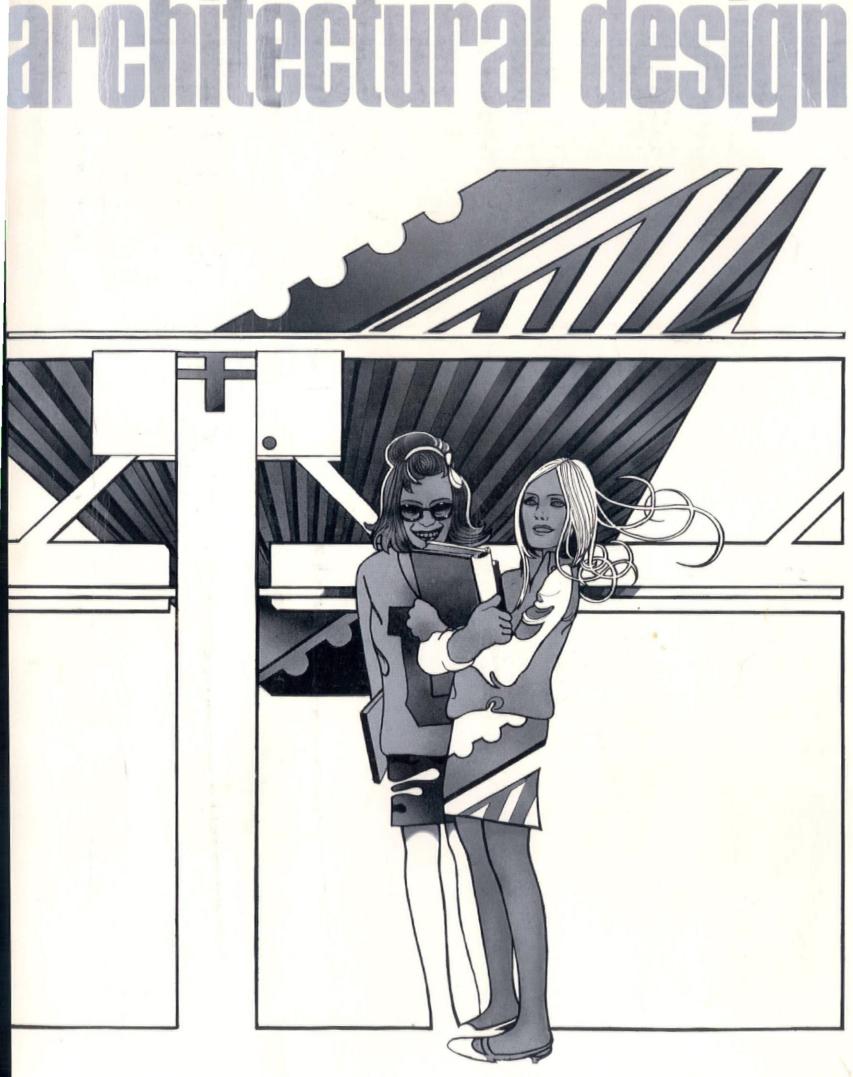
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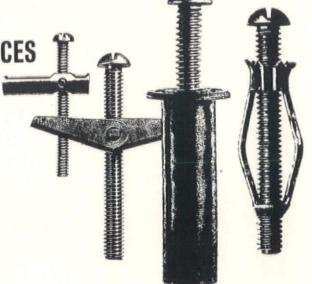
A real brain-teaser: is there any way at all of making firm anchorages in 50 panels of composite material, with hard exterior facings mounted on soft cores?

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Letters

Ideal building

Dear Sir

I have read your annual report for 1984* and I am pleased to note that at last the IDEAL corporation seems well established but, I must say, economically unable to compete with the long established CUTE (Construction Unite Trans Europ) and America's HAM (Housing by Aerospace Methods). The formation of IDEAL seems, with hindsight, to have been a uniquely British process and is symptomatic of the current neo-English revival. Its amateur, almost accidental development is in marked contrast to the thorough rationalization of CUTE and technological sophistication of HAM. I remember, in fact, that the emergence of a super-firm in the UK was forecast in 1966 by one of IDEAL's most influential members, Arthur Quarmby, but received little attention from the traditional under-capitalized industry at the time.

The failure of the UK to enter Europe at the end of the 60s undoubtedly enabled the foundations of IDEAL to be laid without exposing it to the competitiveness of more advanced systems and organizations from within Europe. The slum bulge and political pressure that followed the socialist housing failure of '67 and '68, combined with an ever-increasing insistence on housing standards to match rising earnings, resulted in an unprecedented demand for new housing that the traditional industry could not hope to provide for, even after stretching its reserve capacity to the limit. This allowed IDEAL to grow rapidly and now, in 1984, we have almost caught up with the legislation to deal with the situation for which we were totally unprepared. The growth of the mobile homes market and the world market is offsetting the drop in demand for a second family house, and this will, no doubt, ensure a reasonable level of demand for the immediate future of IDEAL homes (remember the glossy mag. of the same name?) but I am perturbed, to say the least, by the complacency of the report.

To sustain an organization like IDEAL, it must continue to expand its production or, as we have seen in the depressed automobile industry, it stagnates through uneconomic working at reduced output. IDEAL was nurtured on a housing crisis, but the prolonging of the crisis to satisfy IDEAL'S inflexibility is unforgivable. Nowhere in the corporation's report is there the realization that, to satisfy continuously rising living standards, houses must either be infinitely adaptable to cater for new requirements, or they must have a limited life, so that an improved model can be supplied easily and quickly when the original becomes obsolete. As we know, flexibility only defers eventual obsolescence and physical decay. It is also impossible to manufacture an infinitely flexible housing unit. We should, therefore, be building short-life houses, for any other product prolongs the vicious circle of eventual obsolescence and decay (slum).

There is no reason why the cycle of replacement for houses should not be steadily increased to keep pace with the rate at which appliances obsolete the houses. Traded-in houses, through the advances in thermoplastics and synthetic metals, can either be dissolved for re-formation, or traded in at local centres to provide a high standard of living at extremely low cost, for young mutual-contracts couples (previously called 'married' couples). Housing would then be a real service, continually renewing itself, avoiding the technical decay which was such a feature of the Mk. I industrialized houses.

The early systems of the 70s were mostly of concrete and were more substantial than the neolithic brick houses that they replaced. They were also less flexible and consequently became obsolete within 10 years or less, making a mockery of the old 60-year method of financing building.

Their illogical space standards (40 per cent of space devoted to 10 per cent of activity-bedrooms and sleeping) and their high demolition costs seem so fantastic, on reflection, that it is surprising that the old NBA ever granted certificates to their developers!

