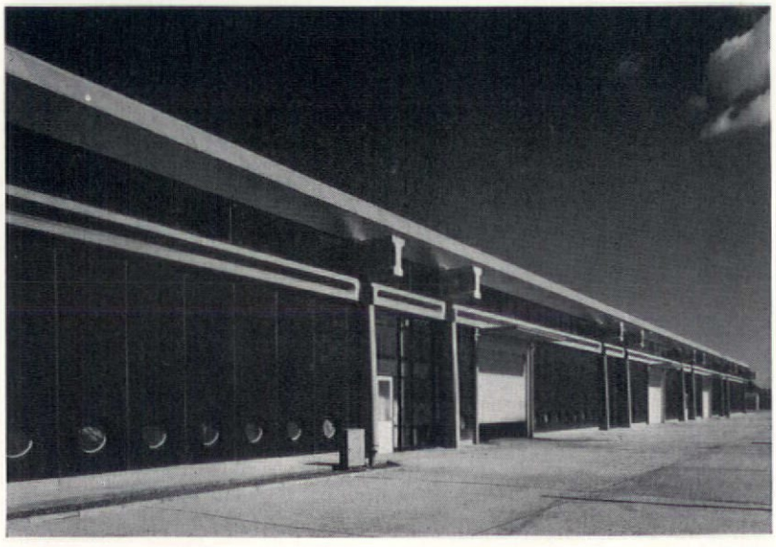






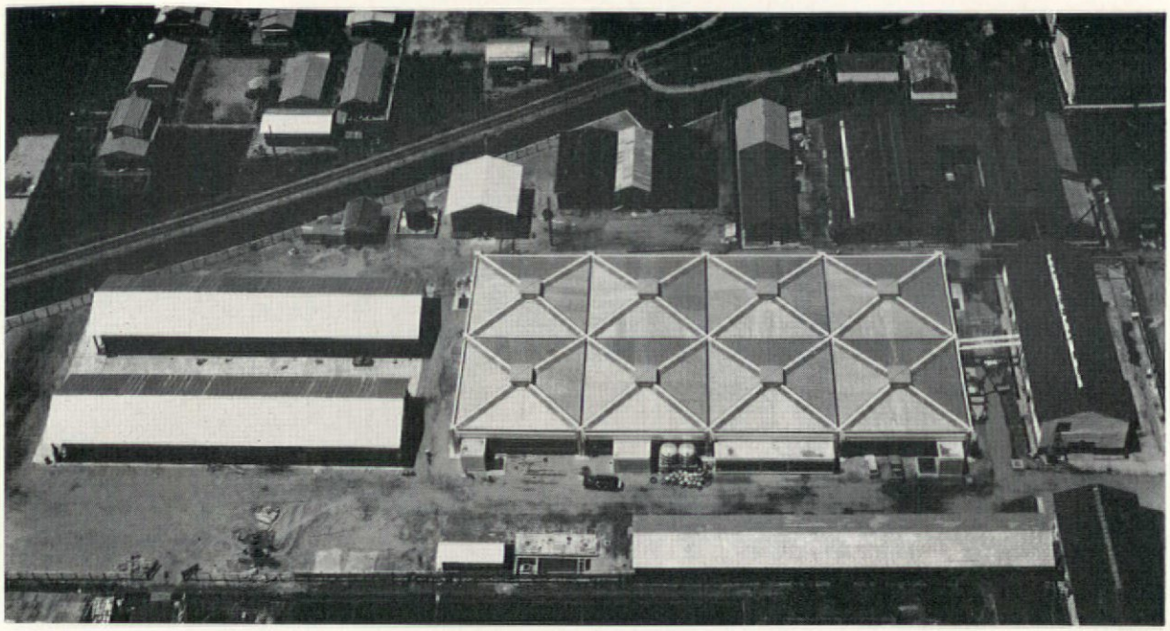






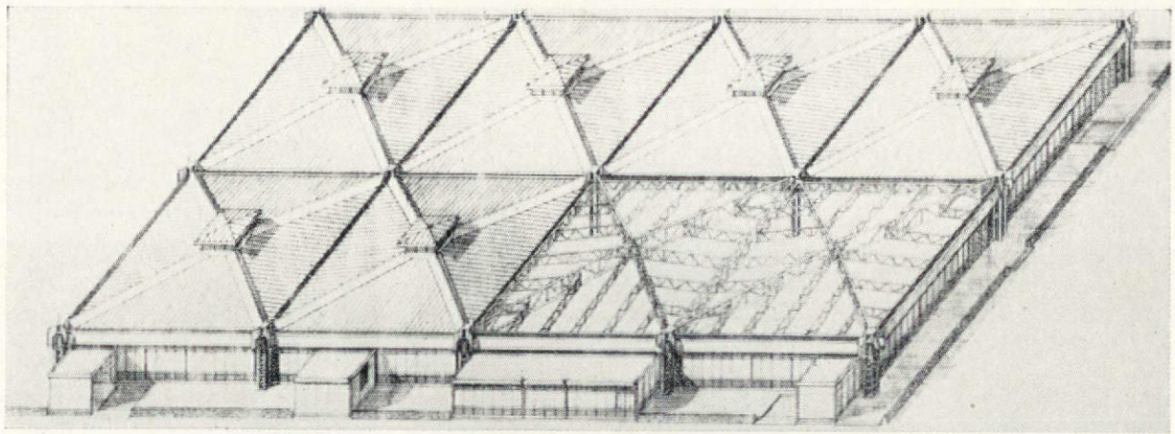
Nitto Foods Co., Sagae, Japan

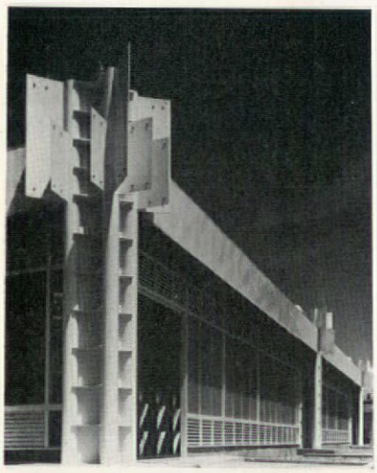
Architect: Noriaki Kurokawa

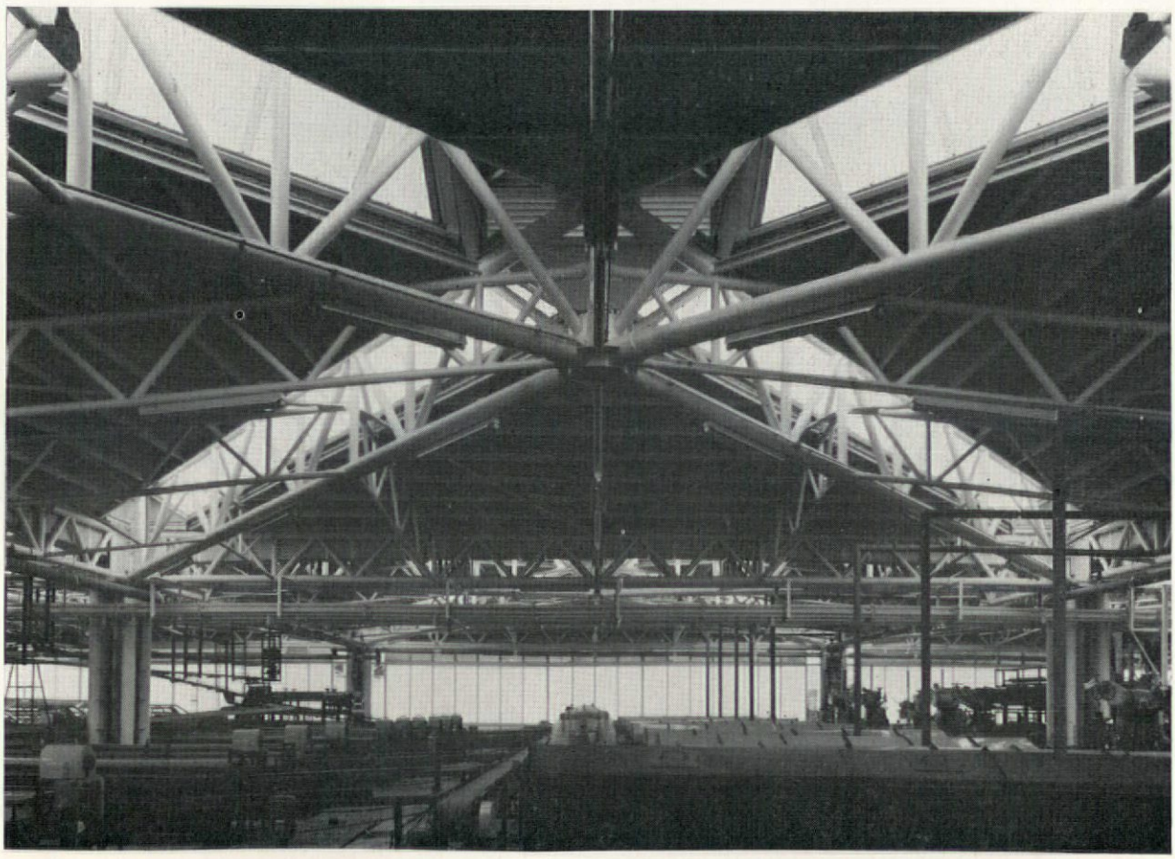


This 17 metre square structural system is based on the needs of the machinery layout for a food canning plant. Roof lighting from the diagonals will provide very even illumination and there are strong service disciplines on the column grid. These disciplines will provide an adaptable space capable of accepting growth and change in the machinery layout

Photos: Osamu Murai

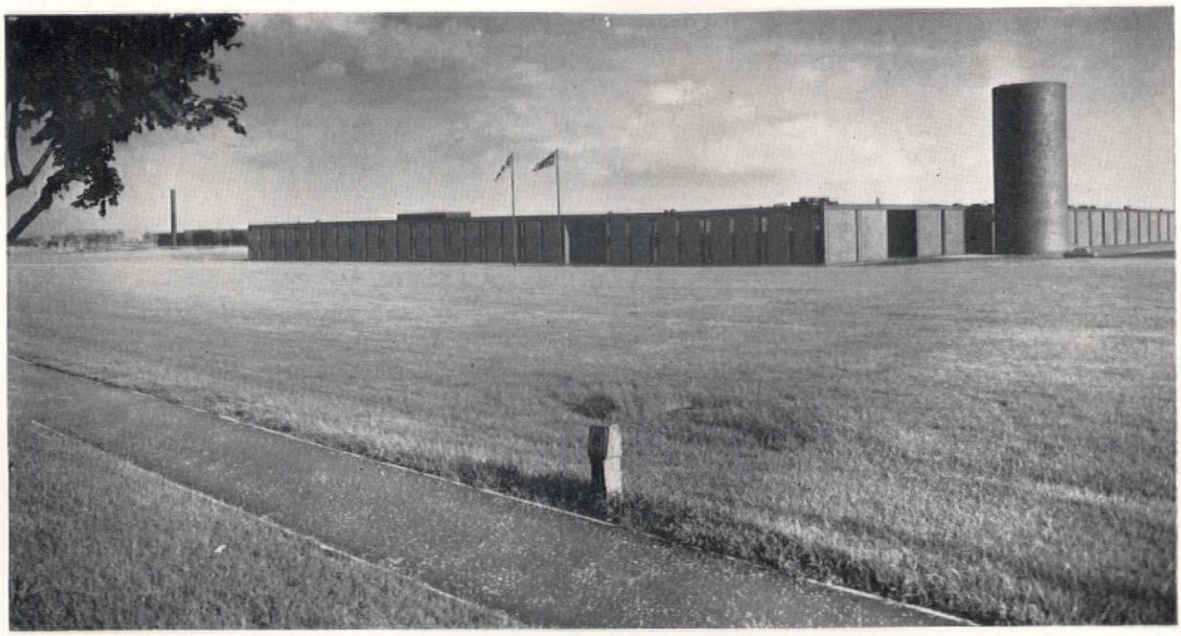




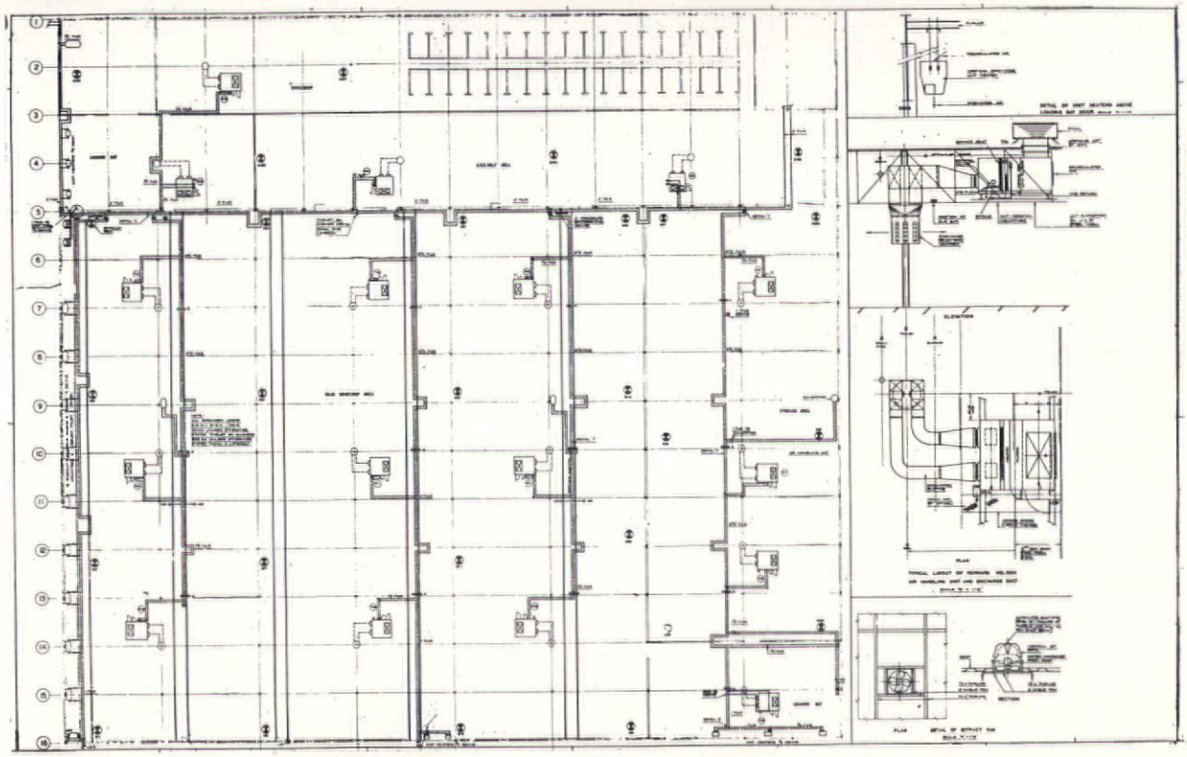


Chrysler Cummins Factory, Darlington

Architects James Cubitt and Partners



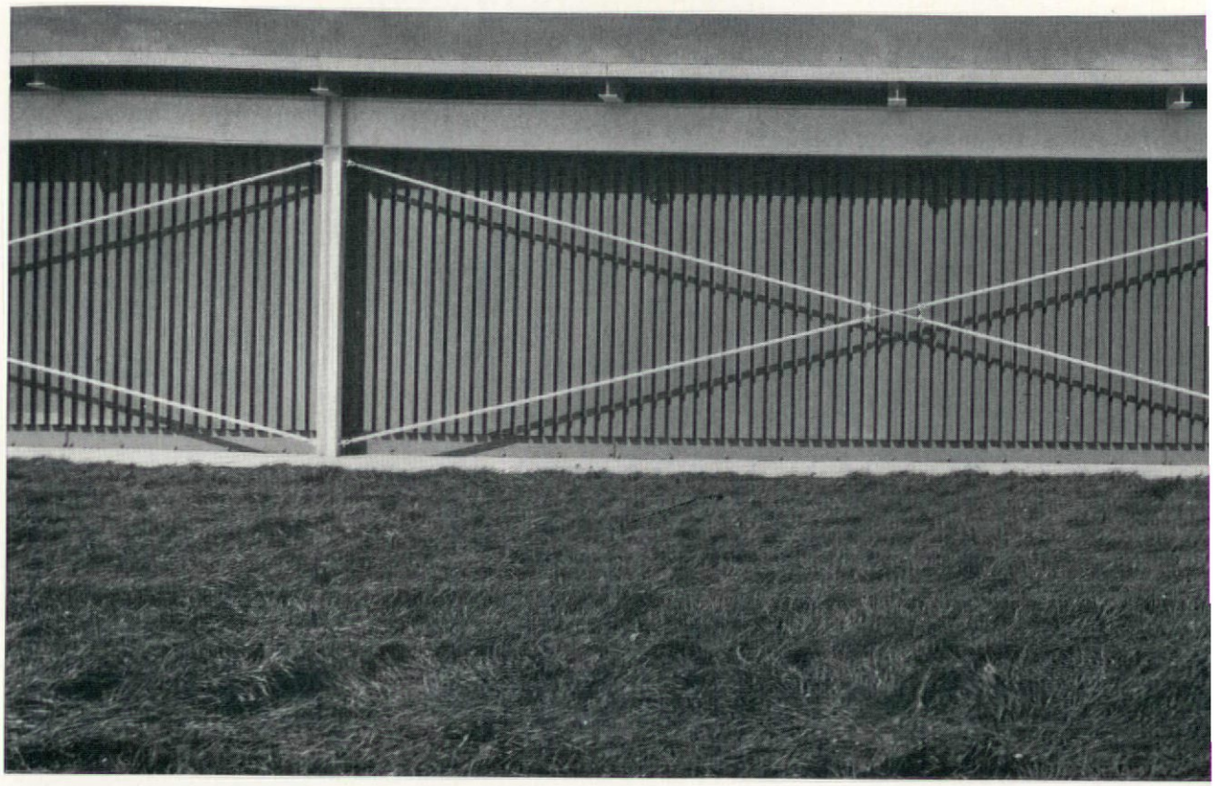
In this factory, the distribution of the services is a consequence of the structural disciplines rather than a generator.
Photos: J. Boulton & A'Court Photographs Ltd.