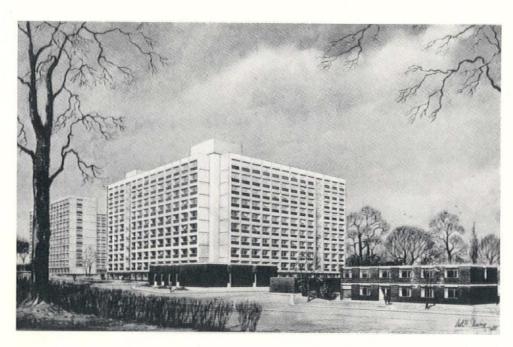
But IDEAL's failure to appreciate the implications of ever-changing demands is partly responsible for the situation today, in which 70 per cent of the housing stock is still comprised of four-person units, and yet the greatest demand is for six- and one-person units. Hence, we still have a housing shortage.

If it wasn't for my electro-encephalograph (*Daily Telegraph*, March 3rd, 1967), which is turned right up to 'maximum happy', this report would really depress me.

T. Jestico (Birmingham)

*See AD, April 1967, p. 158-9

LANDMARKS



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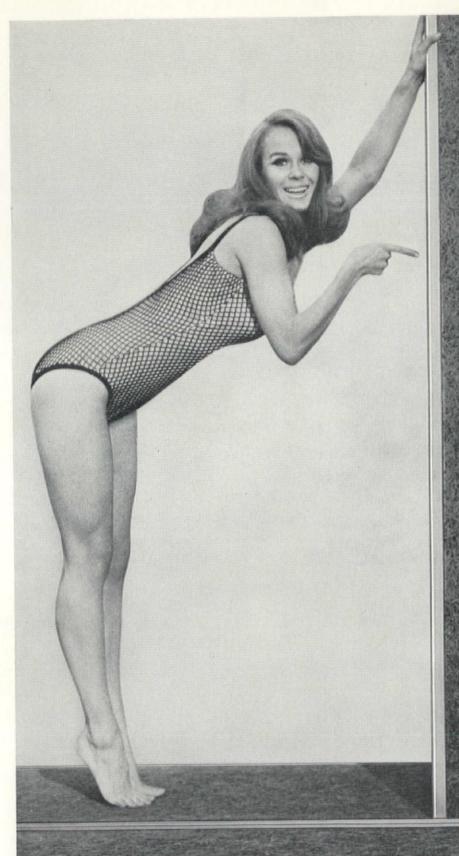
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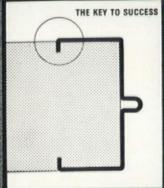
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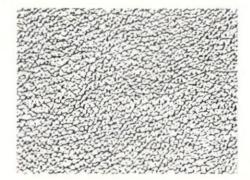
don't tremely hard-wearing Stelvetite PVC see steel laminate.

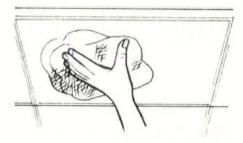
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Maintenance costs are low. Just the occasional rub down keeps them looking like new year after year.

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Above Banking Hall: Northern Bank Limited Belfast Below Boardroom N.I. Chamber of Commerce Architect: Hugh McIlveen MA ARCH (Hons) DA (Edin) ARIBA R Ferguson and S McIlveen



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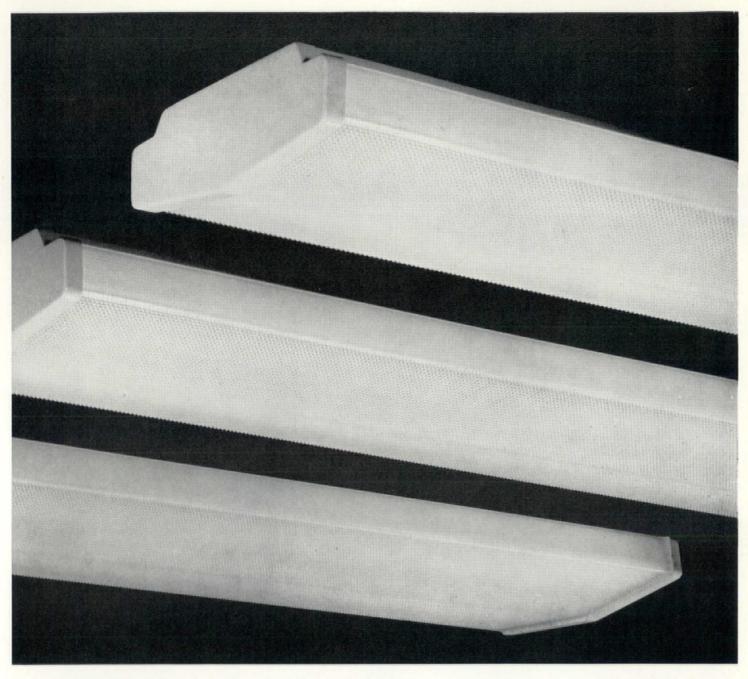
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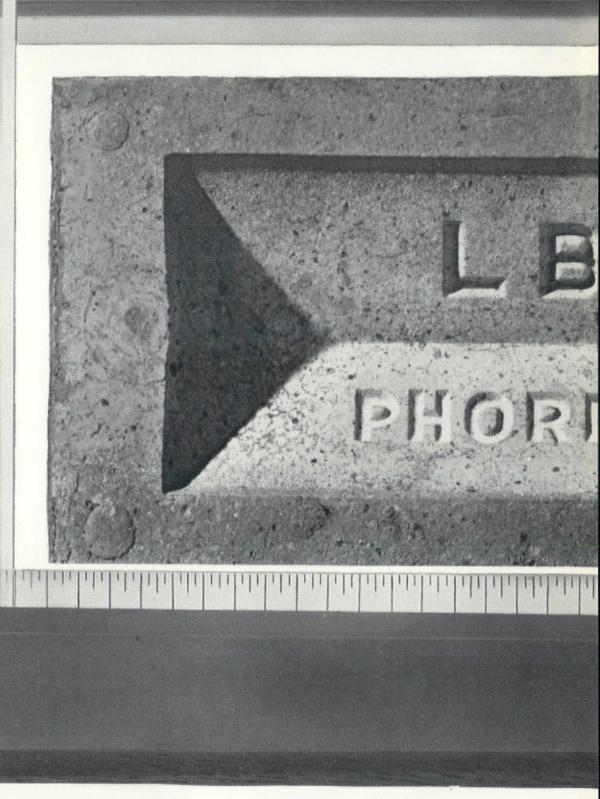




Adamsez follow-up their CoID Design Award winning 'Meridian One' suite of basin, bidet and closet with 'Meridian 2'; a compatible suite in vitreous china to a 10cm module, designed by Knud Holscher MAA and Alan Tye Dip. Arch., ARIBA in collaboration with Kenneth Adams MA Dip. Fine Art (Slade).

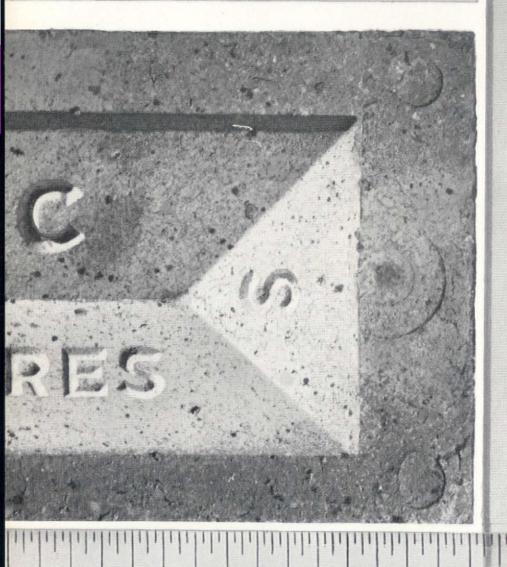
This new suite will be shown for the first time on the Adamsez stand (552, Avenue N, Empire Hall) at the International Building Exhibition, London, 15-29 November 1967, together with other new designs and a selection from the well-known range of sanitary fittings by Adamsez Limited 75 Victoria Street, London, SW1 (Abbey 5846) and Fireclay Works, Scotswood-on-Tyne (Newcastle 674185)

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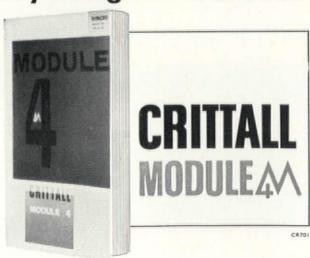
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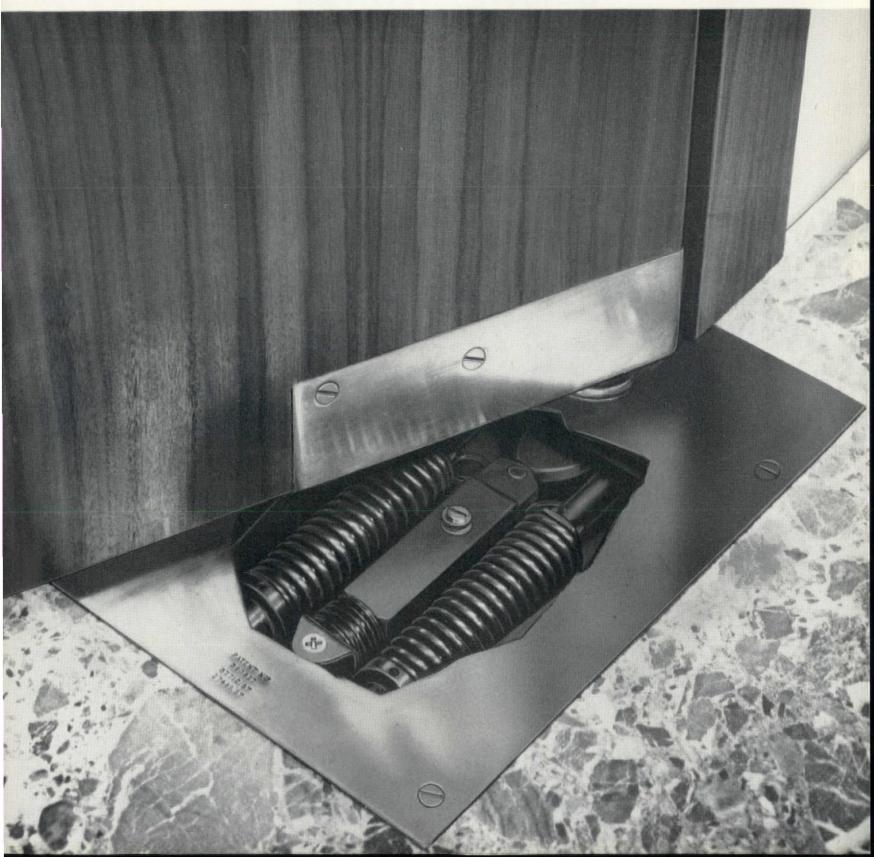


details of this + door weight tables floor mounted + heel radii data

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Can all be found in this catalogue see Barbour Index file SfB 30 or write to:-William Newman & Sons Ltd Hospital St. Birmingham 19.