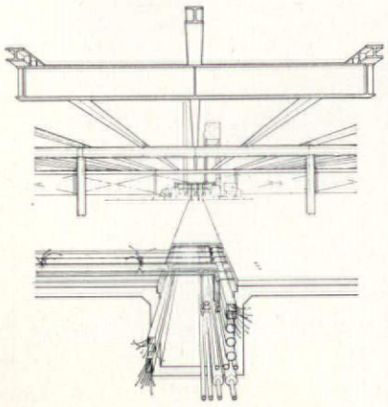
Plan and details of air distribution system by G. N. Haden & Sons

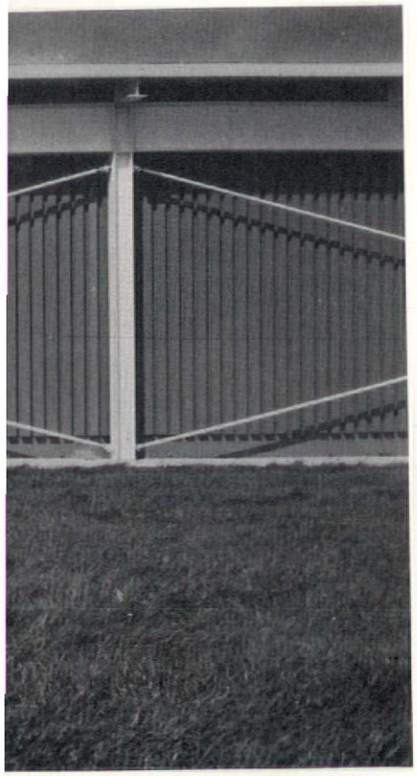
Reliance Controls, Swindon, England

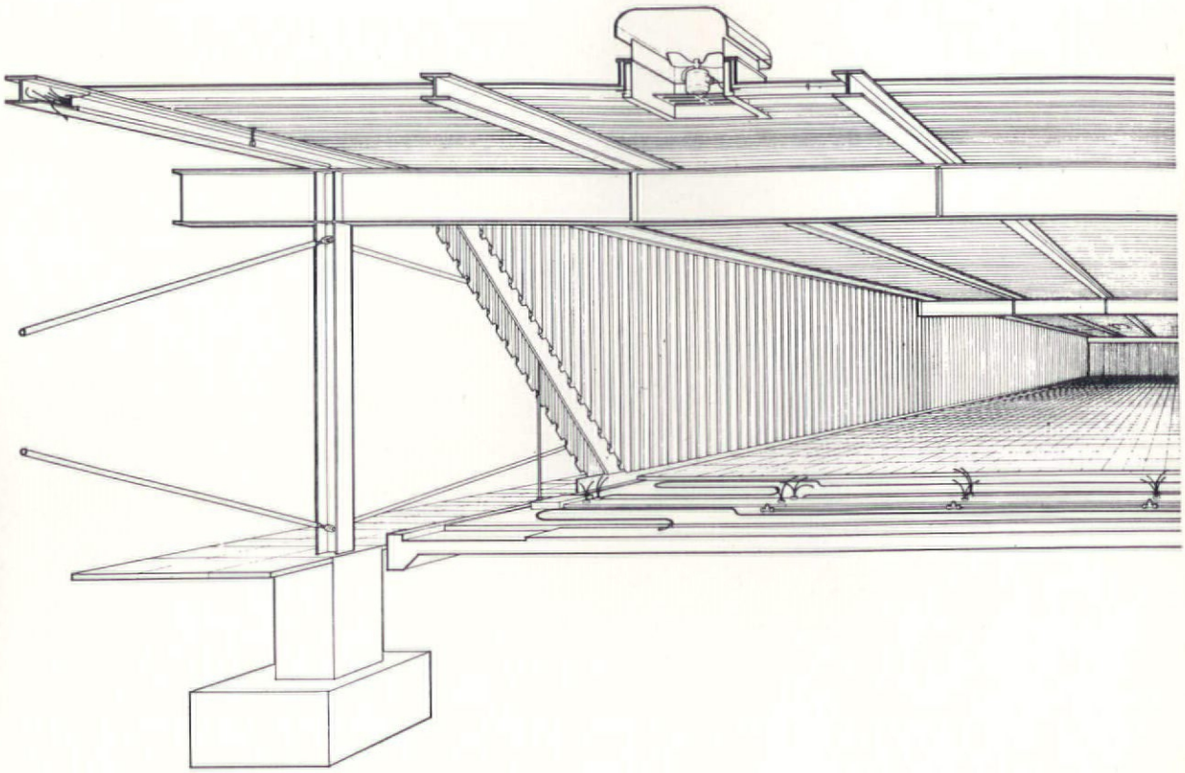
Architects: N. Foster, W. Foster, R. Rogers
Engineer: Anthony Hunt & Partners

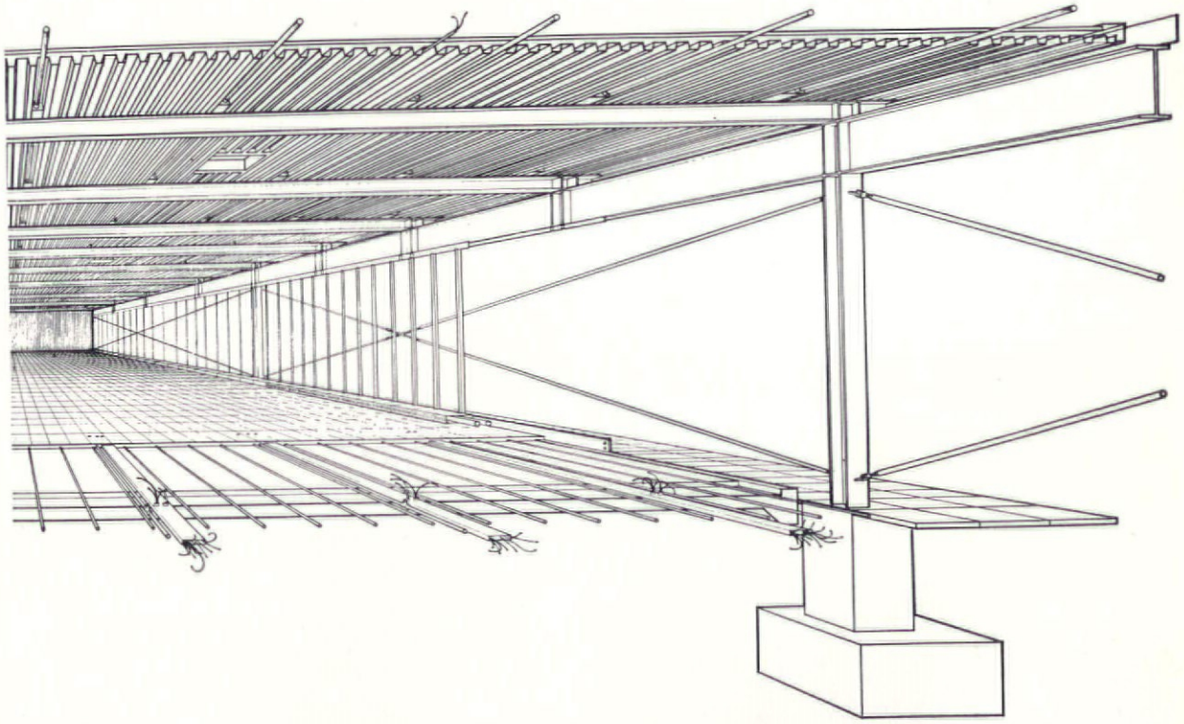


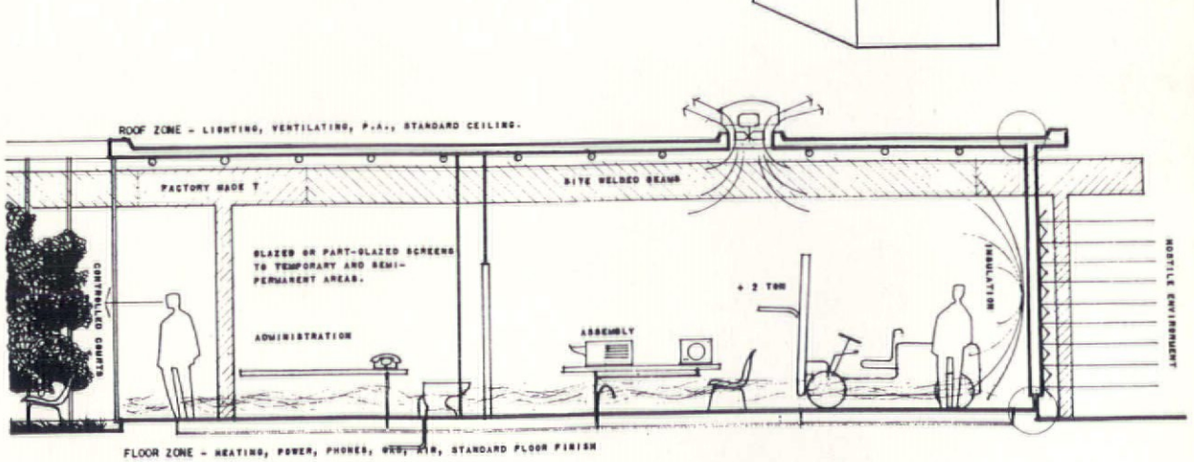
A superbly detailed box—an excellent package for the electronics industry. The use of the floor for factory services will place real limits on the adaptability of the factory space to plant and work bench layout. Perhaps the problem is more marginal in this cottage-industry type of operation but even the landscaped office presents real problems in adaptability of floor servicing. Are windowless boxes really acceptable without air-conditioning?





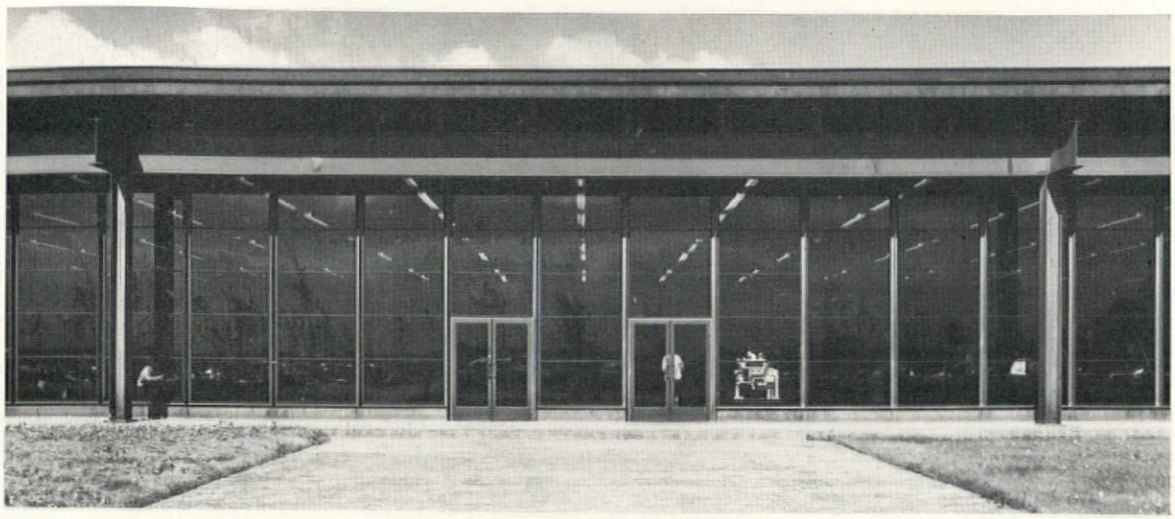





ROOF ZONE - LIGHTING, VENTILATING, P.A., STANDARD CEILING.
FACTORY MADE T
SITE WELDED BEAMS
GLAZED OR PART-GLAZED SCREENS TO TEMPORARY AND SEMI-PERMANENT AREAS.
CONTROLLED COURTS
ADMINISTRATION
ASSEMBLY
+ 2 TON
INSULATION
HOSTILE ENVIRONMENT
FLOOR ZONE - HEATING, POWER, PHONES, [illegible], STANDARD FLOOR FINISH

Cummins Engine Co. Ltd., Darlington, England

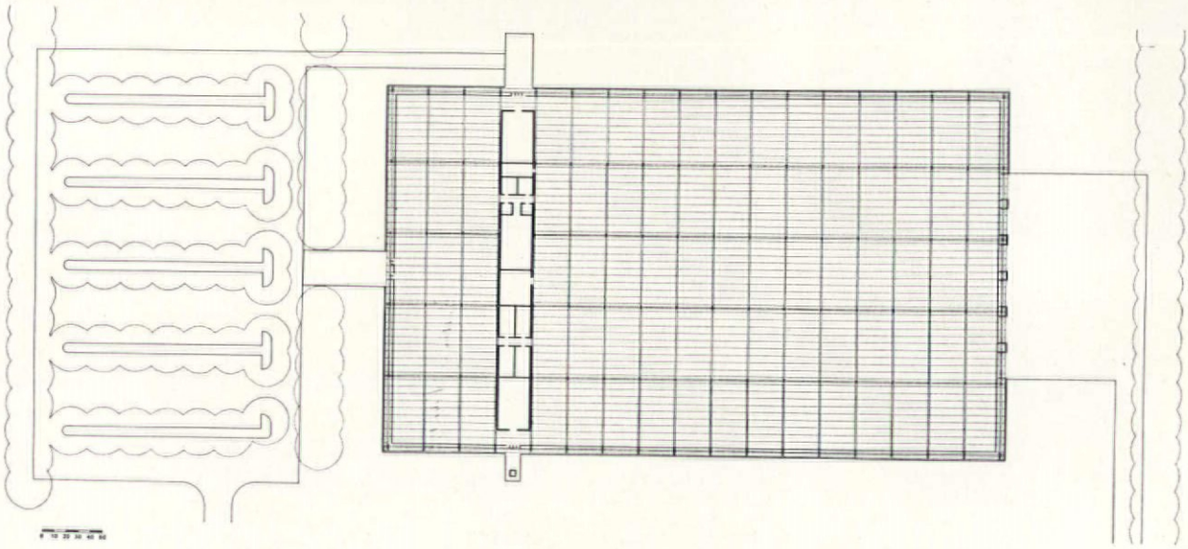
Architects: Kevin Roche, John Dinkeloo Associates

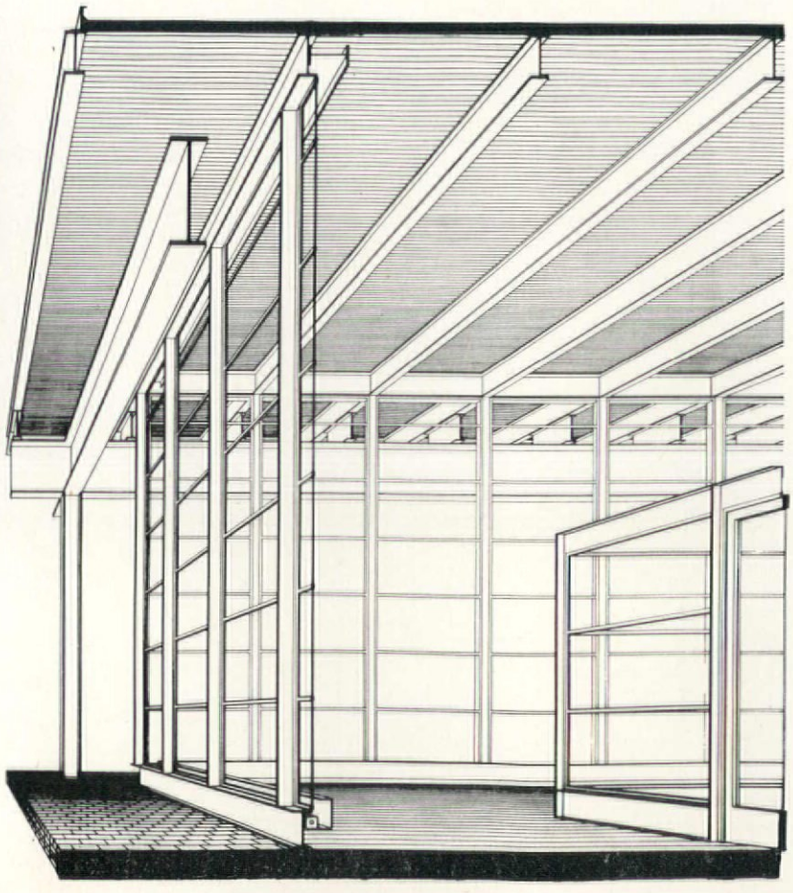


Associate designer David Powrie
Structural engineer H. Pfistever
Mechanical and electrical engineer Coscutini Associates
The architect's own description indicates a well considered system of structure and services:
The heating and air conditioning is taken care of by a unit mounted at the roof. Each unit handles six (30ft × 60ft) bays. This allows the expansion to take place at any pace necessary to keep up with increased production without a major change in the HVAC System.

The structural system is unusual in the fact that each purlin is mounted on an 18in steel WF plinth which rests on the main steel girder. This arrangement of the structural elements gives a 36in clear utility space between the top of girder and underside of roof deck between purlins for all main utility runs including steam, compressed air, electric power, etc., and 18in under purlins for branch utilities. This allowed complete manufacturing flexibility because cranes can be installed full height under girders without interference from utilities. The entire roof structure was designed for a 2-ton point load at any part of the structure."

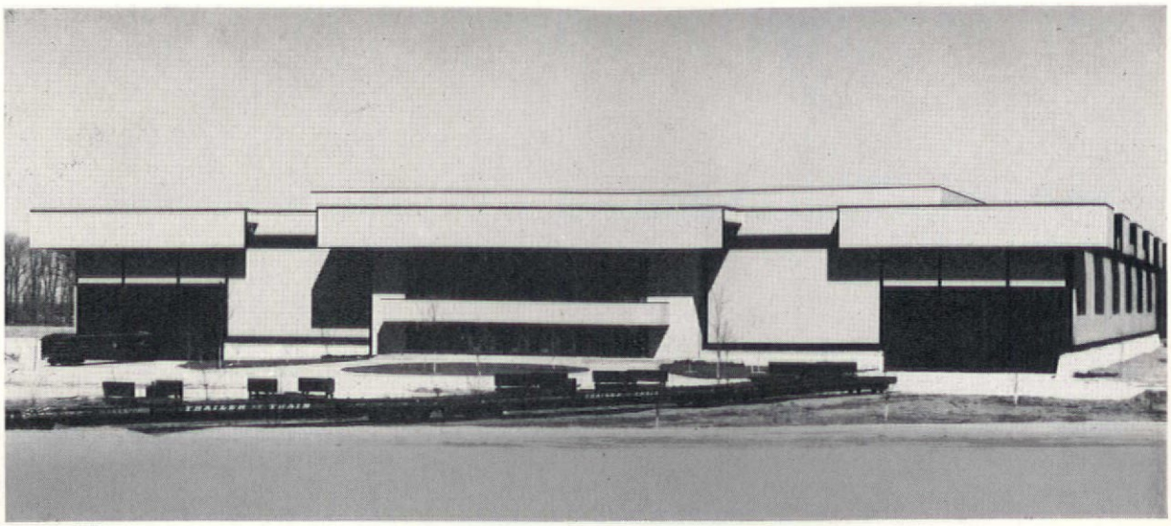
Photos: Balthazar Korab



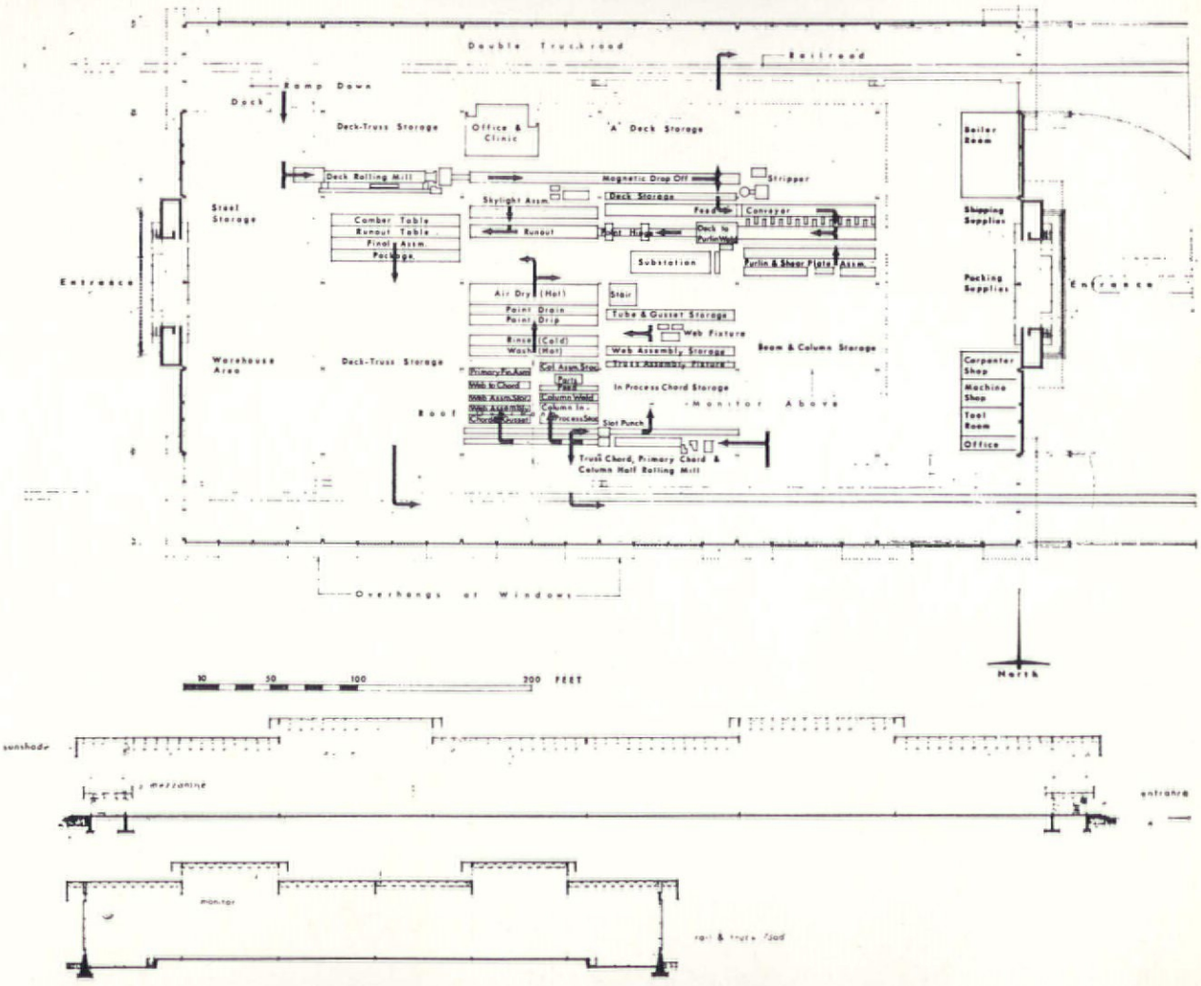


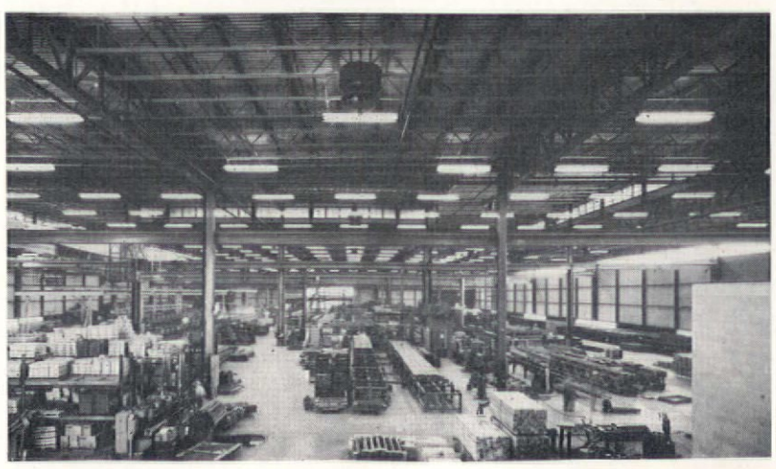
Milwaukee, USA, Inland Steel Products Co.

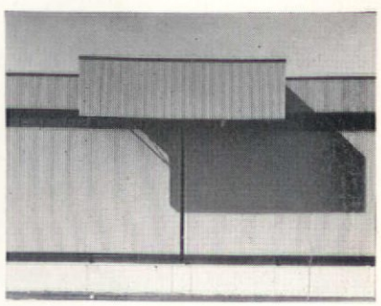
Architect: W. P. Wenzler and Associates
Engineers: The Engineers' Collaborative



The main handling system is like an early twentieth-century UK shed with sidings crossing the factory space. There is a careful combination of artificial and natural light from the roof. Factory services are distributed in the roof above crane rail level
Photos: R. A. Dorn, Cilento Studios Inc.



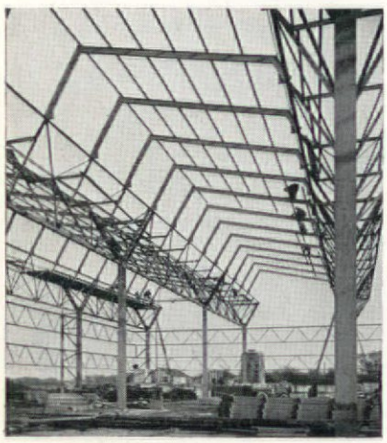


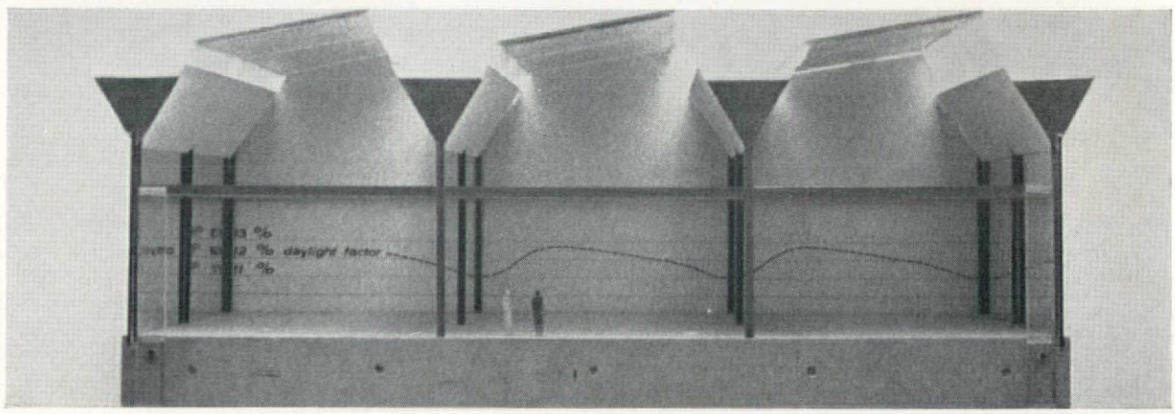


York Shipley Ltd., Basildon

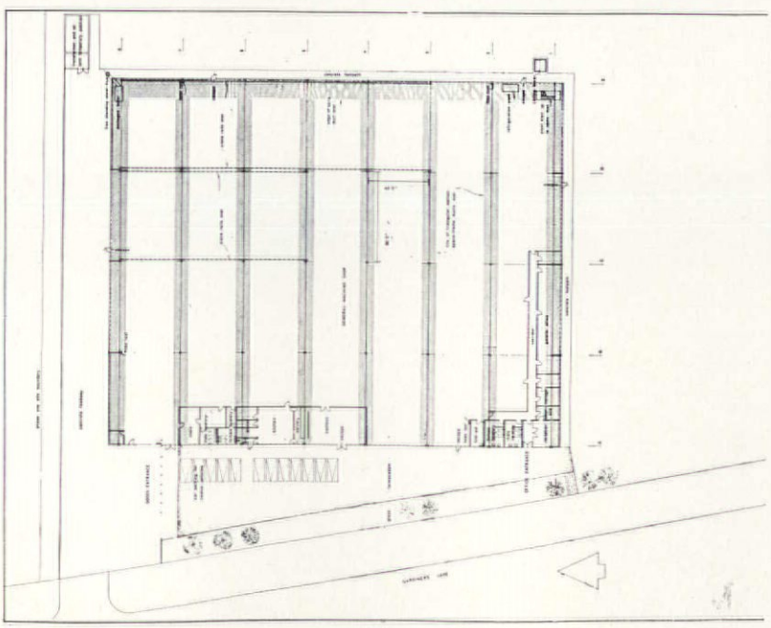
Architects and engineers:
Arup Associates

An air conditioned factory covering a wide range of products from the small bench work of hermetically sealed units used in commercial refrigeration to the large one off industrial refrigeration plant
Photographs: Colin Westwood

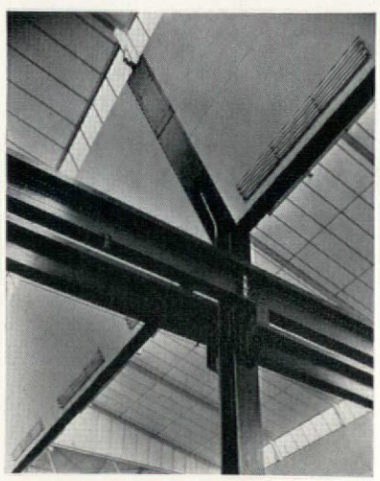




Model of roof shapes showing calculated daylight factors

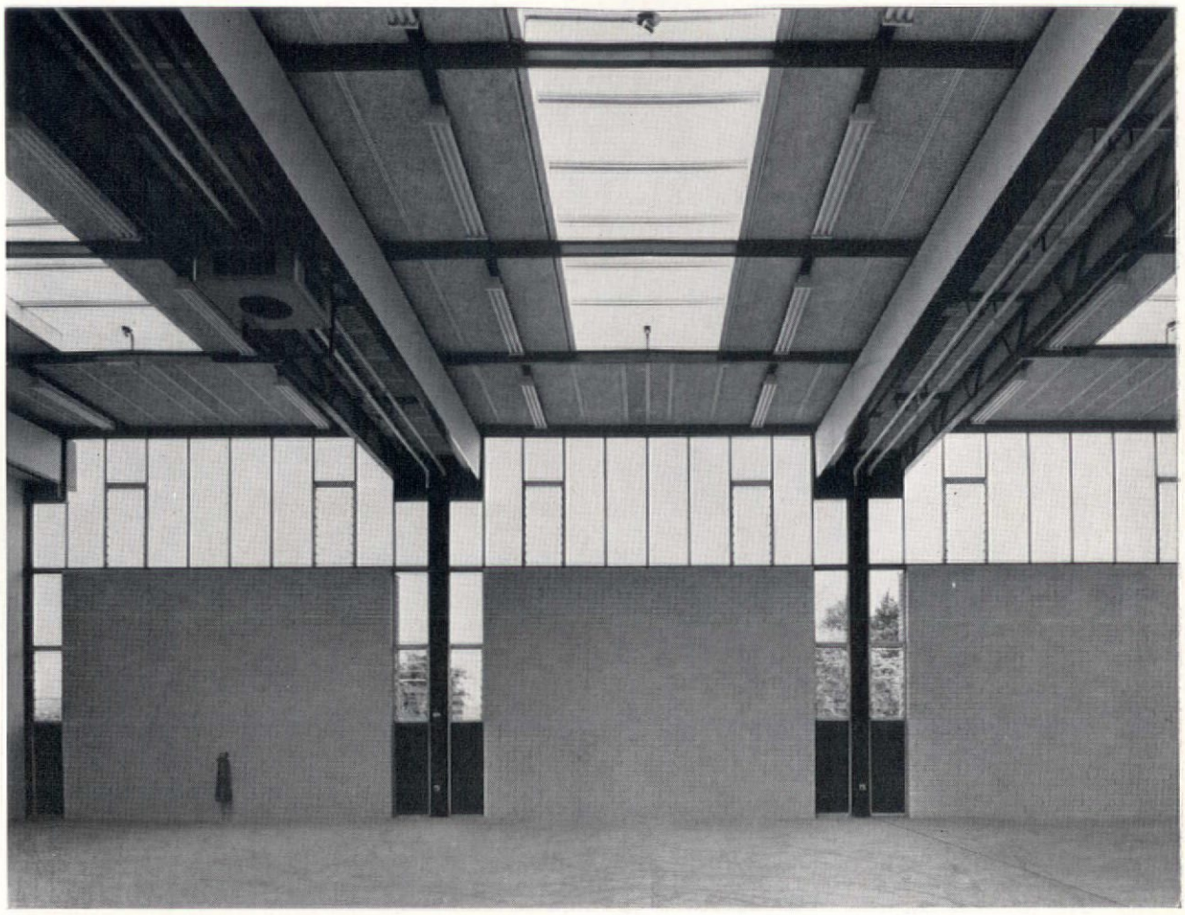


Plan showing service system



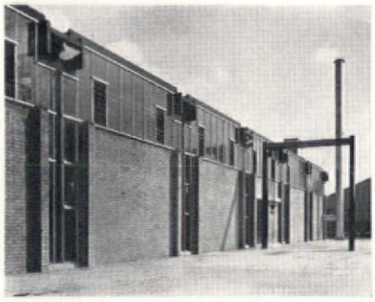
Walter Jones & Co., Kent

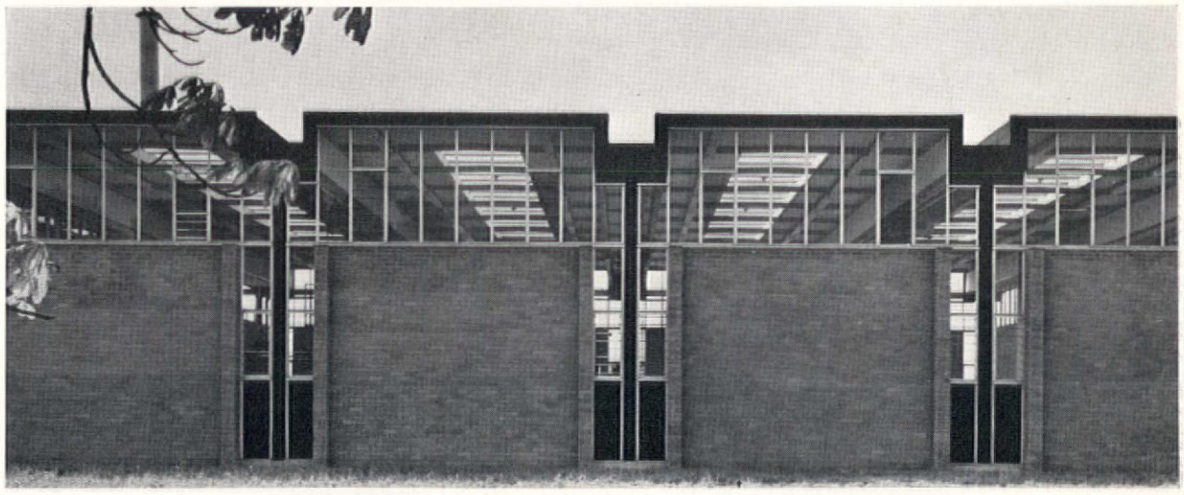
Architects and engineers:
Arup Associates

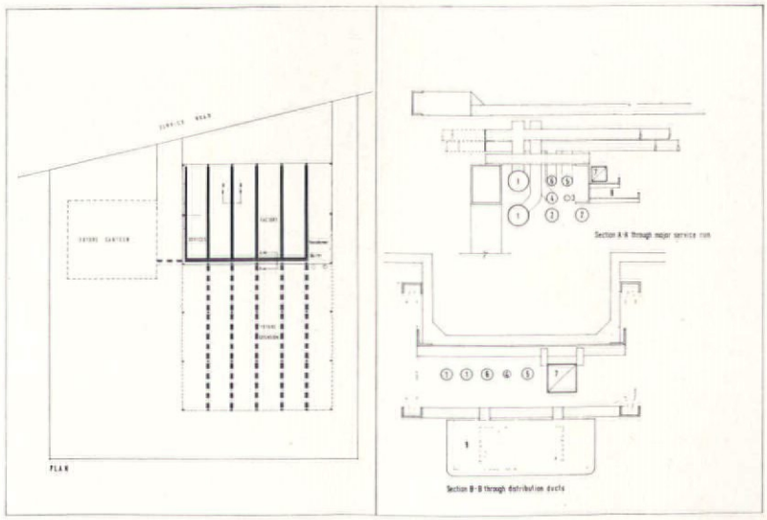


This factory is for the production of small electro-mechanical devices. The structure supports the roof and defines the ducts for the distribution of all services. The distribution ducts are fed from a main duct crossing the factory from the boiler house and sited in a plane below the distribution duct with connections for future extension

Photographs: Colin Westwood

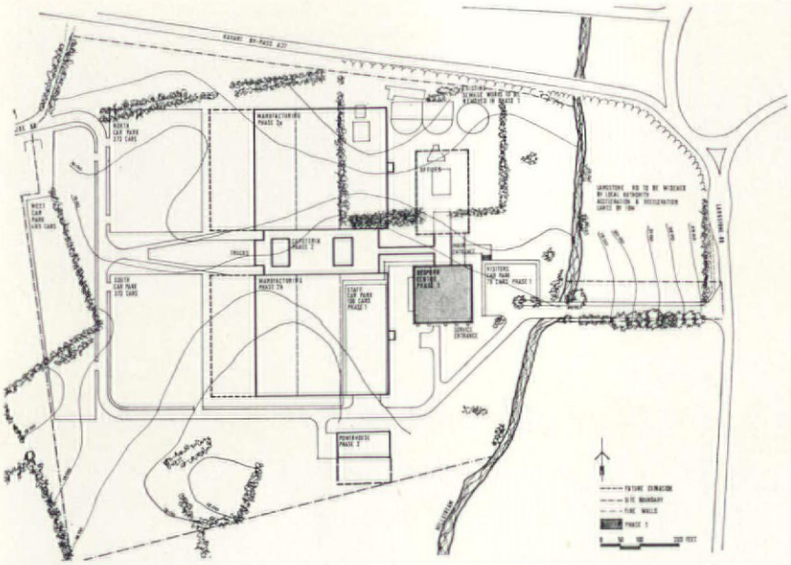


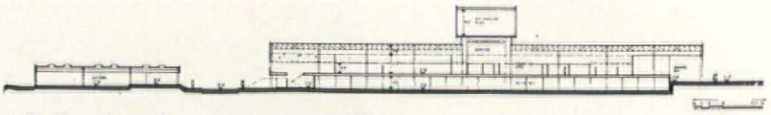




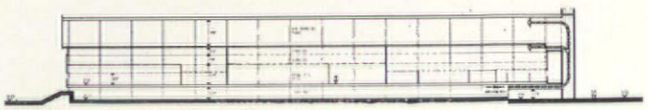
Plan and details showing service distribution system and layout of ducts

Key to services:
1 heating
2 future heating for canteen
3 rising main
4 cold water service
5 compressed air
6 gas
7 electrical trunking
8 cable tray
9 unit heater





1 Section through manufacturing building

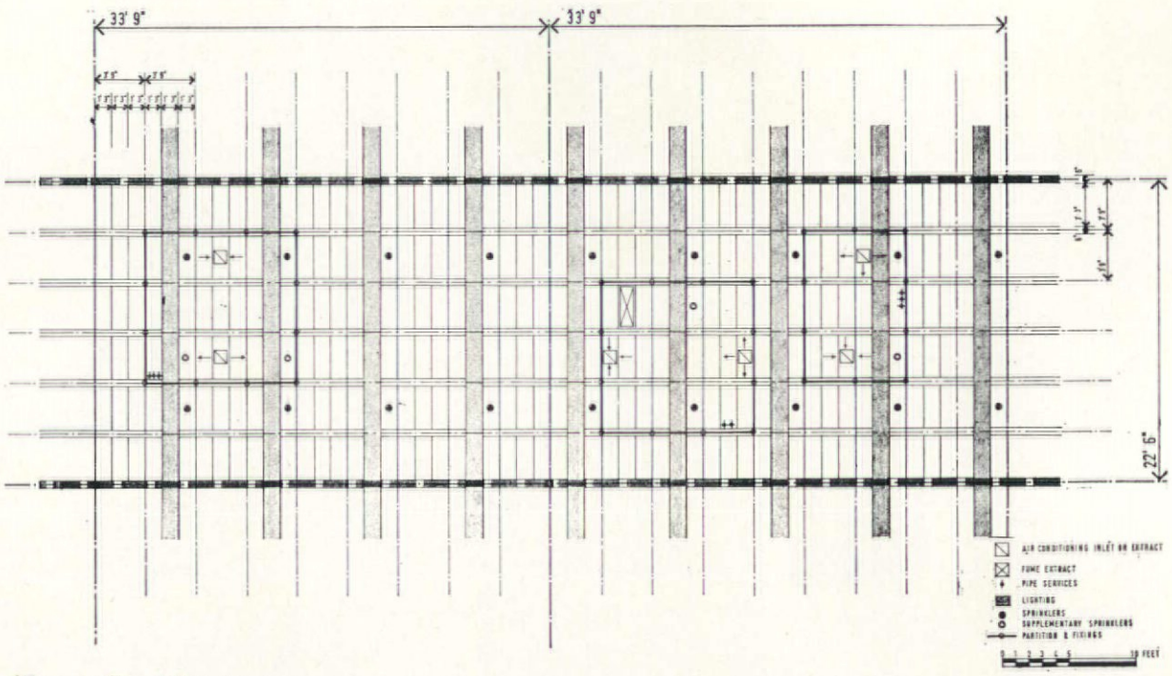


2 Cross-section taken through air handling plant

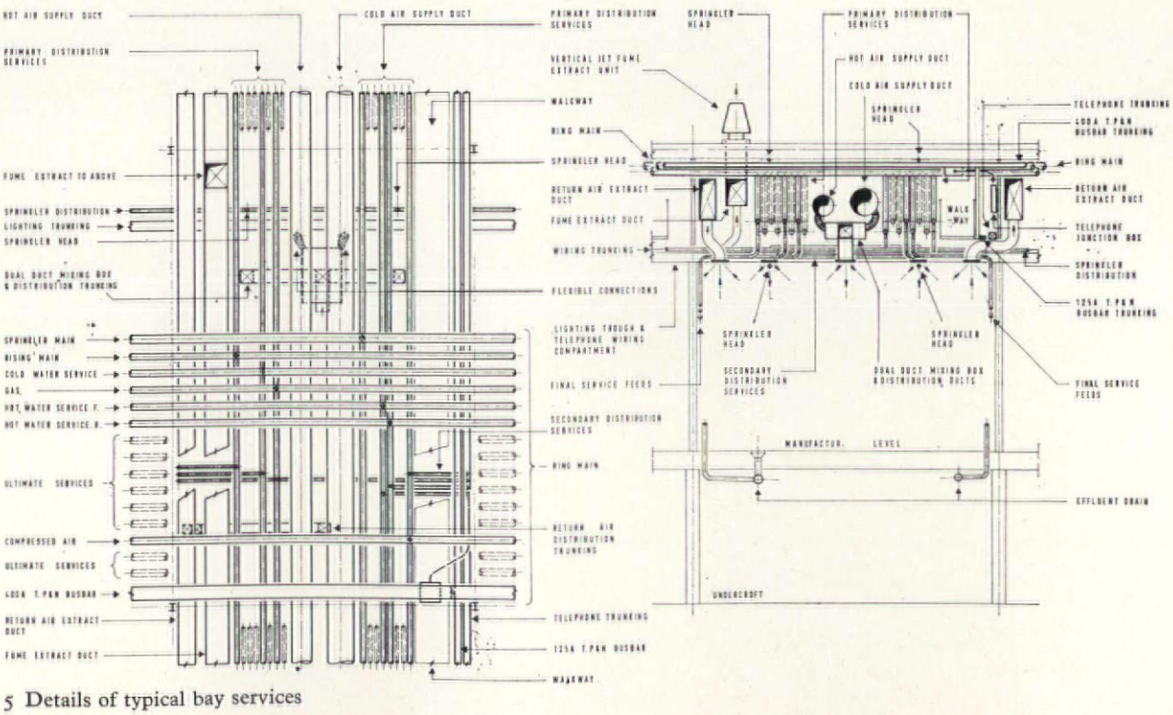
◁ 3 Site plan showing existing and proposed development