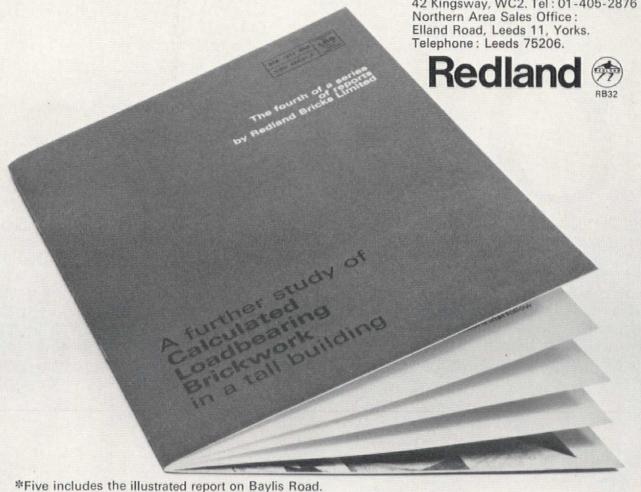


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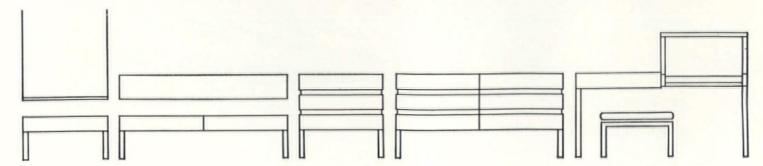
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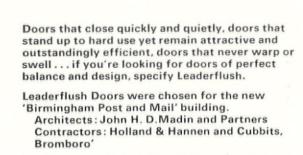
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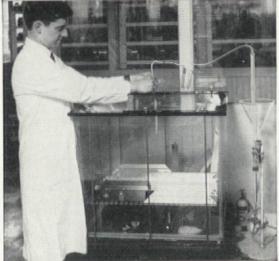
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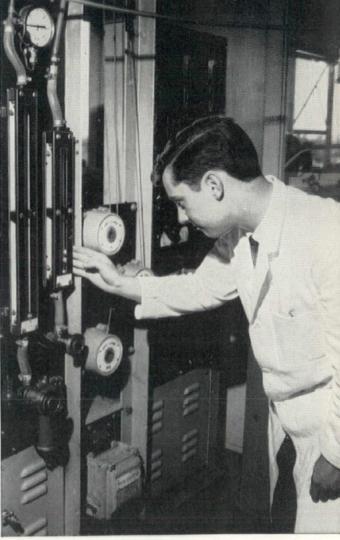
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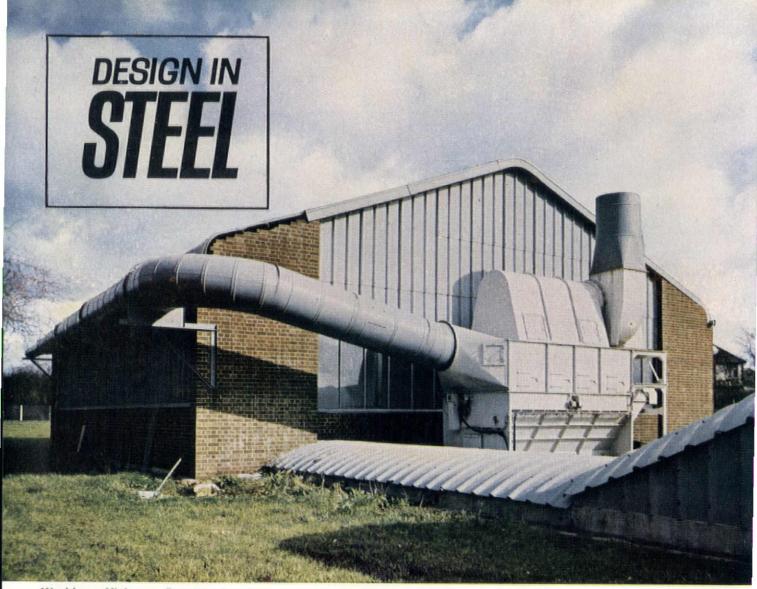
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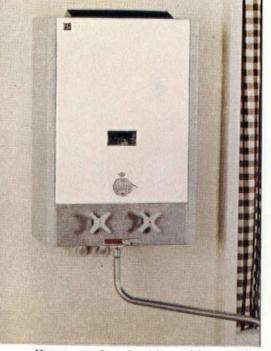
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Working efficiency Protection for refuse operators at Warmley Rural District Council's refuse pulverising plant is provided by this 28,000 c.f.m. dust control plant, which extracts dust in the form of slurry. Ducting is of galvanised steel sheet, and the wet collector and fan of mild steel sheet.



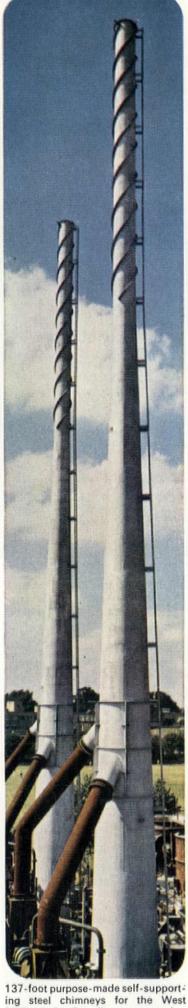
Home comfort Steel is used in a number of ways in this modern sink heater. Outer case employs stove-enamelled zinc-plated steel sheet and polished stainless steel. The back plate is of stove-enamelled zinc-plated steel sheet, and burner bars are in stainless steel.

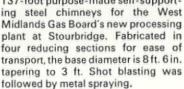
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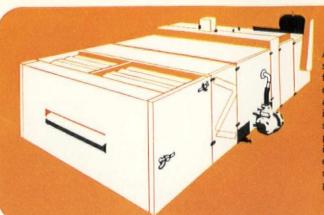
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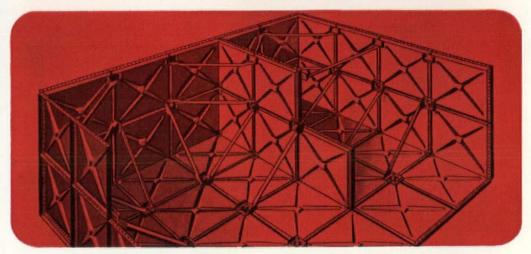
When you need a material combining experience with experiment—design in steel.



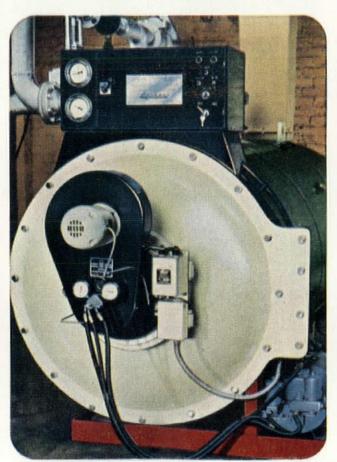




A complete packaged, central station, air conditioning unit for filtering, heating, cooling, humidifying and ventilating. Hot dip and cold galvanised sheet steel is used for the casings of each section, as well as for components of individual sections including spray tree and moisture eliminator bank. The fan shafts on most models are cold finished polished steel.



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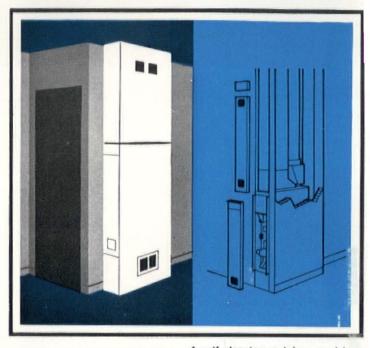




Gas fire with convector and back boiler combined in slim design. All front visible parts are number one finish EN-60 stainless steel, polythene wrapped during pressing. Aluminised steel is used for the heat exchanger.

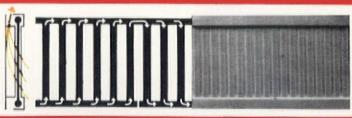


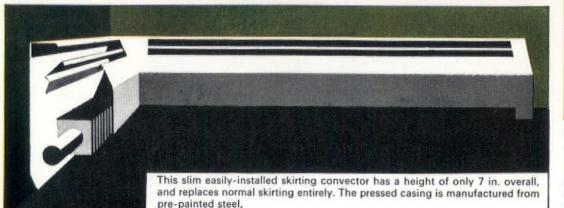
Designed for use with most gas and electric cookers, this hood provides direct extraction or re-circulation, using two-speed fan. Stainless steel case contains activated charcoal and plastic foam filters. The cabinet is stove enamelled, zinc coated steel sheet.





A heat exchanger constructed from horizontal and vertical tubes, with louvred steel sheet seam welded to the vertical tubes, gives this convector radiator a heat exchange surface and thermal output greater than radiators twice its size.