I.B.M. United Kingdom Ltd., Havant—Phase 1
Architects and enginers: Arup Associates

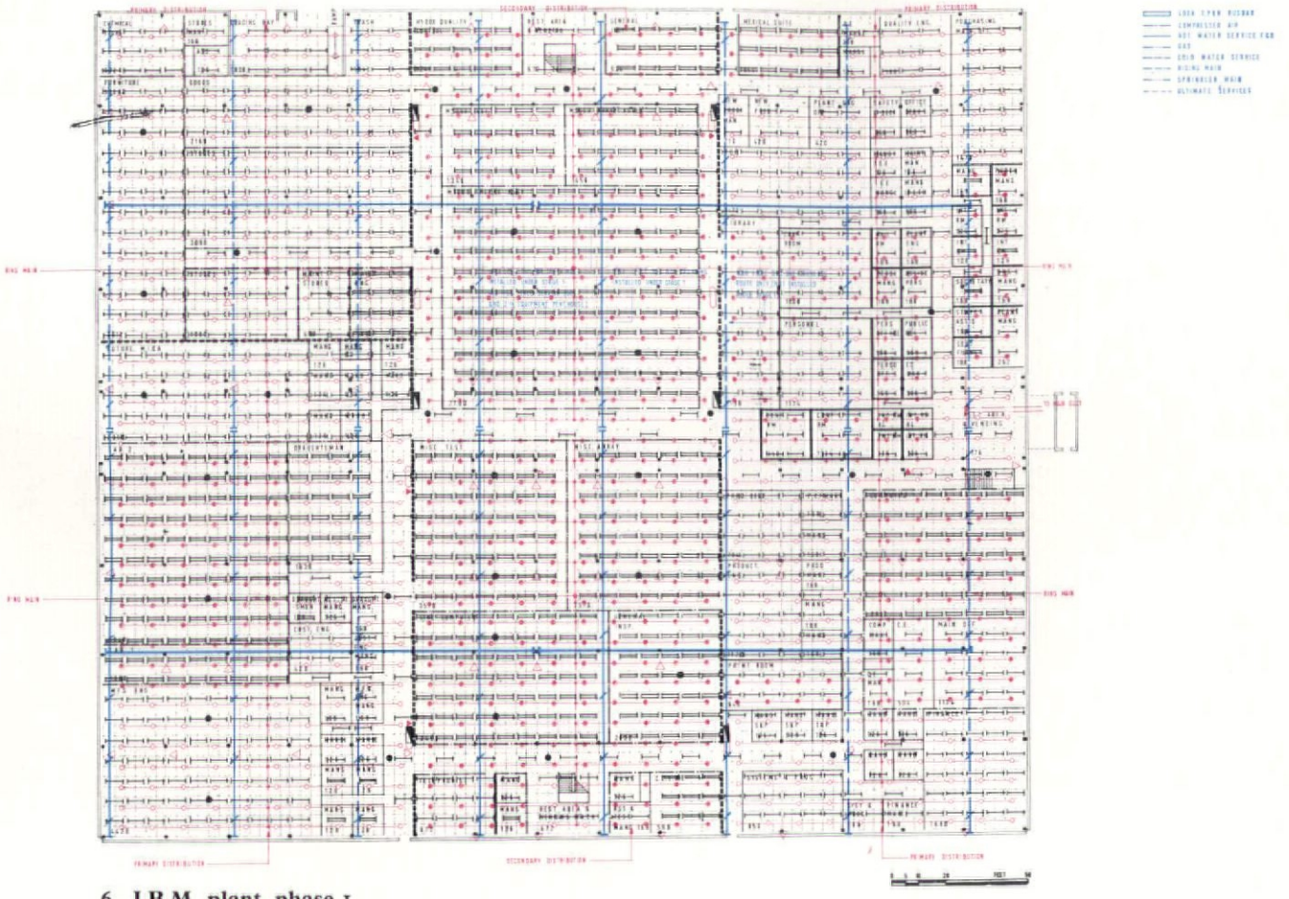
These drawings prepared for the final concept of this factory show the development of a discipline for distributing all types of environmental and factory services at factory roof level. The details at the bottom of this page and the plans on the facing page show the particular relationship to the structural grid.



4 Layout of typical service runs



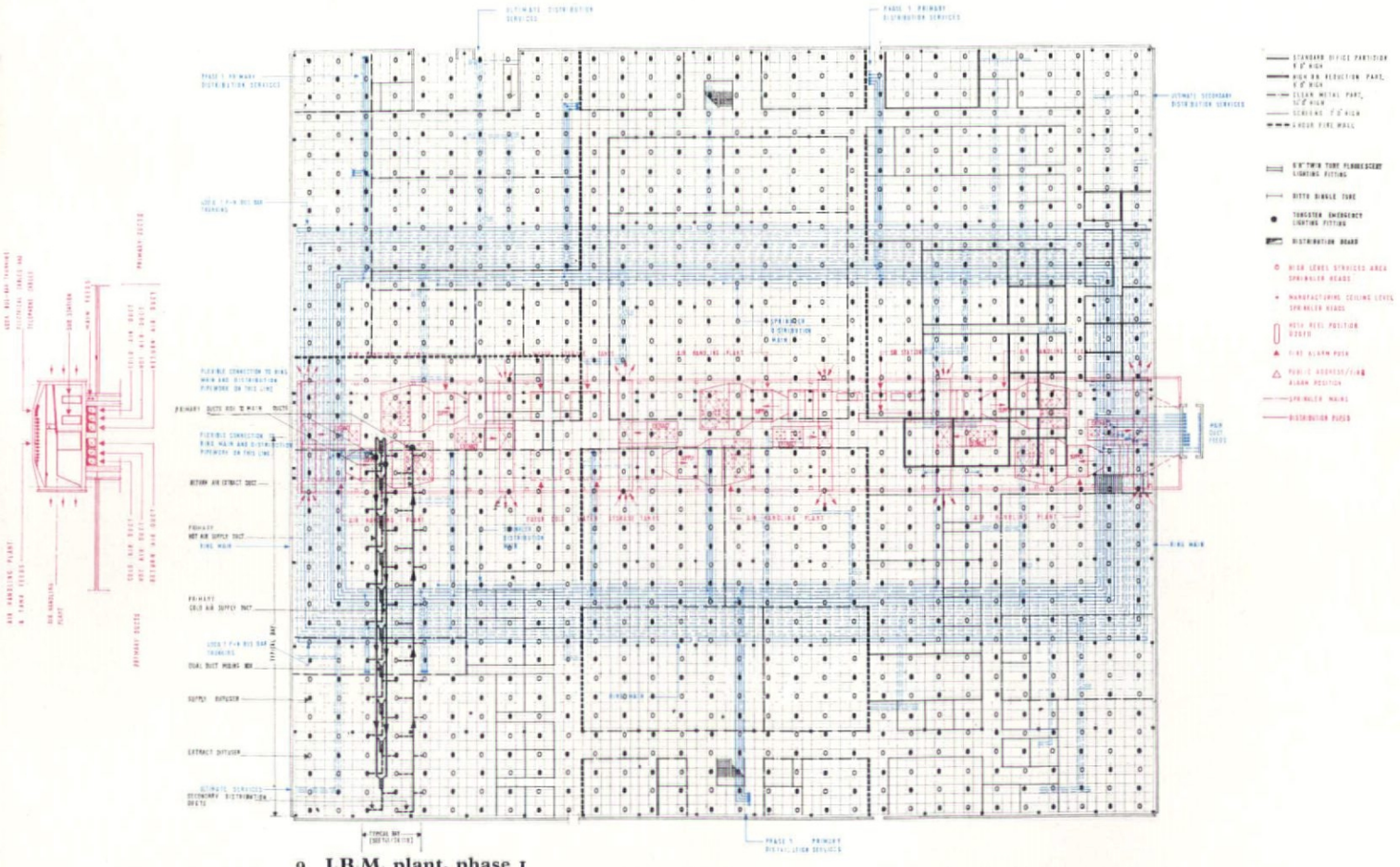
5 Details of typical bay services



6 I.B.M. plant, phase 1
air distribution supply and extract pattern

7 high level services (*see key*)

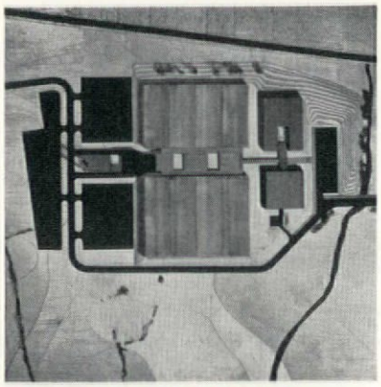
8 plan of equipment penthouse floor level



9 I.B.M. plant, phase 1
plan of production floor, electrical services and lighting layout (*see key*)

10 plan of manufacturing level, high level services, electrical services, overhead bus bar trunking layout

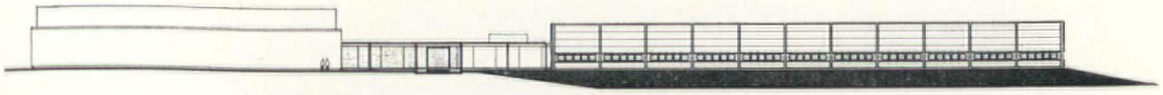
11 fire protection services (*see key*)



I.B.M. United Kingdom Ltd., system assembly plant—Phase 2

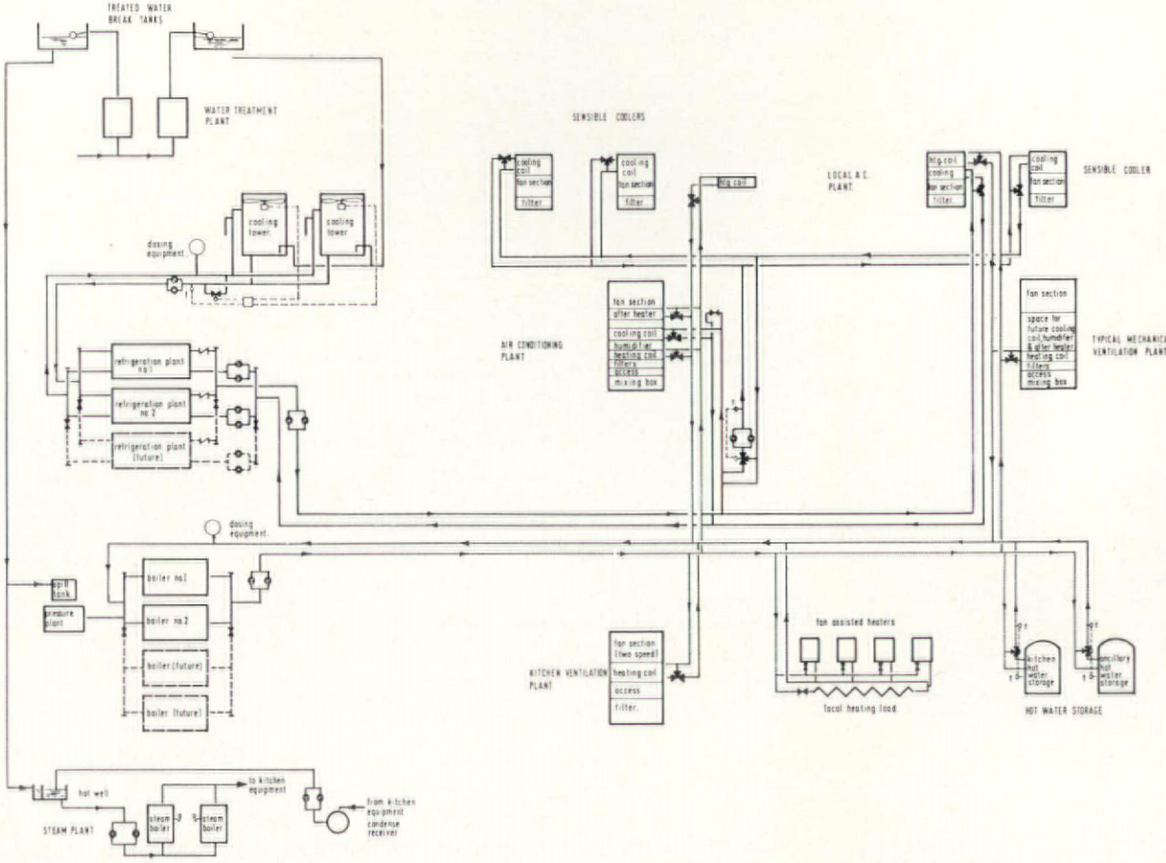
Architects and engineers:
Arup associates

This systems assembly plant, not requiring the sophisticated waste disposal systems of the Phase I factory, dispenses with the undercroft to deal with this. The air conditioning and cleanliness brief is not so stringent but the same disciplines have been maintained

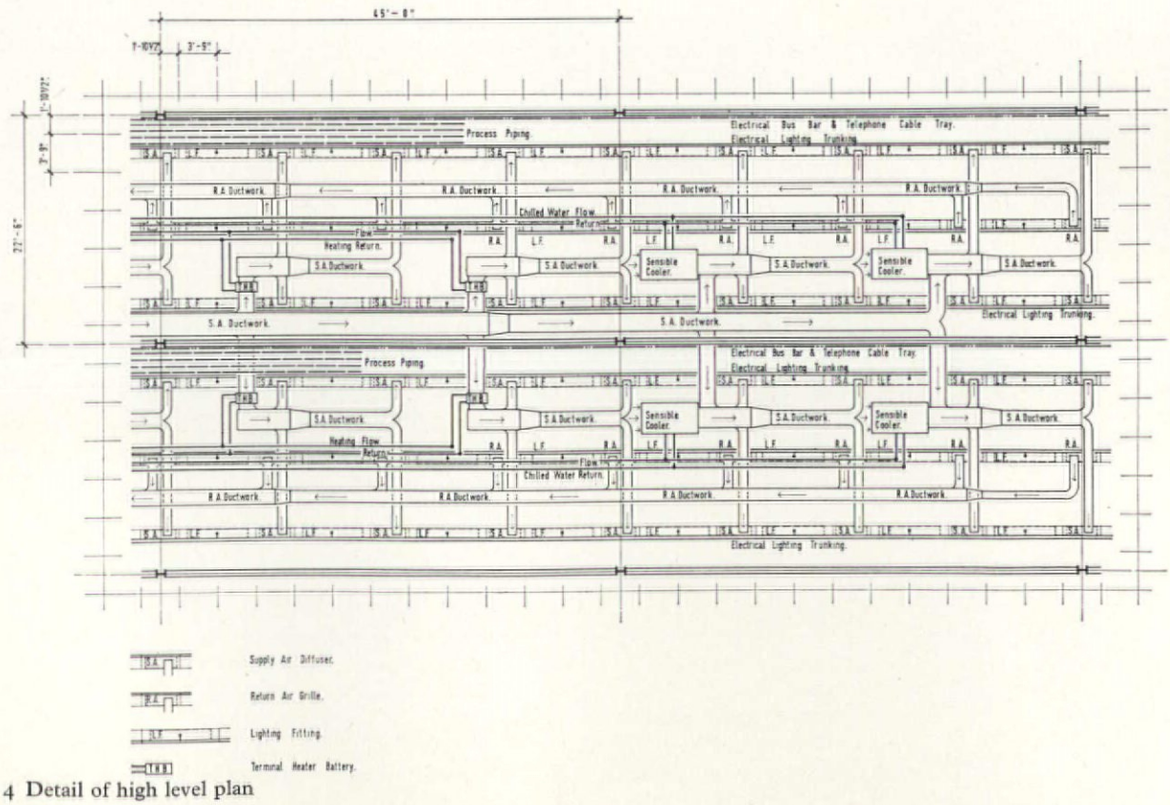


1 East elevation, proposed systems assembly building on the left

◁2 Model of total proposed development



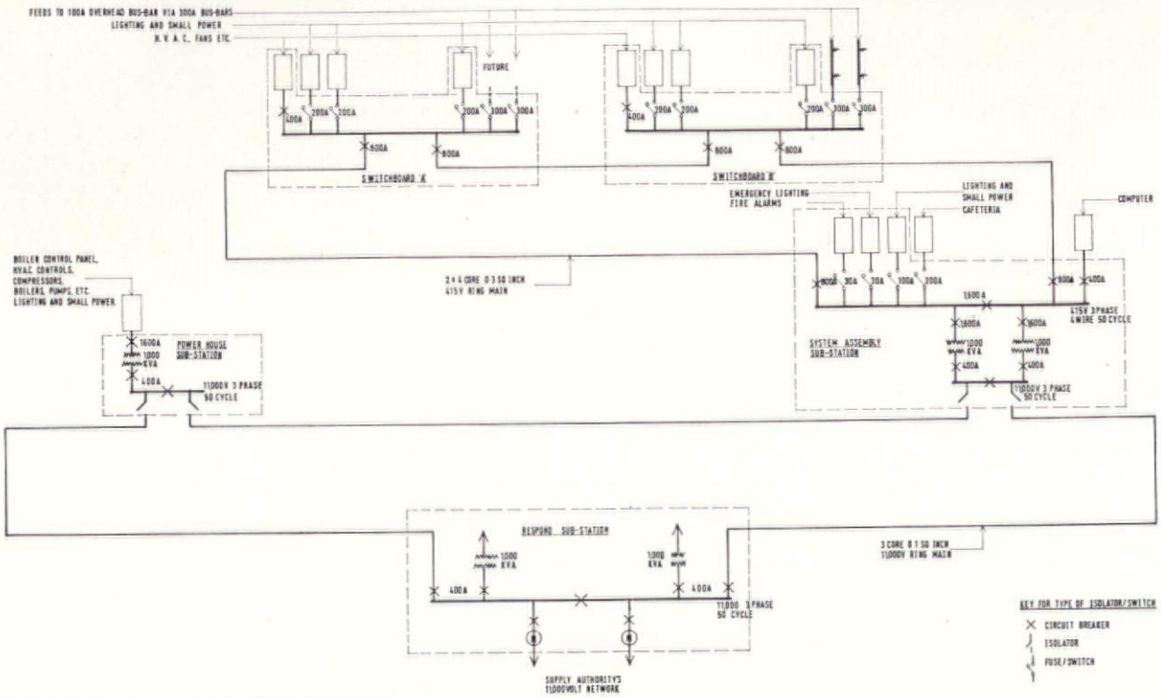
3 Schematic arrangement of primary services



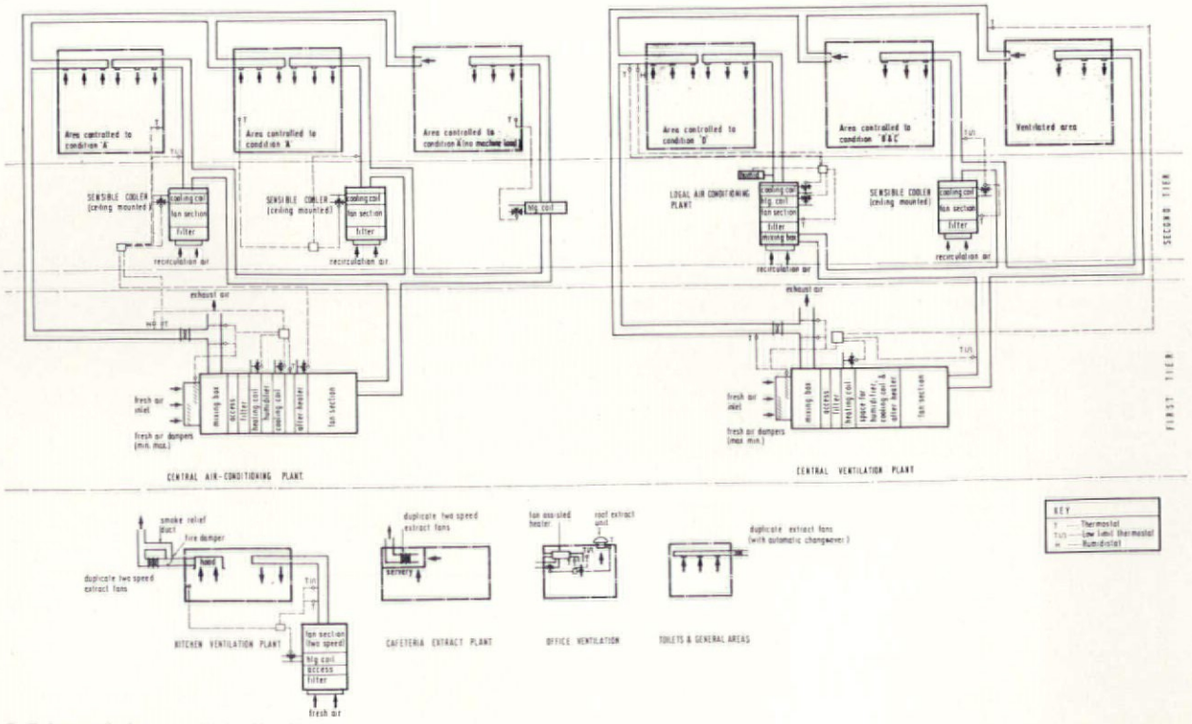
4 Detail of high level plan

5 North elevation, proposed systems assembly building on the left

6 East-west section through systems assembly building



7 Schematic layout of electrical distribution



8 Schematic layout of air distribution

Omnific

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System built factories

Alexander Pike

The complex nature of the problems associated with factory planning usually results in a unique solution, and consequently it is only on rare occasions that standardization of layout is possible. The internal organization is normally extremely specialized, and if the fullest advantages are to be taken of new production techniques and advances in machine design, the plan must provide facilities for flexibility in the layout of machines and sequences of production processes.