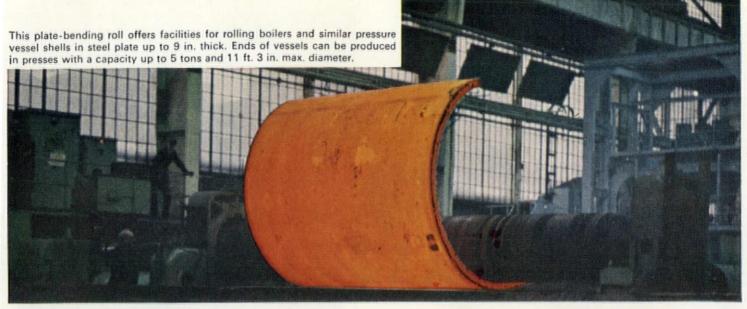




A self-cleaning stainless steel heat exchanger is used in this spacesaving 25,000 BTU/hr counterflow warm air central heating unit. The steel cabinet, designed for storey height or slot fit, is only 8 in. back to front.

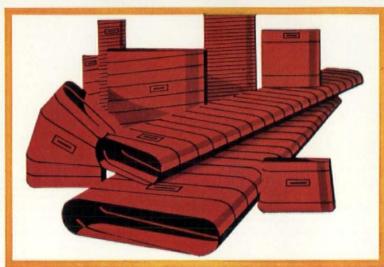


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REFERENCES Front cover Dust control plant for Warmley Rural District Council by Dust Control Equipment Limited, Thurmaston, Leics. _ 'Dart' sink water heater by R. & A. Main Limited, Enfield, Middlesex. Centre pages 'Bermuda' back-boiler gas fire by Baxi Fire Ltd, Bamber Bridge, Lancs. _ Cooker hood by G.E.C. (I.E.) Ltd, Langley Park, Slough, Bucks. _ Heat exchanger by A. G. Sutherland Ltd, Warwick Road, Greet, Birmingham 11 _ Stainless steel capillary fittings by Darchem Engineering Ltd, Stillington, Stockton-on-Tees. Co. Durham _ Convector radiator by Thermal Radiators Ltd, Falcon House, Woodley, Reading, Berks. _ Repco skirting heaters by Bekon-Bell Ltd, Slough, Bucks. _ Oil-fired boiler by Redfyre Ltd, Thorncliffe, Sheffield _ Steel chimneys for the West Midlands Gas Board by the Powell Duffryn Engineering Co. Ltd, Cambrian House, Maindy, Cardiff _ Air conditioning unit by F. H. Biddle Ltd, 16 Upper Grosvenor Street, London W1 _ Bulk storage tank by Braithwaite & Co. Structural Ltd, Gt. Bookham, Leatherhead _ Package-boiler by John Thompson Shell Boiler Division, Glasgow _ Portable projection heater by Landmaster Ltd, Hucknall. Back page Plate-bending roll used by John Thompson Ltd, Wolverhampton _ 'Fluflex' stainless steel flue-liner by United Flexible Metallic Tubing (Manufacturing) Ltd, Enfield, Middlesex & Lloyds Ltd, Lloyd House, 2 Colmore Circus, Birmingham 4 _ Pipe protected with PVC coating by Plastic Coatings Ltd, Guildford _ Galvatite ducting by John Summers & Sons Ltd, Shotton, Chester _ Vitreous enamel pipe by T. S. Hall Ltd, Vale Lane Works, Bristol 3 _ Vitreous enamel flue equipment by R. & A. Main Ltd, Enfield, Middlesex.

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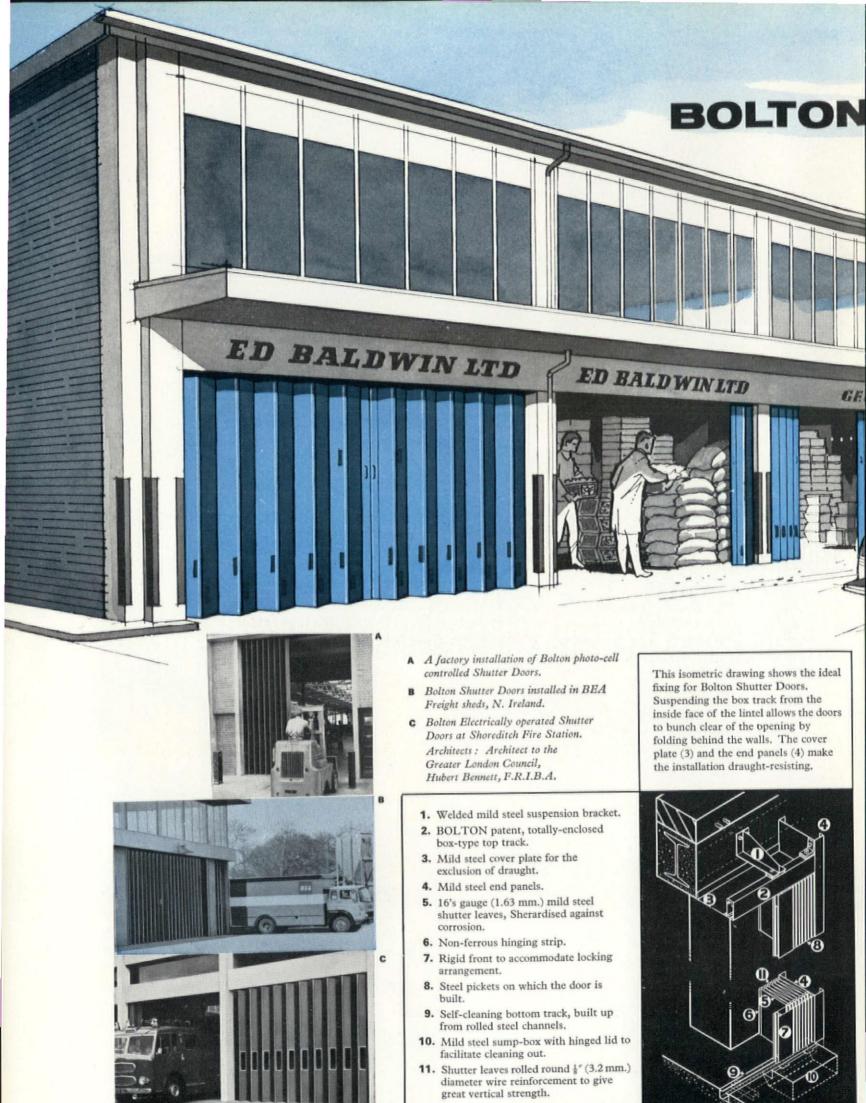
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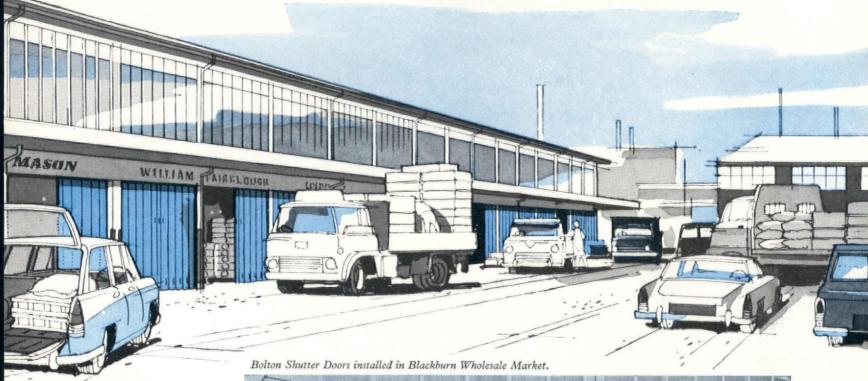
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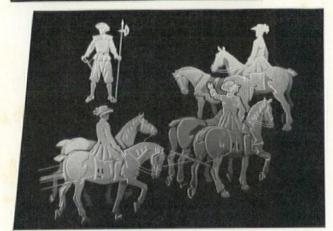
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Month in Britain

Michael Manser

Powell & Moya were commissioned by COI to design the British pavilion for EXPO 70 in Osaka.

Owen Luder discovered Lord Holford had been on the RIBA Council for 23 years, and the new leader of the GLC that his County Architect was currently coping with £75 million worth of work. Anthony Greenwood took time from his party conference to reveal that currently 500,000 houses are under construction—a record—and that 56 per cent of all houses now had baths, larders, hot water, wash basins and wc's as against 50 per cent in 1960.

The Minister of Public Buildings and Works told architects that they would be designing metrically within 15 months, and the British Standards Institution published a booklet *Going Metric: First Stages*. 6200 scientists went down the brain drain.

Alcan Universities Conference programme research revealed that loneliness may be because your front door is in the wrong place and that the position of windows may alter your habits. This might depend on whether you are one of Anthony Greenwood's privileged 56 per cent. Alcan also discovered that if you live in the north of England and have a walled, paved

garden facing south, you can sit out in the evening three hours longer than your neighbour, You'll probably be one up for frostbite tool).

The President of the Institution of Structural Engineers forecast that great increases could be expected in the strength of structural steel. According to the Ministry of Public Building and Works the risk to life is three times greater for building

workers than those in any other job.

The public enquiry opened into the route for the M25 across the best bits of countryside on the North

Downs of Surrey.

Competitions were announced by the AA and the Goldsmiths Company to regenerate an existing ILEA school; by Bird's Eye for a kitchen system for the future; and by Runcorn Development Corporation for the layout of a major residential area. But on November 29th at 6.30 pm at the RIBA, dissatisfied architects will discuss how to realize, before 1970, over 25 competitions annually. (NB. Nominations are due before February 15th, 1968, for the next Reynolds Award.) Christopher Chataway, ILEA's leader, was elected

chairman of MACE (Metropolitan Architectural Consortium for Education) which now comprises 20 London education authorities plus the Department of Education and Science, UGC joined CLASP.

The historic centre of Stamford was the first town to be designated as a conservation area under the new Civic Amenities Act.

The December issue of AD includes a special feature, Heroic Relics, a sequel to The Heroic Period of Modern Architecture (AD Dec. 1965) illustrating the present condition of the surviving paradigms of the twenties. Also articles on Olbrich & Schindler & illustrations of the Centre Le Corbusier, Zurich.

Israel congress of architects & engineers
This international congress, postponed from June, will
now be held from Dec. 18th to 23rd. Speakers include
R. Buckminster Fuller, Arieh Sharon, Louis Kahn,
Michael Brawne, Bruno Zevi, L. Quaroni, A. Mansfeld.
Registration £16. Inclusive charge from UK (air+hotel)
from £111 to £136 per person. (Details from Don
Marshall, Elal Israel Airlines, 193 Regent St., London,
W.1.)

New education

This year the Fourth Rice Design Fete (Rice University, Houston, Texas) focussed on New Education for New Towns.

This research project, sponsored by the Ford Foundation's Educational Facilities Laboratories Inc. and under the direction of Professor William Cannady, selected six prototype new towns and developed an architectural/educational programme for total education in each town.

The six architects who took part were: Charles Colbert, Paul Kennon, Niklaus Morgenthaler, Cedric Price, Robert Venturi and Thomas Vreeland.

Parliament curtain-walling

In 1965 Professor Colin Buchanan and Sir Leslie Martin together submitted their proposals for the reorganization and development of the area around Parliament Square. Their Whitehall report has been vigorously and viciously attacked but, in principle, it has been accepted by the government.

Sir Leslie Martin (no historicist) has specifically recommended that Sir Charles Barry's (and Pugin's) great pile be in no way altered or extended. It stands today an image, if not of the British Empire, at least of Great Britain. It can be tampered with only at great peril-both to the public faith and to the tourist trade. Yet, for the function of government, it is today inadequate. There are no more than 77 rooms for Ministers and 68 for individual MPs. Approximately 400 rooms (15ft × 12ft) with additional secretarial space, are needed. Sir Leslie Martin proposed that these, together with new dining rooms and other facilities, be placed in a new building on the far side of Bridge Street, overlooking the Thames Embankment. This building, the Ministry of Public Building and Works, envisaged, would be linked to the Palace of Westminster by a tunnel under the roadway. Though, if the Whitehall report were to be fully implemented, no such expedient would be needed; Bridge Street would be closed to all through traffic.

A sub-committee of the Commons Services Committee set up to study the recommendations for new office accommodation have rejected entirely Sir Leslie Martin's proposal*. They are not to be reassured by his statement that the building on the Bridge Street site would 'read as a recognizable entity associated with Parliament'. As an alternative they have thought of moving the offices and residences of the House of Lords to a new building in Black Rod's Garden and allowing the Commons to expand, but have put aside the idea quickly enough—'this suggestion was examined by the Services Committee and was thought for a number of reasons to be impracticable at present'. Instead they propose a new building 1 (planned by the Ministry of Public Building and Works at £15 a sq ft), completely enclosing New Palace Yard. Four storeys high along Bridge Street, three storeys high along the Parliament Square frontage, it would obliterate one of the most famous views in London, crashing into St Stephen's Tower (Big Ben), effectively masking Westminster Hall. Even the catalpa trees would go. The aesthetic justification for this piece of botched expediency ('perpendicular' in its general effect to harmonize with the existing building and mercifully not in the pastiche Gothic promised earlier by the Speaker's committee) is that Sir Charles Barry himself intended such a building. While it is true that Barry prepared ungainly designs in 1844 and again in 1853 for enclosing New Palace Yard, 2 this was done under pressure when he was asked to accommodate the Law Courts on the site. The design was not part of his





original conception, nor did he much admire it. Such historical justification is, in any event, specious. The committee has more compelling concerns. MPs have six minutes to get to the Chamber to vote after the division bell has rung. The new building on the Bridge Street site, it is argued, would be too distant. With adequate lift accommodation (and escalators and travelators, too, for the ride) the problem could be easily solved. More pertinent, the committee state 'Bridge Street is not only a physical barrier, it is a psychological barrier'. One can sympathize with those MPs who might feel isolated on the Bridge Street site from the Parliamentary hub, but by insisting on being a physical part of it they will destroy the very image with which they seek to identify themselves. The proposed new offices will not, moreover, provide a proper, long-term solution to the problem-only 123,000 sq ft of office space can be squeezed around New Palace Yard and along the flank of Westminster Hall, even now 150,000 sq ft are needed. So that some sort of building will have to be put up on the Bridge Street site. Parking is another problem. An underground car park is proposed 'since the subcommittee is strongly of the opinion that any parking in the enclosed yard would seriously detract from the aesthetic appearance of the new building! *New Parliamentary buildings, HMSO 2s.