However, the shell within which the machinery is housed and the processes take place must always provide certain basic essentials.

It seems logical to assume that forms of system building should be ideal candidates for the provision of the basic essentials, offering scope for standardization where it can be readily applied and economy where it is urgently required.

An examination of the products marketed in UK as system-built factories reveals a disappointingly low level of achievement in this respect. With a few exceptions, most firms appear to be so anxious to provide the customer with a building which will meet very precise requirements, that all chances of standardization, higher volume of output (with consequent economy) and earlier completion are lost.

Although many firms appear to offer less of a building system than of a design service, their specifications indicate that many of the standard problems of design for the shell of a factory have not been fully considered and few conclusions arrived at.

With the notable exception of Space Decks, (where the phrase *to suit requirements* is unique in revealing explicitly a characteristic in the design of a mass produced component which can be assembled in a number of alternative ways to provide considerable flexibility of choice, the firms listed here which show alacrity in meeting a great number of client's requirements may be assumed to provide one-off buildings, to a large extent specially designed.

Words and phrases tend to achieve clear definition by usage, and it is now becoming obvious that *system building* is losing many of the connotations of speed, efficiency, economy and technological advancement with which it was originally endowed. Perhaps it is time for a new word.

The list of manufacturers given is not comprehensive, and does not include all those manufacturers who claim to supply built factory buildings. It does however include all those firms, from a fairly comprehensive list of 65 manufacturers, who were able to reply to a simple questionnaire, requesting specification details of their products, within a period of fourteen days.

It must be left to the reader's judgment whether this is a fair indication of the service which may, or may not, be provided by the firms excluded.

Manufacturers in UK

(Their index numbers tally with the left hand column in the chart below.)

1 ATCOST, a. Multi-4; b. A Frame; c. F2 Frame.
Atcost Ltd., The Pantiles, Tunbridge Wells, Kent.
2 BELCON
Bell & Webster Ltd., Essex Road, Hoddesdon, Herts.
3 COMPTON
Compton Associates, Station Works, Fenny Compton, Nr Leamington Spa, Warwickshire.
4 CONDER LID
Conder Group Services Ltd., Winchester, Hampshire.
5 COSELEY
Coseley Buildings Ltd., Lanesfield, Wolverhampton.
6 CRANLEY
F. & D. M. Hewitt Ltd., Vine Works, Cranleigh, Surrey.
7 CRENDON
Crendon Concrete Co. Ltd., Thame Road, Long Crendon, Aylesbury, Bucks.
8 ESL
Essex Stonecrafts Ltd., Wickford, Essex.
9 JONESPAN
T. C. Jones & Co. Ltd., Treorchy Works, Treorchy, Rhondda, South Wales.
10 LAMBDA
R. E. Eagan Ltd., 56–58 High Street, Sutton, Surrey.
11 ORLIT
Orlit Ltd., Vicarage Road, Egham, Surrey.
12 PEEL
H. Peel Ltd., Mearclough Works, Sowerby Bridge, Yorks.
13 INTRAD
J. Gerrard & Sons Ltd., Century House, Pendelbury Road, Swinton, Manchester.
14 SANDERS & FOSTER
Sanders & Foster Ltd., Bridgewater House, Warton Road, London E.15.
15 SHERBOURNE
Sherbourne Engineering Ltd., Sherbourne Road, Acocks Green, Birmingham 27.
16 SPACE DECK
Space Decks Ltd., Chard, Somerset.
17 STAFFORD UNIT
Baswich Builders Ltd., Cannock Road, Stafford.
18 TRENT T4
Trent Concrete Ltd., Colwick, Nottingham.
19 TRU-WOOD
Green Brothers (Brandon) Ltd., London Road, Brandon, Suffolk.
20 WIDESPAN
Ward Brothers (Sherburn) Ltd., Sherburn, Malton, Yorks.
21 HILLSPAN
Hill Construction Co. (Engineers) Ltd., Woodside Road, Eastleigh, Hampshire.
22 KENKAST
Kencast Buildings Ltd., Astley, Manchester.
23 PANDEX
Ludwell & Co. Ltd., 27 Waterloo Place, Leamington Spa.
24 UNI-BILT
T. Bath & Co. Ltd., 41 Norwood Road, London, S.E.24.
25 MARLEY, a. C-Plan; b. L-Plan; c. M-Plan.
Marley Structures, Guildford, Surrey.

Key to chart

FRAME MATERIAL
S Steel
C Concrete
T Timber

FRAME TYPES
RP Rigid Portal
TP Tied Portal
1HP One Hinged Portal
2HP Two Hinged Portal
3HP Three Hinged Portal
LT Lattice Truss
TLT Tied Lattice Truss
NF Northlight Frame
NG Northlight Girder
SP Simply Supported Beam
M Monitor
SF Space Frame

COLUMN
H Hinged
C Cantilever

CLADDING MATERIAL
CP Concrete Panels
AS Asbestos Cement Sheeting
AP Asbestos Cement Panels
AL Aluminium Sheeting
D Aluminium or steel decking with built-up roofing
SS Steel Sheeting
SP Sandwich Panel
WF Woodwool & Roofing Felt
TF Timber & Roofing Felt
T Timber
P Plastic Sheeting
O Other types of infill cladding

CEILING MATERIAL
A Asbestos Cement
F Fibreboard
P Plasterboard
PW Plywood

CEILING TYPE
I Integral with underside of roof
O Over Purlin
U Under Purlin
N No Ceiling
S Suspended

	Frame							Ceiling					Cladding				Natural Lighting				Building Complete With Services	
	Module	Spans	Increment	Bay Lengths	Material	Type	Columns	Ceiling Ht./ Clear Ht.	Material	Type	Suspended	Suspended Loads From Frame	Roof Material	Roof 'U' Value	Walls Material	Walls 'U' Value	Side Wall	Roof	North Light	Monitor		
1a		20' to 100'	10'	10', 20', 30'	S	LT	C	30' max.			if required	Services only	AS SS	0·19 0·34	AS SS	0·19	†	†	†	†	No	
1b		15' to 70'	1'	15', 16' 6", 20'	C	3HP	H	22'		O, U	if required	(1)	AS	0·19	AS	0·19	†	†			No	(1) By arrangement, at design stage
1c	300 mm.	30' to 50' 50' to 80'	5' 5'	15', 30' 15'	C	2HP	H	26'	A	O, U	if required		These frames will accommodate any form of infill				†	†			No	
2		25' to 100'		15', 20'	C	2HP	H	20' max.	A, F, P	O		(1)	SP AS	0·19 1·30	SP AS	0·19 1·30	†	†			No	(1) By arrangement, at design stage
3	4' 3"	20' to 40'	4'	8' 6"	S	3HP	H	8' 0½"/7' 9" 9' 5"	A, F, P	O, S	†		AS O	1·02 0·26	AS O	0·83 0·26	†	†			Yes	
4		up to 60'	3'	15', 20'	S	SB				N, S	†	(1)	AS AP SS WF	0·14 0·14 0·11 0·09				†			No	Consists of roof and supporting beams only. (1) To suit requirements.
5	2' 6"	30' to 250'		12' 6" to 40'	S	All	H, C	← To suit requirements →													Yes	
6		20' to 80'		15'	C	2HP 3HP NF		(1)		O, U	(1)						†	†	†		No	
7		20' to 70'		10' to 30'	C	1HP 2HP 3HP	H, C	30' max. ← To suit requirements →									†	†			No	
8	4"	8' 4" to 41' 8"		8' 4"	T	LT		8' 0" to 14' 6"	P, PW	1	if required		TF	0·19	T	0·18	†	†			Yes	
9		30' to 100'		20'	S	2HP LT	H, C	← To suit requirements → (1)					AS		AS			†			No	(1) Loads at tie level.
10		30' to 100'		15', 20'	C	RP 2HP NF M	H, C	← To suit requirements → (1)													No	(1) 2–3 tons runways or gantry cranes can be accommodated.
11		up to 100'		15', 20'	C	2HP NF	H	← To suit requirements → (1)					← To suit requirements →								No	(1) By arrangement.
12	6' 4"	up to 60'		12' 8"	T	RP LT TLT	C	8' 0" to 15' 0" in 1' 0" increments	P	I, U, N	Timber framed	(1)	AS AL SS TF	0·16 0·14 0·15 0·13	AS AL SS	0·17 0·15 0·16	†	†			Yes	(1) Services loads at frame centres.
13					C(1)	RP		← To suit requirements →														(1) Precast and in situ.
14		30' to 210'		20'	S	RP TP		11' 0" to 20' 0"	A, F, P	I, O, U, N	if required	(1)	AS AP AL SS SP PS	1·4	AS		†	†	†	†	No	(1) By arrangement.
15		25 to 60'	5'	15', 20'	S	RP LT TLT NF NG SF	H, C	10' 0" to 20' 0" in 2' 0" increments	P	O	†	(1)	AS SS	0·35	AS	0·35	†	†	†		No	(1) Maximum of 1 ton on panel points of tubular structure.
16	4'	← To suit requirements →			S	SF	←	← To suit requirements →													No	
17	4'	12' to 48'		4'	C	LT	H	6' 10" to 10' 0"	A, F, P	I, O, U	†	(1)	← To suit requirements →				†	†			Yes	(1) By arrangement.
18		24' to 74'		22'	C	(2)		25' 0"	(2)	(2)	(2)	(1)	← To suit requirements →				†	†			No	(1) Crane rails may be incorporated. (2) Prestressed concrete beams giving 4" pitch, flat soffite.
19	6'	up to 48'		6'	T	(1)	(1)	8', 10', 14'			†										Yes	(1) Laminated beams and columns.
20		40' to 250'		15', 20', 25'	S	RP TP 2HP LT NF M	(2)	(2)	A, F, P	(2)	(2)	(1)	AS AP AL SS SP		AS AP AL SS SP		†	†	†	†	No	(1) S cwts at panel points.
21		up to 200'		15', 20', 30'	S	PP(1)	H, C	← To suit requirements →					AL	0·8	SP	0·17	†	†	†	†	Yes	(1) Normal provision. Other types if required.
22		21' to 41'		12' 7½"	C		C	7' to 14'	F, P	O, U	if required		AS	0·3	CP	variable	†	†			Yes	
23		up to 200'		up to 30'	S	LT	C	← to suit requirements →					D	0·33 to 0·08				†				
24	6'	12' to 48'			T	SB		8' to 14' in 6" increments	P	I			T	0·23	T	0·23	†	†			Yes	
25a		20' to 70'	5'	15'	S C	RP 2HP			A, F, P	I, O, U, N			AS		CP AL SS SP P		†	†				
25b		20' to 55'	5'		S C	RP			A, F, P	I, O, U			AS AL SS SP		CP AP AL SS SP P		†	†				
25c		9', 12', 16', 20', 24'		8'	C	2HP	C	8'	A, F, P	I, O, U			AS		CP		†	†				

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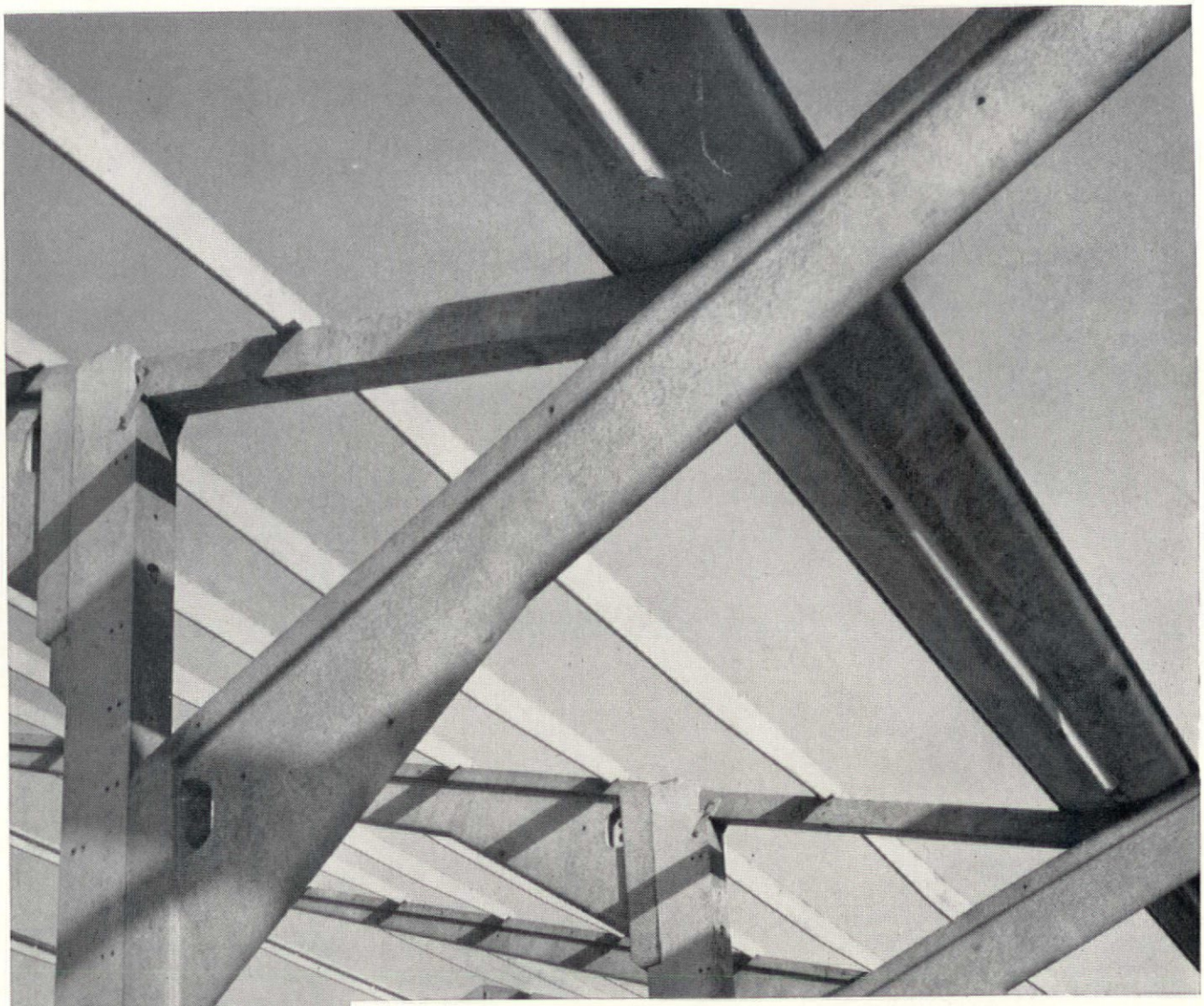

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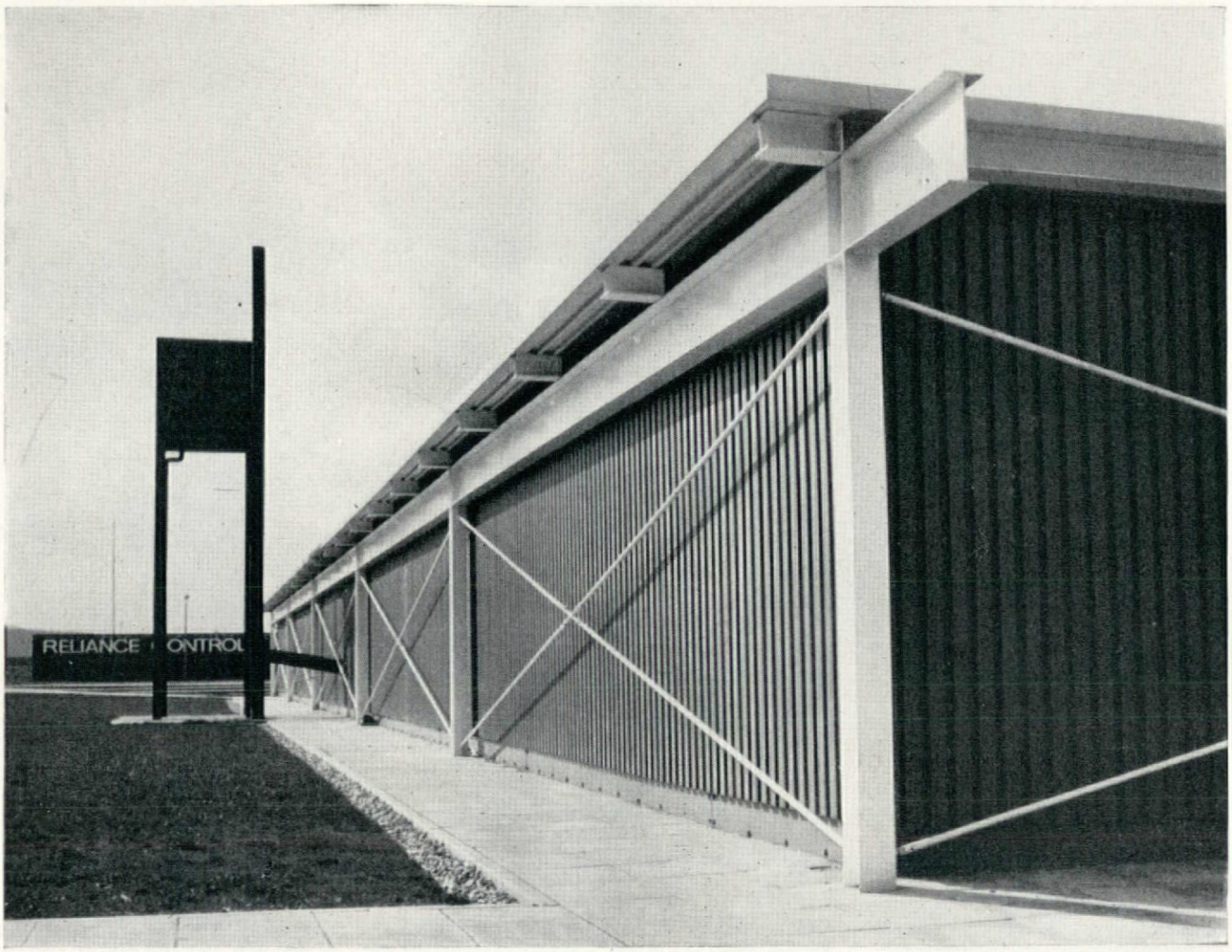

Electronics factory at Swindon for Reliance Controls Ltd. The Design Group employed steel throughout. The cladding is corrugated, double-skin, plastic-coated, galvanised steel sheet in a maintenance-free exterior colour finish. The panels are full storey height to 12 feet without intermediate support.