King's Cross and St Pancras Hermione Hobbouse

British Rail's recent decision to retain King's Cross rather than St Pancras as the north-eastern terminus follows the recommendation of a working party report. But the working party is concerned with much more than redundant termini. The King's Cross area will have to accommodate the confluence of an important link to the motorway, the Euston Road, and an existing north-south traffic corridor through Camden Town, a new coach terminus for those who no longer wish to travel by rail, and possibly an air terminal for Stansted. BR's ingenious scheme for diverting commuters at Finsbury Park on to the Victoria Line, or straight through to the City at Moorgate, will relieve some pressure on the area, but will still leave it one of London's major traffic interchanges.

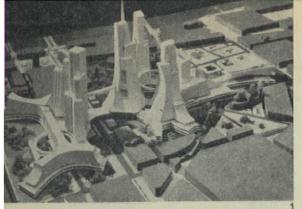
The future of the important terminal buildings, regarded as 'among the major architectural works of their era (and) also industrial monuments of international significance' is not yet settled.

The future of St Pancras is now a matter for the Borough of Camden which shows a most encouraging

attitude to the matter.

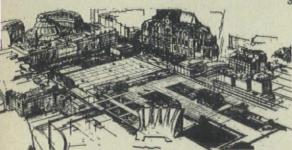
The future of King's Cross, to judge by the perspective made public by BR, 3 is likely to be less happy. Leaving aside the unlikely and undesirable non-urban garden city environment implied by this piece of suggestio falsi, the two-storey concourse slapped down in front of Lewis Cubitt's functional façade will be disastrous. The station's mutilation in this way will be little better than BR's original plan for demolition (contrast view in AD, October, 1966). There seems little reason why BR, if they are given permission to build a lucrative office block next door, should not be required to provide an agreeable urbane and urban setting for these two heroic buildings.

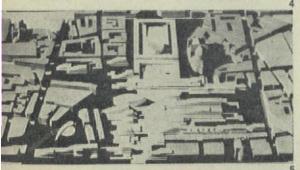


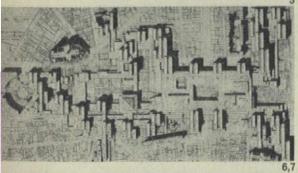












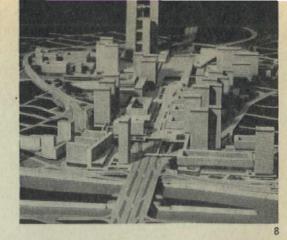


Paris-the power to act

Whether or not power corrupts absolutely, it brings out the absolutist. Apart from the intransigence, ruthlessness and general skullduggery, this involves, as a rule, the most grandiose dreams of glory. Despots want obeisance and reverence not only during their lifetime, but after death. They want to be remembered, if not for their deeds, for some solid, monumental achievement. Building mania is the result. French rulers, in particular, have been prone to building sprees. Louis XIV found his medium in Jules Hardouin Mansart; Napoléon relied on Percier and Fontaine; by the time of Louis Napoléon, an administrator rather than an architect was needed and Haussmann was summoned from Bordeaux. Now General de Gaulle has pinned his faith on M. Paul Delouvrier, a man of versatile ability, who moved from the Resistance, through various Finance Ministries, to become first Secretary General of the Government Commission of European Economic Co-operation, then director of the financial division of the European Coal-Steel Authority. In October 1958 he was picked by General de Gaulle to be his delegate general in Algeria. 'I'm afraid I'm not big enough for the job, General', he is reported to have said. 'You'll get bigger, Delouvrier,' the General replied, 'you'll get bigger.'

Together they have since conceived a grand and efficient Paris of the future. The scrubbing and refurbishing of old monuments that has been going on at the instigation of M. André Malraux, is a mere prelude to a glorious glass-and-concrete future. The architecture of the millenium as it is already emerging in the towers of Maine-Montparnasse and La Défense and as it is glimpsed in Paris-Match (July 1 and 8 1967), is of the most ignorant, botched and rétardataire kind. But the statesmanship that has made such heavyhanded fantasias possible is of the most impeccable, adroit variety. Plans have long been laid. M. Delouvrier was appointed head of the Délégation Générale au District de la Région Parisienne in 1961, but real power has devolved upon him only recently as the result of the most far-reaching administrative reforms. The division of France into 90 Napoleonic departments, it was long realized, was inimical to any large-scale economic planning. Not until 1964, however, was France divided into 21 new 'régions du Programme', each under the command of a regional prefect. The problem of Paris was set aside for the moment. But the anomalies of the situation caused some ugly scrimmaging in the provinces. Who was in command? Were the heads of the regions in full control of the new administrative entities or were they mere coordinators of inter-departmental services? Were the departmental prefects subordinates? In theory, of course, there should have been no conflict: the regional heads were to control economic planning, transportation and population shifts, the departmental heads were to supervise routine administrative matters, the taxes, the police and the schools. But power cannot be too fastidiously delegated. For two years the Government sought to allay the problem by making the prefect of each new region the prefect also of its central department. Only in September 1966 did they appoint the first independent regional head, M. Paul Delouvrier. Decrees were published setting up a new superprefecture of the Paris region and giving to its prefect greater authority than any other regional prefect.

By the autumn of 1968 the fruit and vegetable market at Les Halles will have been transferred to a vast new depot at Rungis, near Orly. The development of the 32 hectares thus freed (it seems a foregone conclusion that all but one of Baltard's pavilions are to go—see AD, May 1967) are the subject of considerable speculation. No less than 12 different projects,* by six different groups of architects, have been prepared. Jean Faugeron, the designer of the flamboyant Ministère de l'Education Nationale, has submitted another obtrusive design 1 for a whole cluster of sculpted towers, one rising to 280 metres. Marot and Tremblot have also made bold to introduce a tower (intended for the Ministère des Finances) into the centre of Paris 2, but they have wisely submitted an alternative, traditionalist scheme—a series of rectangular courts surrounded by low buildings in the manner of the Place des Vosges or the Palais Royal 3. Even more preservationist in spirit is the design of Claude Charpentier 4, in which all building is kept to the 26 metre height limit, the surrounding area is not to be dominated or rudely changed, unless it be by the



His exact hierarchical relationship to the eight departmental prefects of the new Paris region was not too precisely defined, but there is little doubt who exercises authority. His task is to replan and render habitable an area of 12,000 sq km. where 14 million people will find housing, employment and opportunity for recreation by the end of the century.