The Design Group were—Architects: N. Foster, W. Foster and R. Rogers; Consulting Engineer: Anthony Hunt; Quantity Surveyors: G. A. Hanscomb Partnership; Service: G. N. Haden & Sons Ltd.

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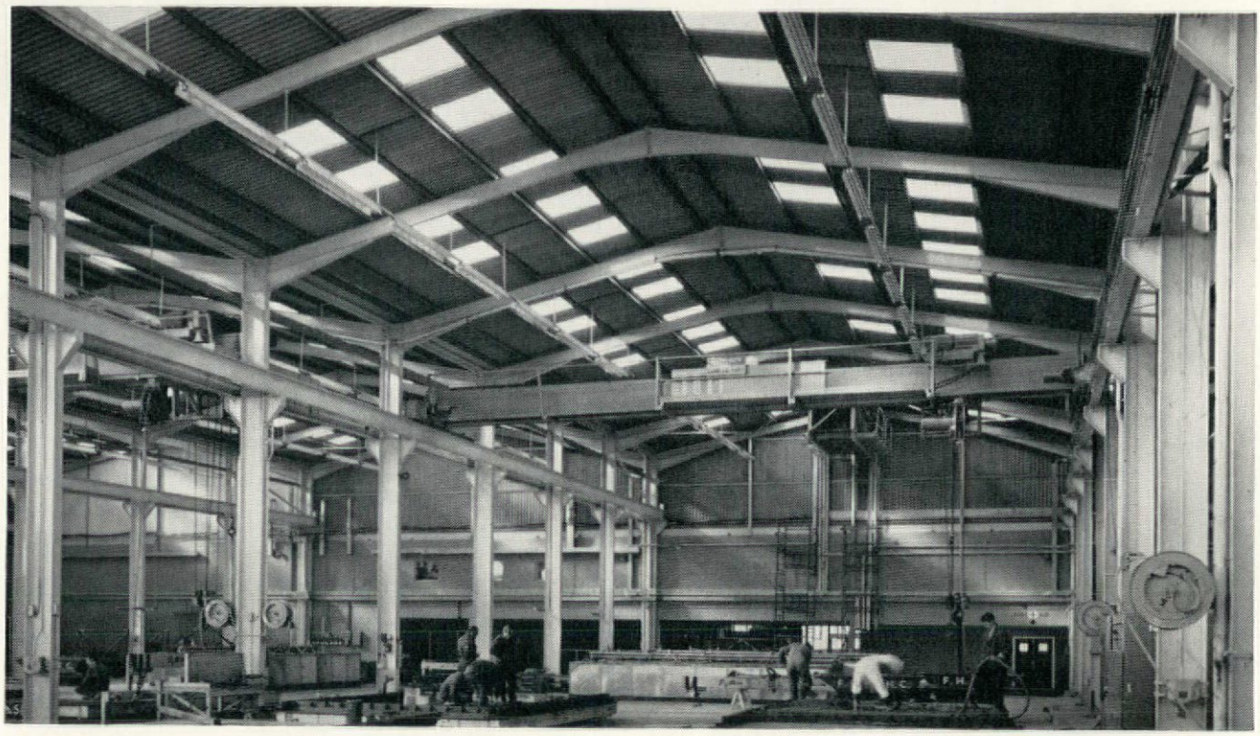

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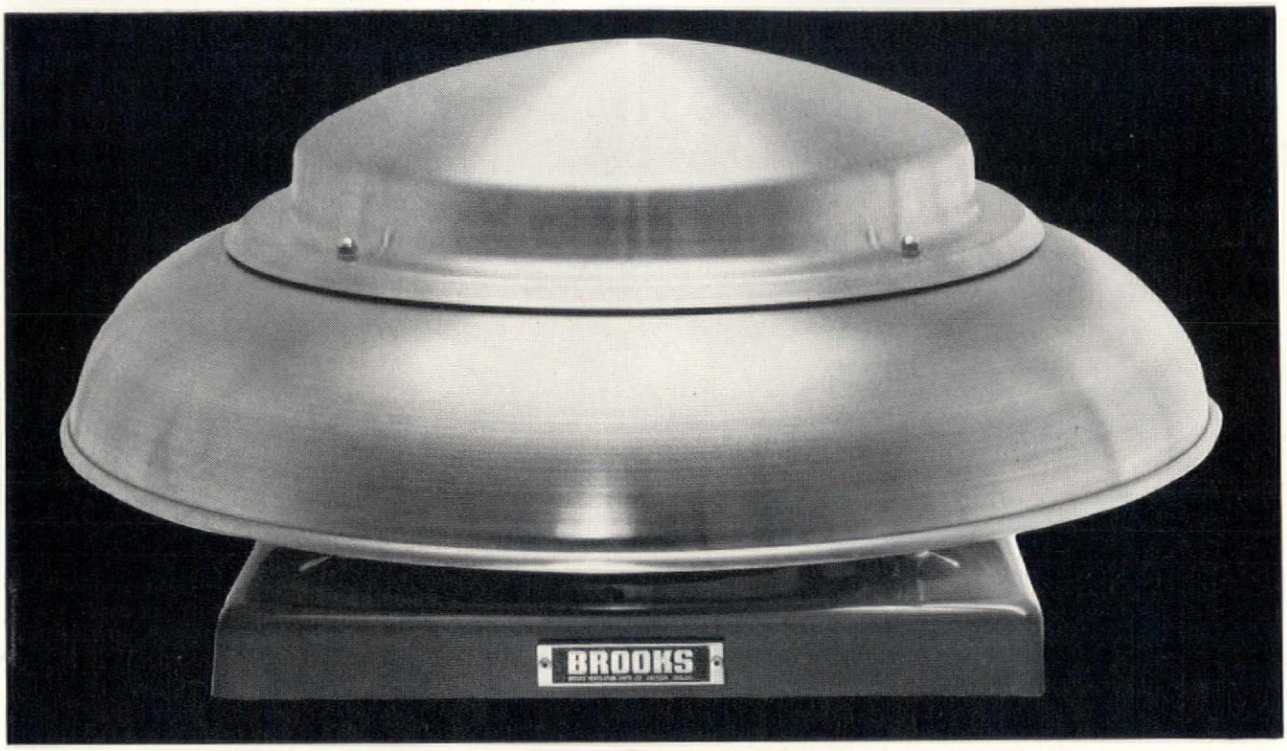

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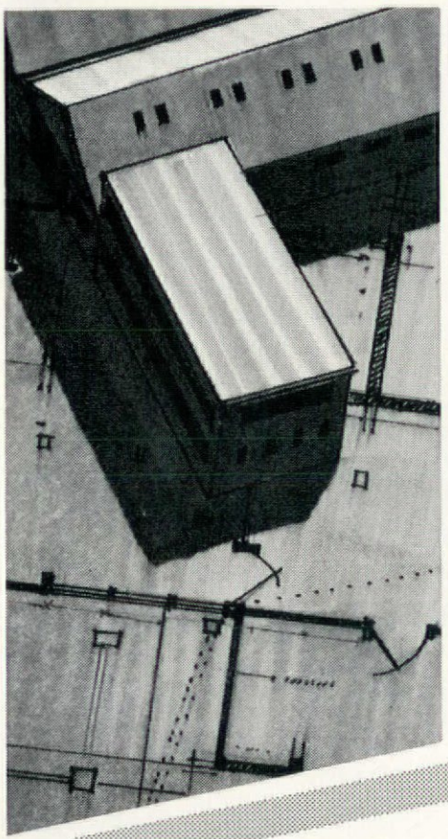

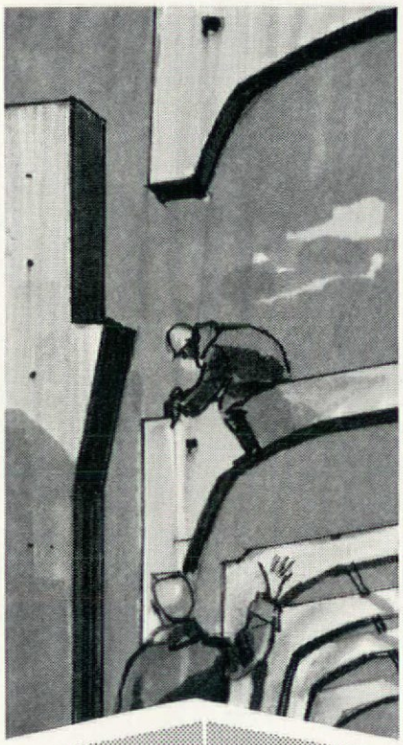

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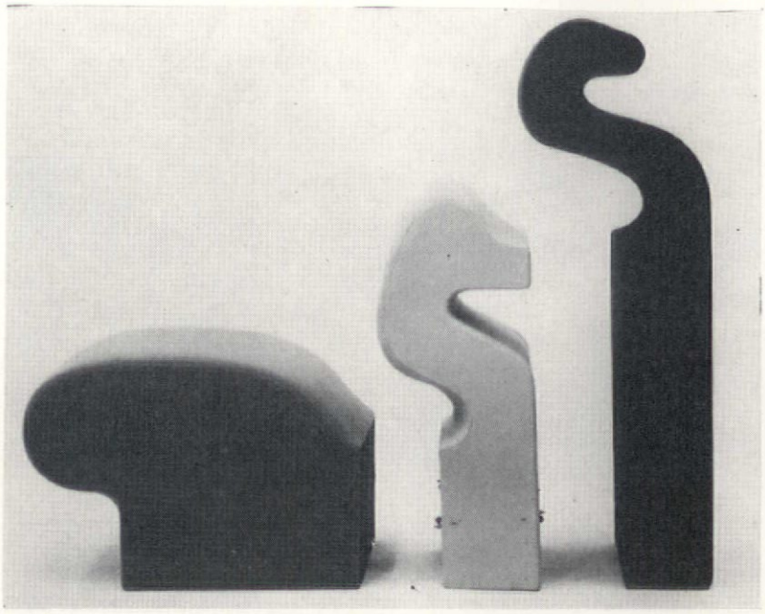
I 32

Italian lights

Below
Gae Aulenti uses yellow enamelled metal for his combination of flower vase, ashtray and multiple lamp, 'Rimorchiatore', designed for Candle of Milan.
Via Ariberto 24, 20123 Milan

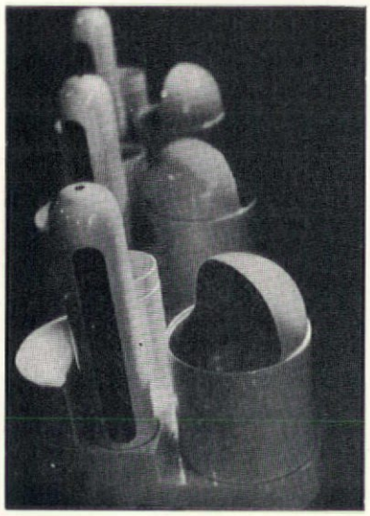
Centre
Wit and fantasy are combined in Joe Colombo's elastic table lamp 'Spring' made by O-Luce, with an £0cm long, stainless steel, coiled spring looped through a movable knuckle, whose position on the spring, combined with the size of the loop, controls the height of the lamp.
Via S. Eufemia 2, 20122 Milan

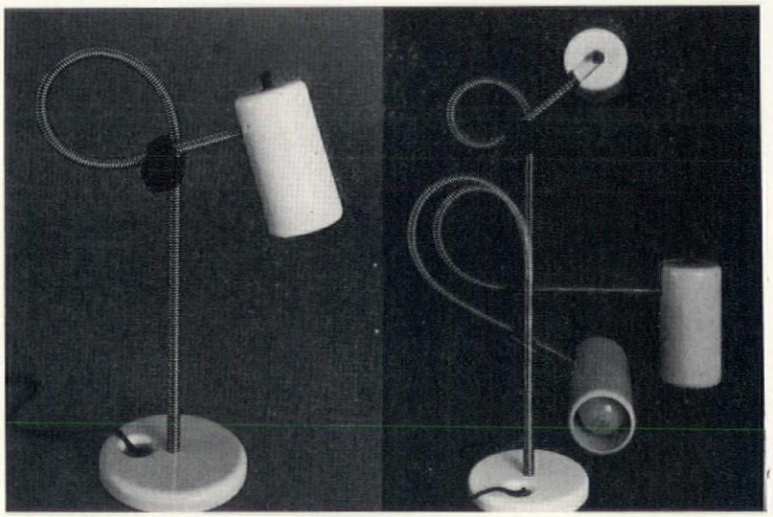
Right
Witty, too, is the pliant 'Periscopio' lamp designed by Danilo and Corrado Aroldi for Stilnovo of Milan. Basically two metal tubes joined by rubber, it clips on to ledges.
Via G. G. Govone 78, 20155 Milan

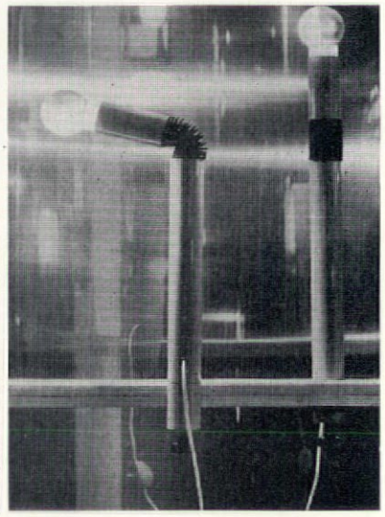


Moulded foam

We like the intention (flexibility) behind Jorn Utzon's sculptured furniture units but not the UK prices (£39 10s 0d for the seats, £39 10s 0d for the low back, £59 10s 0d for the high back, in each case exclusive of covering fabric). He uses hard polyurethane foam (the liquid is placed in a mould and under forced air pressure is enlarged to 40 times its original size, taking only 10 minutes to set), and the units are made under licence in Britain by Oscar Woollens Ltd.
421 Finchley Road, London NW3





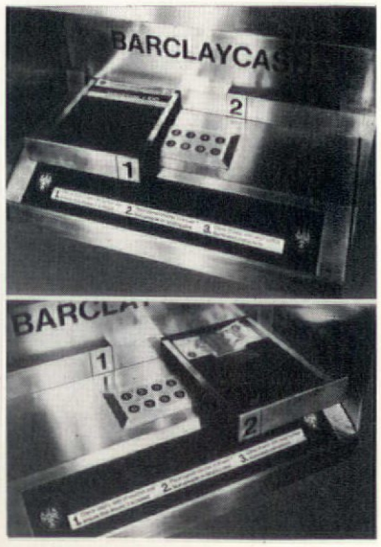


Cash dispensers

Chubb's new cash dispenser for banks (already widely advertised by Westminster) was the subject of detailed display at the Design Centre's 'Design for Export' exhibition.

In the original brief, the cash dispenser had to be mechanized, with security of paramount importance, and had to be economic, capable of volume production, and visually acceptable. A design team was set up, with two members from Chubb's and two from Smith's Industries, and Jack Howe to advise them on overall design. The demonstration prototype was completed in 18 months, the final model four months later.

Bank customers are given a plastic card, with a personal identification number encoded on it, for the machine to read off the card on insertion, and verify against information conveyed by the customer by pressing his own personal memorized number on to numbered buttons. The machine then dispenses a packet of money and retains the card.
Chubb and Son's Lock and Safe Co, Tottenham Street, London W1



The cash dispenser used by Barclay's Bank was designed and developed for them by De la Rue Instruments. Here, again, the customer has his special voucher and personal code number with which he can cash 10 £1 notes.

168 Old Street, London EC1

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AD/20/1

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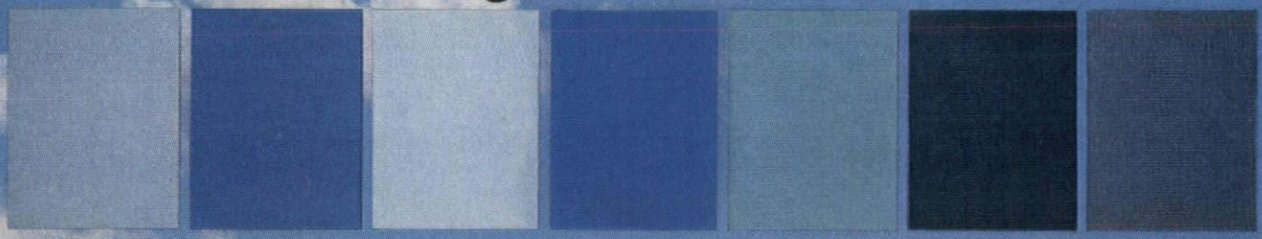

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But there's a lot more to Arborite than that. There are thicknesses and special grades to meet practically every kind of application. In addition to standard thicknesses of $\frac{1}{16}$" and $\frac{1}{32}$", Arborite manufacture solid plastic laminate from $\frac{1}{8}$" to $1\frac{1}{4}$" thick. Also Post-forming grade for finely contoured working surfaces. Bending grade for forming larger radii. Fire-retardant grade to comply with the surface spread of flame regulations. And there are over 150 patterns, woodgrains, marbles and plain colours, all available in Arborite's five grades. Standard sheet sizes are $10' \times 4'$ and $8' \times 4'$ with others, including $12' \times 5'$, available. Arborite comes in three finishes: high gloss, furniture finish (semi-matt) and texture finish.

If you need any kind of information or advice, please call our technical service. They'd be delighted to help.

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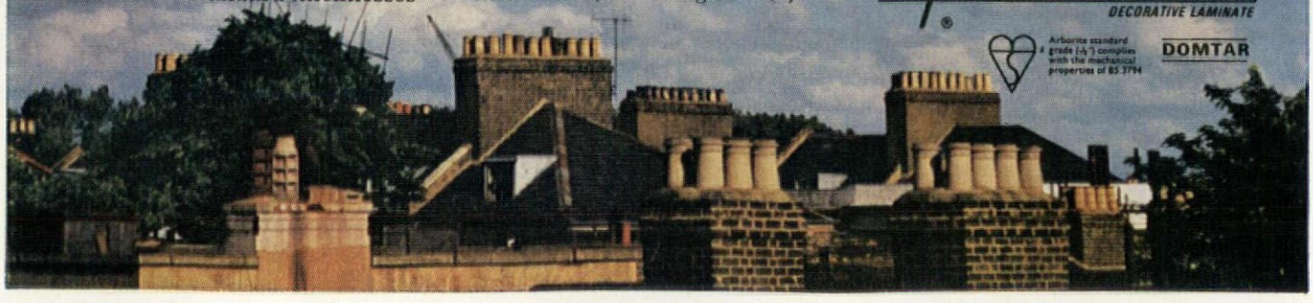


Giro

At last Britain is to have a GPO National Giro current account banking system. Its hub, the new £4·8 million Centre at Bootle, Lancs, opens on October 18th, with an initial target of 1·2 million accounts.

To achieve 24-hour clearing of customers' instructions and the speedy and accurate preparation of statements of accounts, a sophisticated system of document handling was needed, with a steady but fast input of information to feed the computer suite of several International Computers Ltd 4/70 which update ledger records.

The UK has been divided into six geographical sectors, each sector with distinctive colour-coded envelopes, to speed sorting of incoming mail which will flow in from three main sources: from account holders; from post offices; and from banks. A fourth source will be the other Giro systems abroad.

This mail will be sorted into transaction streams (inpayments, deposits, transfers, cleared payments from banks and the like) and then passed to a scrutiny control section.

A code line on each document (in optical or magnetic ink characters) will be completed in the data conversion branch, amounts and account numbers being verified by means of check digits, to ensure the accuracy of all information input to the computers. Documents which do not incorporate a code line will pass through a direct keying complex. This is a completely new kind of data conversion unit, using a complex of 150 keyboards. It has been specially built for the National Giro Centre, and will enable the Centre to process instructions from customers which are not on standard forms.

Ledger accounts will be held on magnetic tape and will be updated daily by means of the magnetic tapes produced by the optical character readers, the magnetic ink character reader and the direct keying unit, all of which will be on line to the central computers. After updating customers' statements will be produced on high-speed printers. At the same time the documents will be sorted into creditor account order either on the magnetic ink character sorters or on bar code reader sorters. The bar codes will have been printed in fluorescent ink on the back of the forms on their passage through the optical character readers.

1 Disc storage unit on one of the central 4/70 computers

2 Tape deck of one of the central computers

3 Miracode retrieval system for reproducing details of microfilmed statements

5 Document encoding machine

Each statement will then be associated with the forms representing credits to the account, and posted off to the account holder.

The information on statements and on all transaction forms will be microfilmed to constitute the permanent Giro record.

International Computers Ltd. (4/70 computers)
Recognition Equipment Ltd. (Electronic Retina Computing Readers)
R. E. Ltd. (Ink-jet printers and bar-code reader-sorters)
Standard Telephones and Cables Ltd. (Direct Keying complex)
Advanced Data Systems Ltd. (Check digit encoding and verification machines)
British Olivetti Ltd. (Encoding machines)

4 Check digit generator machines for ensuring accuracy of figures

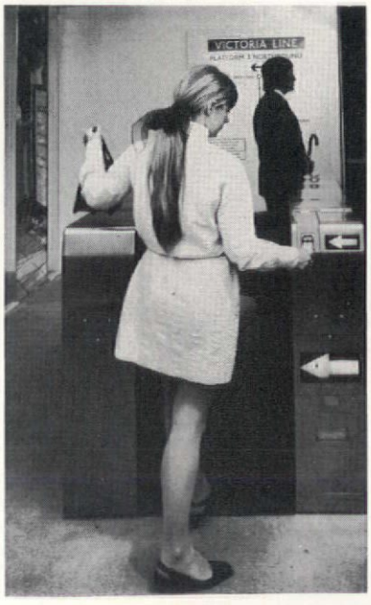
The Victoria Line

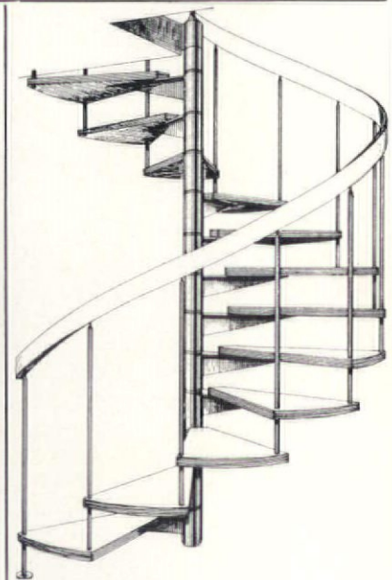
One of the most important features of London's new Victoria underground line is the automatic train driving system. Each train's electronic 'brain' receives driving instructions through the running rails from special trackside equipment. The train operator in the front cab controls the opening and shutting of doors, and only takes over driving in the event of failure of any part of the system.

London Transport are very proud of their automatic ticket dispensing and control which has been developed to cut costs and as a deterrent to fraudulent travel. Entry as well as exit gates are operated by yellow tickets with magnetic tape backing on which the journey details are electronically encoded. When placed in the appropriate slot **6**, these details are 'read' by the gates which then open, but only if the ticket is valid. The passenger enters a padded, waist-high 'girdle' which has to close round him before it can open to allow him to pass. (Let us hope he is not obese!). Parcels have to be lifted over; heavy luggage goes through on a moving belt not shown here.

Tickets can be bought from automatic and multi-fare machines which accept any coin; and there will also be banknote changing machines.

It will be interesting to see how long the queues will be.





Prefab stairs

The timber spiral stairs in the houses at N19 (*AD* 7/68, p330) came from Lewes Design Contracts Ltd who also produce this iron and timber stair.

2 Mount Place, Lewes, Sussex

Don't mention Alcan Weatherboard to Percy.

Percy has been a housepainter for a good few years. And he knows well enough that the wooden fascia he painted yesterday will need his brush again before too long.

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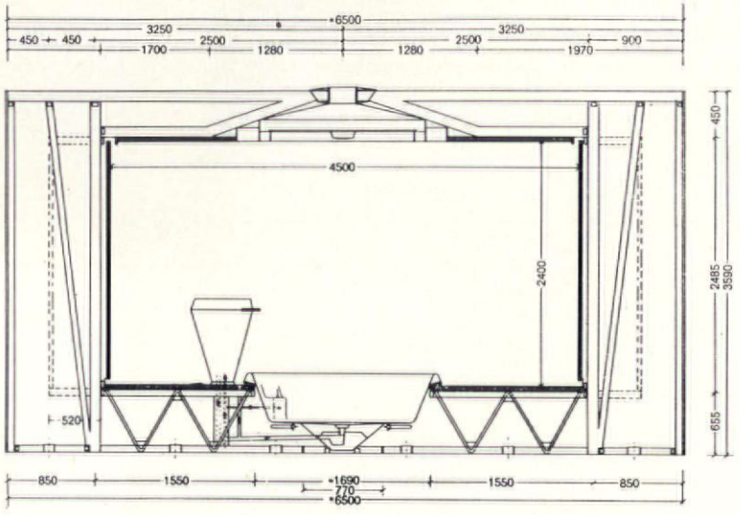
To obtain additional information about any of the items described below, circle their code numbers (N1, N2 . . . etc.) on the Readers' Service Card inserted in this magazine.

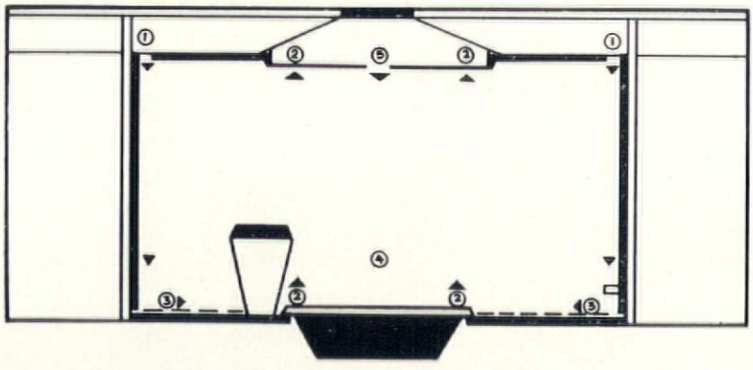
Alexander Pike

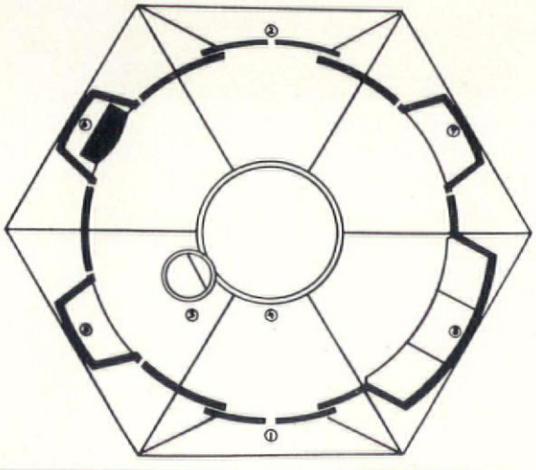
N1 Living bathroom

Rohm & Hass GambH, Werbeabteilung, Darmstadt

A bathroom designed at the Institute for Industrial Design, Technische Hoschschule, Hanover, under the supervision of Professor Matthias Hanssen, develops the possibilities for relaxation by providing scope for other activities. The room is approximately 15ft in diameter, with a central bathtub, 6ft diameter × 20in deep, and alcoves let into the walls accommodate a television set, record player, bookshelves, a bar, a cosmetic area and a sitting area. Ventilation takes place through a slit around the perimeter of the ceiling, through which conditioned air is blown into the room and flows down the walls. This air is warmed over the heated floor and is extracted, together with the moist air in the ceiling over the central wet zone. The shower nozzle automatically controlled from the bath, is located in the ceiling over the tub, but as an alternative the hand shower provided for the wash basin may be utilized. To permit lounging and television viewing, the water in the bath is thermostatically maintained at a constant temperature. The prototype structure consists of a skeleton of galvanized steel supporting panels of acrylic sheet insulated with polyurethane foam.







Section
1 conditioned air inlet
2 used air outlet
3 floor heating
4 wet zone
5 shower

Plan
1 entrance
2 exit
3 wash basin
4 bath tub
5 cosmetic zone
6 TV zone
7 reading zone
8 sitting zone

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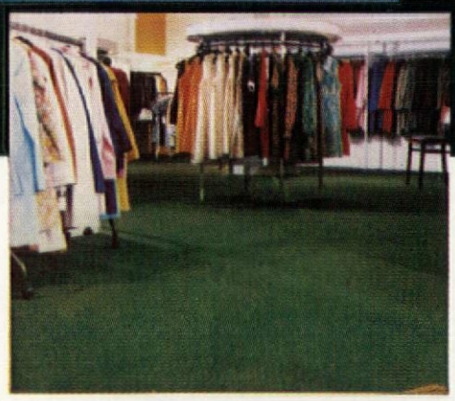

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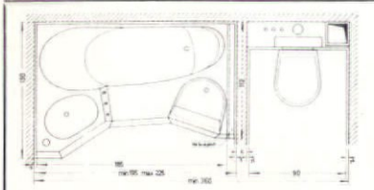
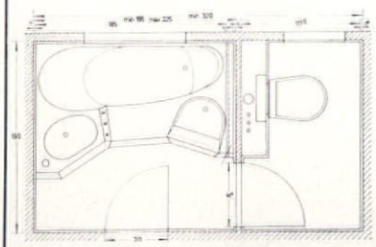
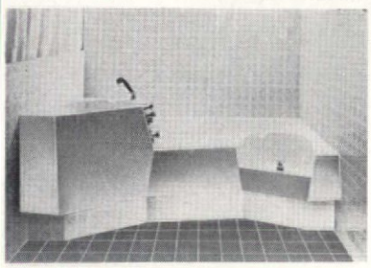
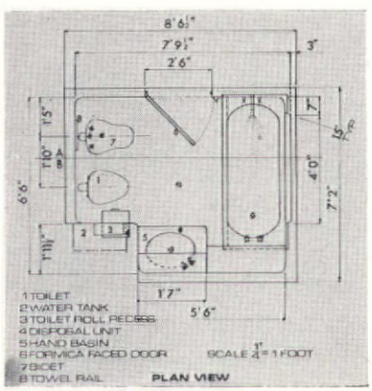


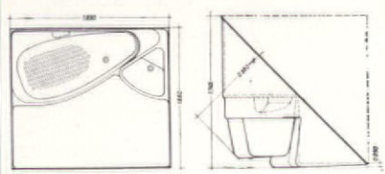




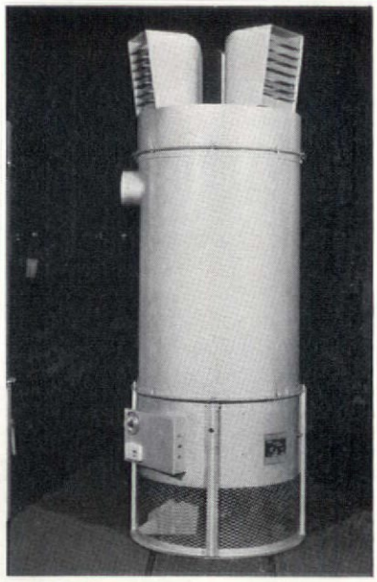
N2 Bath unit
Mero, Dr Ing Max Mengeringhausen, 87 Wurzburg 2, Germany, Postfach 462
The Maisonette-Bath consists of a bath-tub, washbasin and bidet formed of plastic in one piece. The unit is supplied complete with all fittings and pipes, reducing installation time. The controls for all parts of the unit are centrally mounted, and an integral bench provides seating space.



N3 Standard bathroom
Finlock Products Ltd., Penmill Trading Estate, Yeovil, Somerset
The Instant Glass Fibre Bathroom was originally designed for incorporation into building projects where bathrooms are required in quantity and at speed. The application has now been broadened to enable it to be used on a one-off basis. The plumbing, wiring and fittings are factory installed and are grouped together at one point outside the sheet to facilitate site connections. Basic price of standard unit £375.



N4 Moulded acrylic bathroom
Hans Gunter Moeller, 287 Delmenhorst, Oldenburger Landstrasse 60, Postfach 48, West Germany
The Moeller-Sanitar Bathroom (K17, *AD* August, 1968) in vacuum formed acrylic sheet backed with GRP, is supplied complete with all fittings. DM 850.



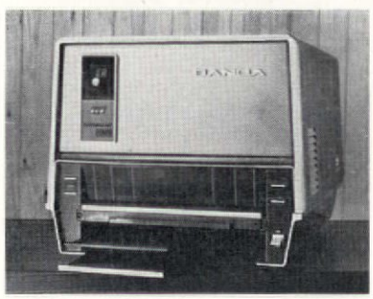
N5 Oil-fired warm air generator
Turbomatic Engineering Co. Ltd., Cornwall Road, Smethwick, Warley, Worcestershire
Gemini heaters are offered in a range of capacities from 300,000 to 1,000,000 Btu/hr, applicable to either vertical or horizontal mounting. Fully enclosed control boxes contain all the electrical automatic equipment, transformer box, time programmer, etc., housed in one unit mounted externally on the base of the unit.

N6 Combined gas fire and back boiler
Glow-Worm Ltd., 47 Hatton Garden, London, EC1
Suitable for small houses and flats, the Majorca unit comprises a teak panelled gas fire providing both radiant and convected heat, and a back boiler to supply hot water to radiators and to heat an indirect hot water cylinder providing constant hot water. The gas fire and back boiler can be operated independently if required, and the ratings are 11,500 and 40,000 Btu/hr respectively. Controls for the gas fire are recessed into the fire cabinet and give a choice of eight thermostat room settings. Boiler controls are concealed within the fire cabinet and include a control box with provision for a plug-in programmer, a circulating pump and a room thermostat. The unit is designed to fit in a standard fireplace opening and measures 34in wide × 27½in high, and projects 8⅝in into the room from the chimney breast.

N7 Fan heater
Wynn Developments Ltd., Staverton Aerodrome, Gloucester
Four blades, having a sweep of 40in, incorporate heating elements, each of 500W. The unit is intended for mounting on the ceiling and employs a fractional horse-power motor to run the fan at a speed of 140 r.p.m. It can be selectively switched to provide outputs of either 1 or 2kW, or may be used for cooling with the heaters switched off.

N8 Exhaust ventilators
Supervents Ltd., Magnare House, Sidcup By-Pass, Sidcup, Kent
Available in capacities ranging from 690 up to 11,000 cfm, the Supervents Low-Dome Powered Ventilators have a body and base made from corrosion resistant aluminium alloy and a weathering cap of GRP, hinged for quick servicing of the fan and motor. Automatic louvres and bases for all forms of roof coverings are available.

N9 Colour copier
3M Company Limited, Wigmore Street, London, W1
A new office machine is capable of producing a colour copy, 8½in × 11in, in about 60 minutes. The makers claim that the colour reproduction is excellent and that the copy stability is as good as most colour photographs.

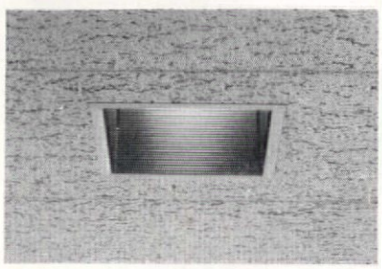


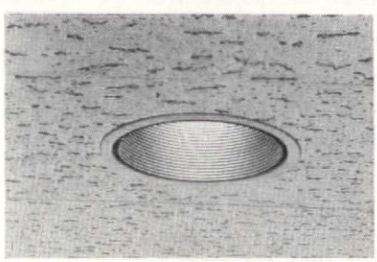
N10 Electrostatic copier
Block & Anderson Ltd., Banda House, Cambridge Grove, Hammersmith, London, W6
Claimed to be the world's fastest desk top electrostatic copier, the Banda 88 can produce 14 finished dry copies per minute. After switching on it is only necessary to dial the number of copies (from 1 to 10) and feed the original into the machine. There is a separate receiving tray for both copies and originals, which are therefore automatically stacked in sequence. Maximum image size, 17in × 11in. Size 16in high × 18in wide × 17in long.

N11 Self-adhesive lettering
Morol Ltd., Gresham Road, Staines, Middlesex
Rivi lettering is made from rigid vinyl sheet backed with a pressure sensitive adhesive of high bond strength. It can be used either internally or externally for permanent or temporary signs. Available in ten sizes from ½in to 7in, in black, white, blue or red in expanded and condensed type faces. International symbols for telephone, restaurant, toilets, etc., are also available. Price about 1s 0*d* for one medium-sized letter.

N12 Non-slip rulers
Eagle Pencil Co. Ltd., Ashley Road, London, N17
Linex Super Rulers are provided with rubber strips countersunk on the underside to prevent slipping. The 8in and 12in rulers have one rubber strip and one acrylic rib, enabling the ruler to be tilted and slid smoothly when it needs to be moved. The 16in and 20in rulers have two rubber strips to provide the firmer grips necessary with these lengths. The rulers are made in clear acrylic plastic, fully bevelled and with both metric and inch measurements. Prices: 5s 6*d*, 8s 0*d*, 11s 7*d*, and 15s 3*d*.

N13 Letter opener
Industrial Marker Co., 30 Baker Street, London, W1.
Housed in a plastic case 6in square and operated by three U2 batteries, a new machine from Japan opens letters by cutting a thin strip from the top of the envelope. Price £5 5s.





N14 Recessed lighting fittings
Allom Heffer & Co., Ltd., 17 Montpelier Street, Knightsbridge, London, SW7
The CD6 circular and QD6 square Darklites are economy versions which have now been added to the standard range. They employ the same ceiling trims as the standard versions and may be recessed in wet or dry ceilings. The trims incorporate a quick-fixing self-locking device for all types of suspended ceiling. The fittings take a 150W PAR lamp or 150 or 100 IS lamps. A 4in square model is also available. Prices: 6in circular, £4 3s 0*d*; square, £5 8s 8*d*; 4in square, £4 19s 4*d*.

N15 Aluminium decking system
Midland Extrusions Ltd., Factory Centre, King's Norton, Birmingham, 30
The Spanfast system consists of extruded aluminium sections which lock together and can be used to span up to 24ft with only simple end supports. It is claimed to be capable of erection many times faster than ordinary roofing materials and to have good weathering properties. The eaves apertures are sealed with PVC and caps. Prices from 8s 6*d* to 11s 0*d* a square foot, dependent upon quantity.

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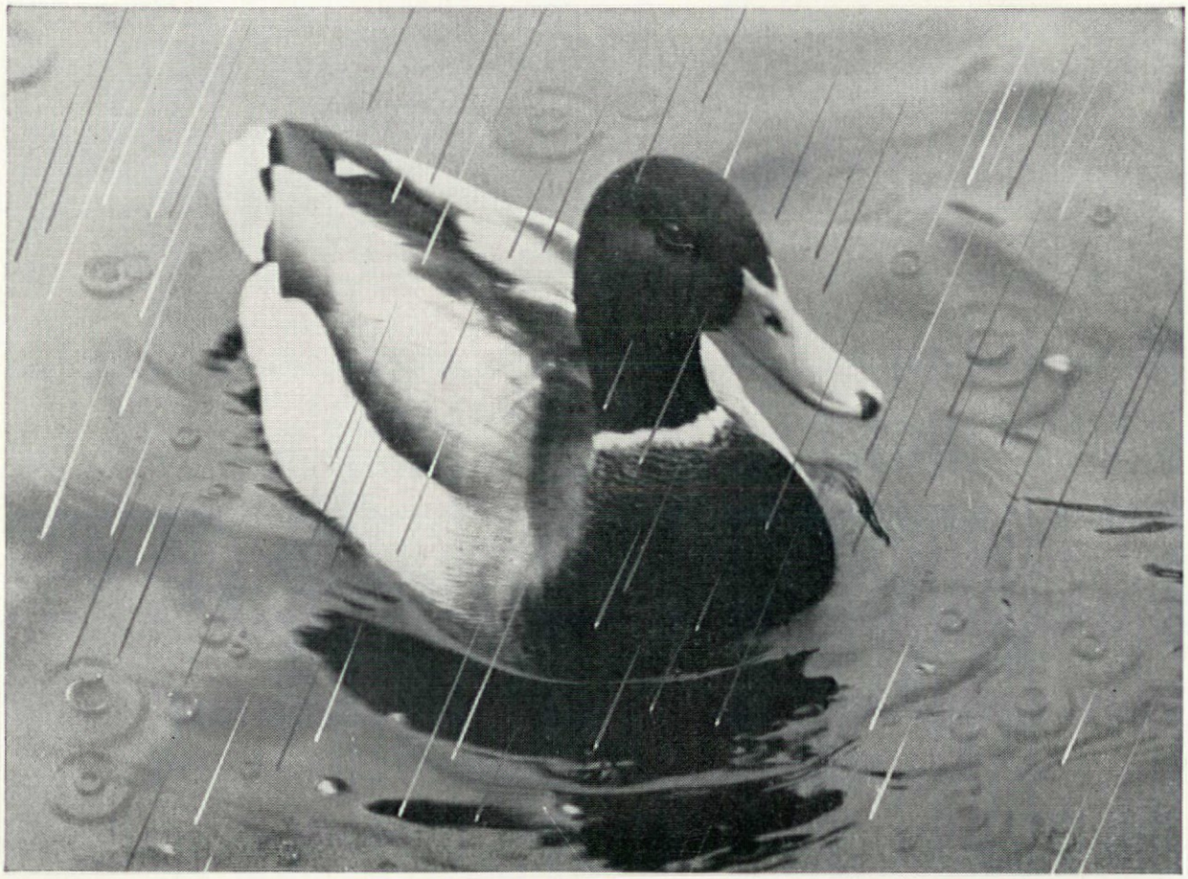

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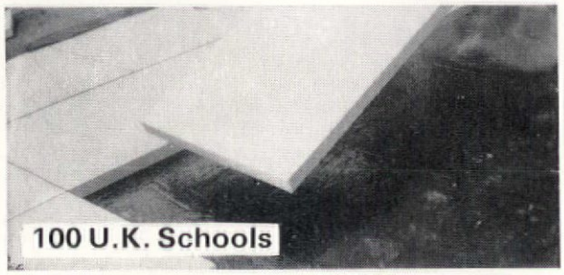

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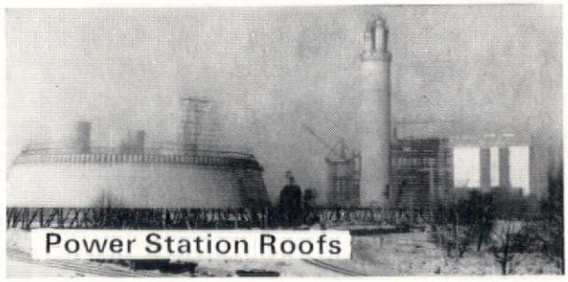
Constant environmental control: Roofmate was chosen for the insulation of a new G.P.O. Computer Centre at Derby to help ensure a damp-free atmosphere and precise temperature control for highly sophisticated electronic equipment.



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Model 1354 A horizontal display bookcase with flanking cupboards, each fitted with one adjustable shelf. The centre display section is fitted with two sliding glass doors and two adjustable shelves.
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Model 134/13 The three quarter junior display bookcase is supplied with one adjustable shelf in the cupboard section. The display section, with two sliding glass doors, has two adjustable shelves.
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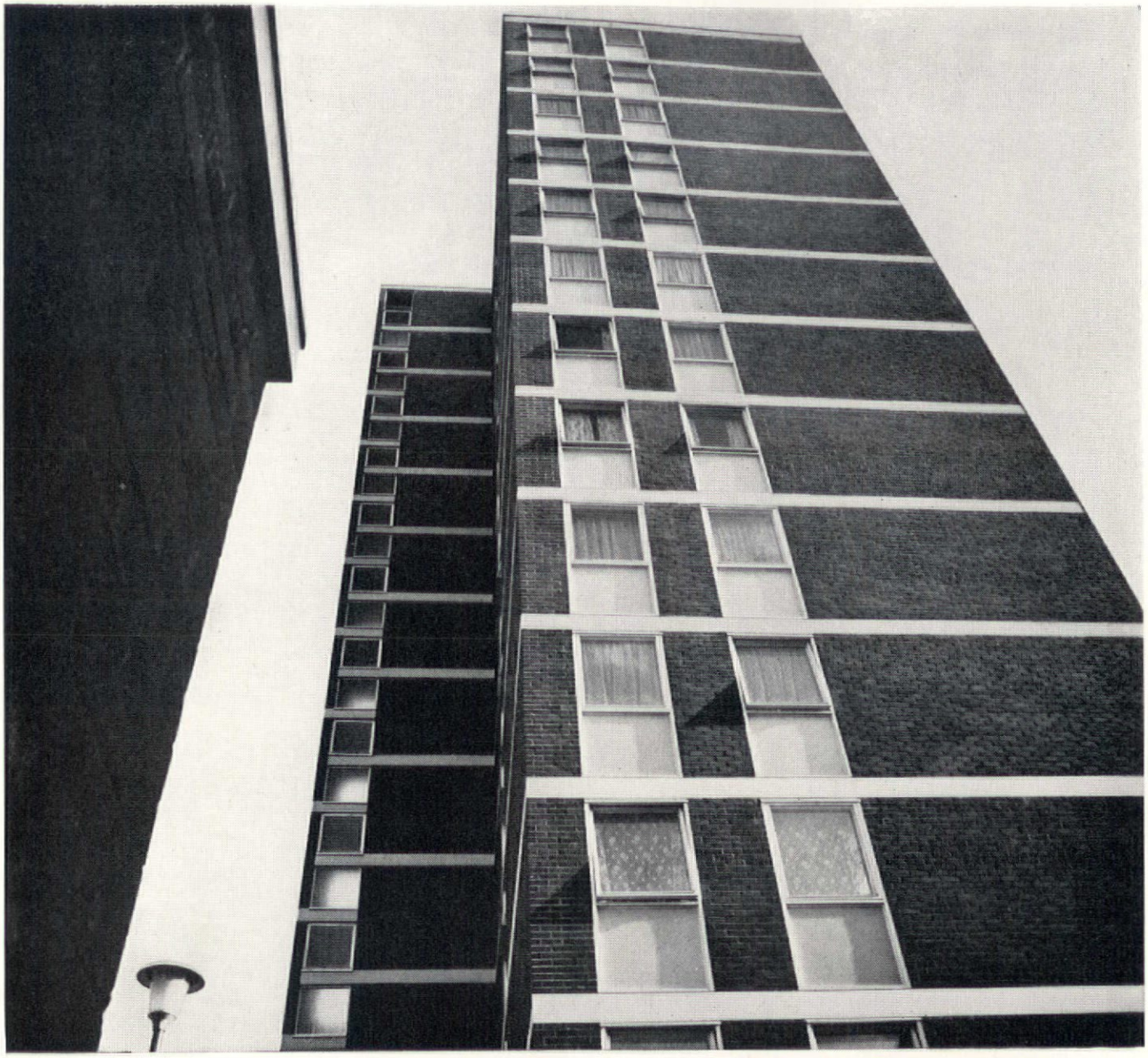

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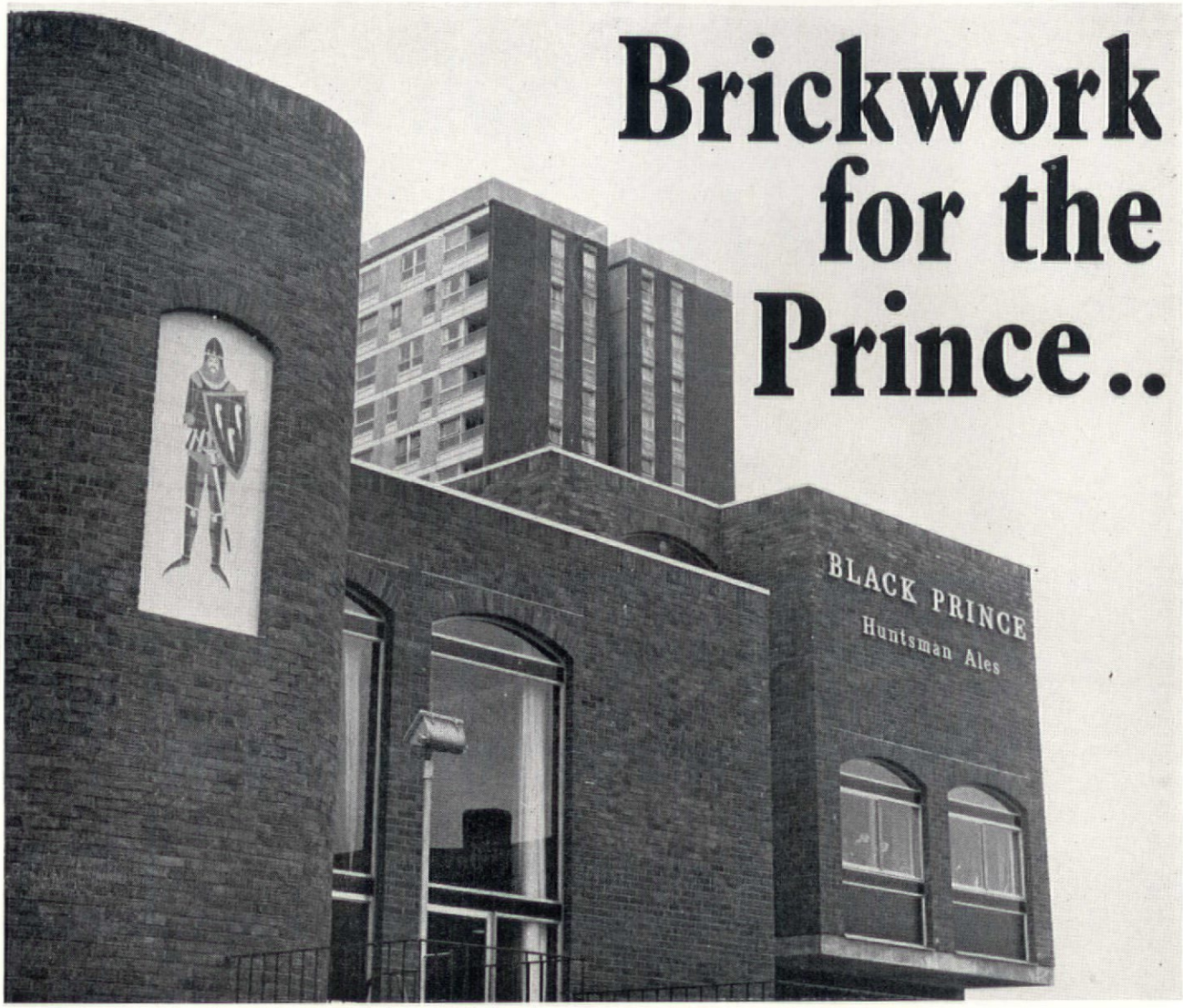

Brickwork for the Prince..

Public house, Portsmouth. Architects: W. H. Saunders & Son

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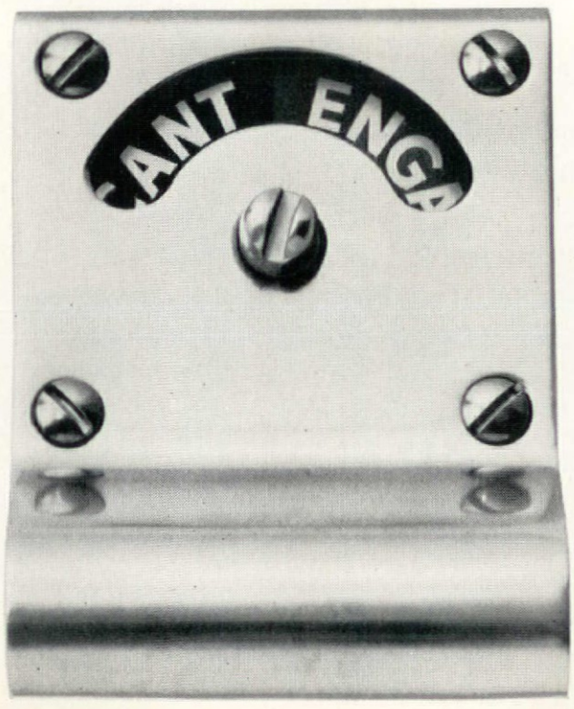

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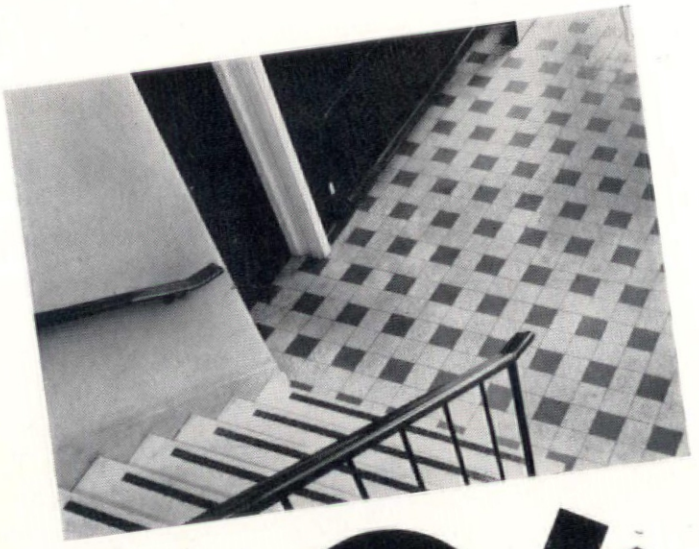

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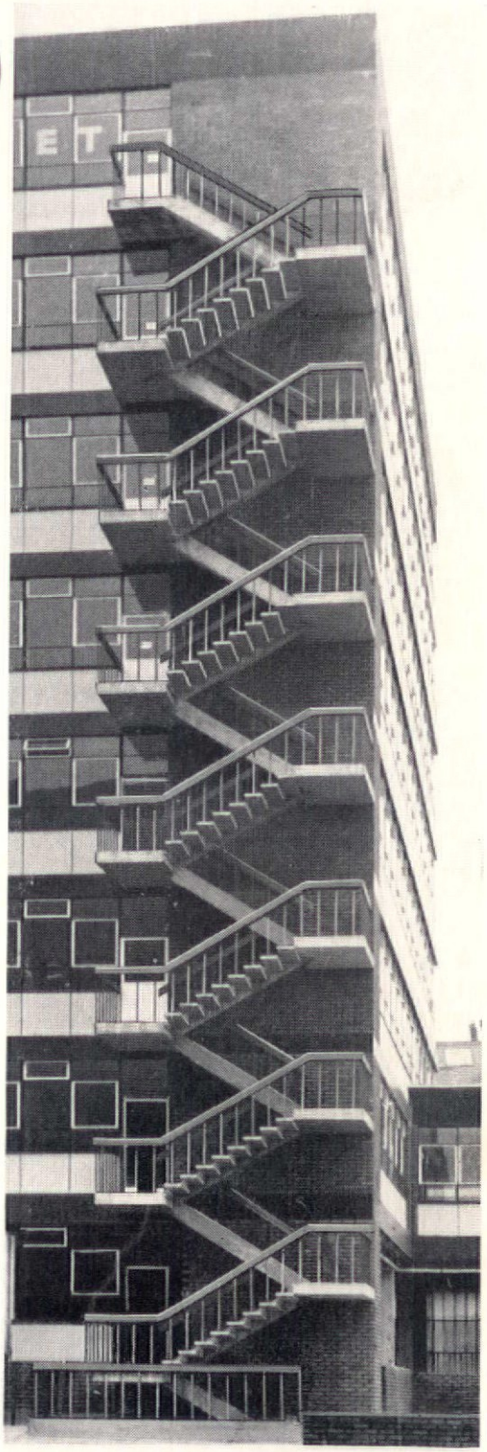

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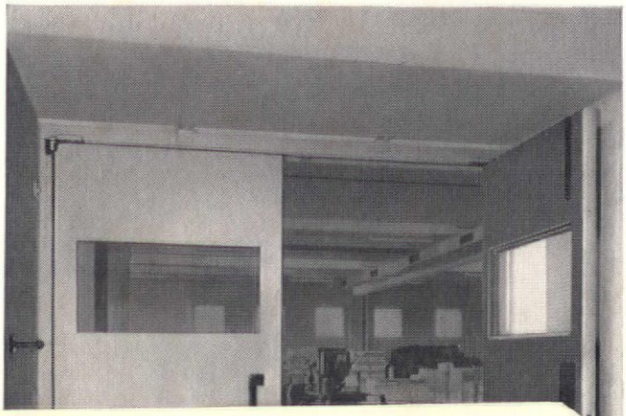

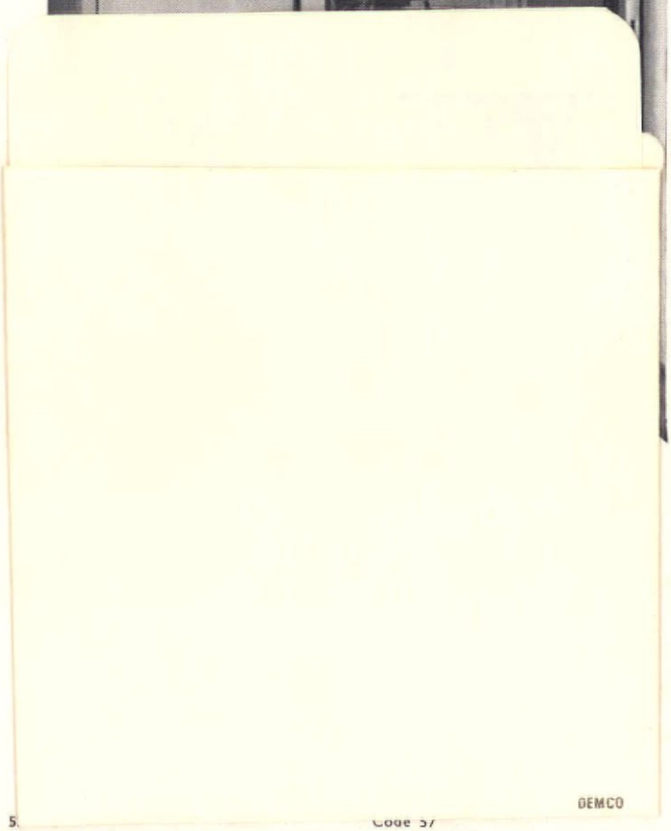

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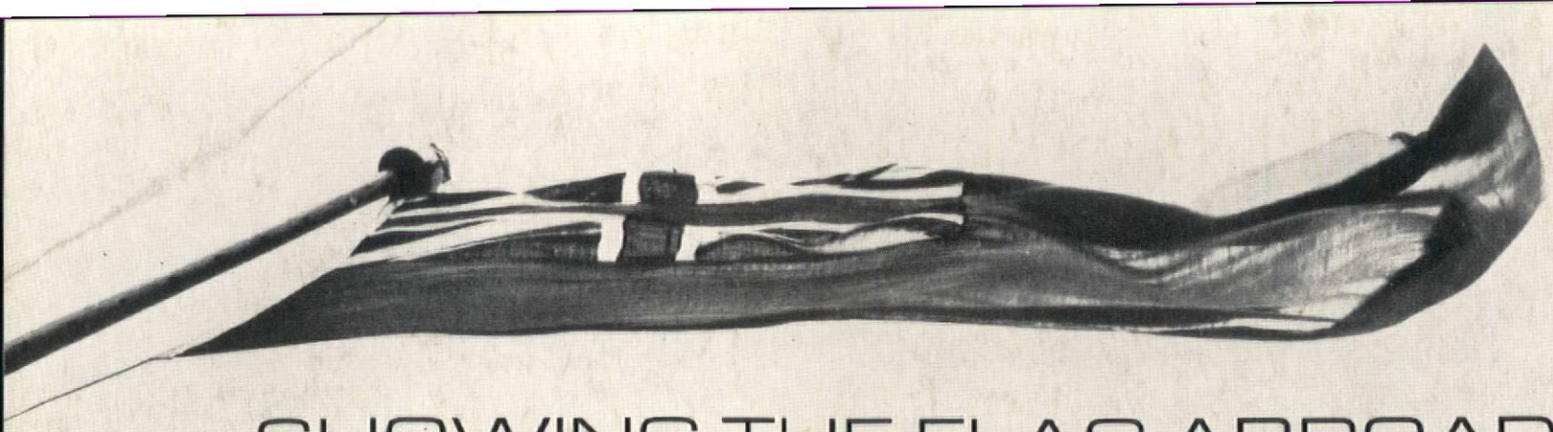

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