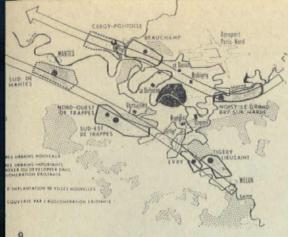
On July 27th, 1964, long before he had assumed full power, M. Delouvrier presented his Schéma Directeur (master plan) to General de Gaulle. The following year it was published. Its boldness and scope are staggering to English observers-and to quite a number of French ones too. Paris is no longer to be conceived of as a great radial city, slowly being choked by grim, concentric accretions; it is to become part of the linear development of a whole region 9. The lines of this expansion will follow the spontaneous westward movement of the town, running in two roughly parallel lines along the valleys of the Seine and the Marne. The northern line of development will stretch 47 miles from Cergy-Pontoise to Meaux, the southern line 56 miles from Mantes to Melun. But to avoid the effect of a continuous ribbon development eight independent new towns, or 'colonies' as they are called, surrounded by greenery, will be strung out along these lines. The main centres proposed for development are Pontoise-14. Bry-sur-Marne-Noisy-le-Grand, Tigery-Lieusaint (all of which will have their own universities), Evry, Trappes (which will become an electronics centre) and Mantes-Sud. Two immense parks of 7000 acres each are proposed as recreation areas, together with other forests and pleasure grounds. In addition there will be two new airports, Paris-Nord, at Roissy-en-France, which is to replace Le Bourget by 1972, and Paris III, half-way to Rouen. Work here is likely to be initiated only in 1985. More than 100,000 acres have been acquired or appropriated for the new townsroughly the total needed for the factories and office sites, universities and administrative buildings. The construction of Evry, to the south, has begun. But the boldness of the venture has not been translated into detail. Here it might flounder. The Institut d'Aménagement et d'Urbanisme was created only in 1960. There is a dearth of expert and experienced planners. For Cergy-Pointoise, Graeme Shankland and Oliver Cox of London have had to be called in. The problems of detail that are being tentatively tackled in the regional area are already acutely visible in the outskirts of Paris and in the centre itself, where building has begun.

The task of transforming the 20 arrondissements of Paris is that of Maurice Doublet, the new Prefet de

introduction of large open spaces (so desperately needed). Louis Arretche has presented two variants for making the area a cultural centre 5, grouping comparatively low buildings in various geometric configurations. Louis de Marien has hedged his bets even more effectively, offering three variants—one with a 'nef culturelle' 6, another with a sprawling Ministère des Finances and the third with buildings kept to the Paris height limit. In two of the designs a Baltard pavilion is retained. The AUA team (Atelier d'Urbanisme et d'Architecture) commissioned by M. André Malraux, has made three plans for mixed development, none are extravagant, but neither are they particularly distinguished. Their distinction rests on the pattern-making abilities of the designers—a diagonal arrangement 7, a rectangular one and another of squares

The 12 projects were shown to General de Gaulle on May 19th of this year, but he decided to defer his decision until the autumn

* L'Architecture d'Aujourd'hui, May-June 1967



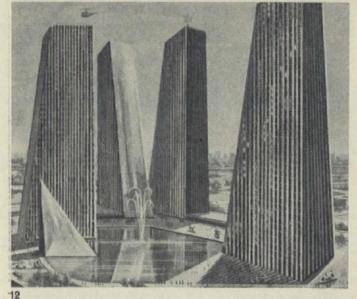
Paris, and the head of his planning department, Henry Bernard, Industry is to be gradually removed from Paris. By the end of the century, it is hoped, the population will be reduced to no more than 3,000,000, enough, it is thought, to sustain the focus of French civilization. To relieve the present pressure on the centre (Parisians have only 4.4 sq m of open space p.p. compared with Londoners' 9 sq metres) intensive development is proposed of an inner ring of suburban centres-Versailles, La Défense (which is well under way 8), St Denis (where Michel Folliason has designed a cluster of eccentric towers, the Ensemble Pleyel 12), Bobigny, Creteil and Rungis (where the markets of Les Halles and Bercy are to be accommodated). Two new universities of science are proposed for the west, the Université de Villetaneuse, for 20,000 students, and the Université et Centre Scientifique de Montesson, for 15,000 students. The counterpart of these will be the Ensemble Culturel André Malraux 15, near La Défense a glorifled university of fine arts and architecture and a museum of twentieth century artefacts. The first sketches for this were done by Le Corbusier, but the vast rectangle proposed (296 metres long) is now being detailed by André Wogenscky. The perspective of this as delineated in Paris-Match, with two neighbouring blocks of tiered flats, is disheartening in the extreme, the real sadness is that this and the other views offered of the Paris of the future are probably more realistic in their evocation of the environment than any more tasteful architectural renderings. The central area, if we are to judge by the brushstrokes of M. Tangy de Rémur and M. Michel Siméon, is to be devastated. It has always been assumed that the centre of Paris was to remain undisrupted by towers-the height restriction would stay at 26 metres. But the Maine-Montparnasse tower, 200 metres high, has already overshadowed the left bank. On the site of the Santé prison (to be moved outside near Fleury-Mérogis) Jean Faugeron is to build an extraordinary tower, 180 metres high, for the Ministère de l'Education Nationale 13. At Le Front-de-Seine an expansive and expensive high-rise residential quarter is to be developed 10, while on the site of the Entrepôts de Bercy an equally aggressive, though no less pedestrian array of residential and office towers is proposed 11. At Les Halles it is feasible that a further cluster of Faugeron towers will

These of course are the more spectacular changes intended. There are numerous other developments planned, most of which will not be so obtrusive. Though the transportation network (see over) might do more to alter the appearance of Paris than any individual building or group of buildings. The Axe Nord-Sud, might necessitate the demolition of 10,000 houses. The Right Bank expressway has already

transformed parts of the city.

But modernity is not all. Consolidation of past glories is afoot. Perrault's east façade at the Louvre has reemerged, the ditches around the Place de la Concorde are to be dug out and Louis XV is to be restored to the centre (the obelisk will be banished to the forest of St Germain); the Palais Royal, though it is to shelter one underground parking garage, is to be refurbished. The Invalides will become the President's residence, the Ecole Militaire will be prepared for the Prime Minister. At Versailles the perspective of the Grand Canal will be extended four kilometres. Paris is being stripped of encumbrances and groomed as a great European, even international capital. Its new symbol will be a flashing cybernetic tower (347 metres) near La Défense, by Nicolas Schöffer (see over).

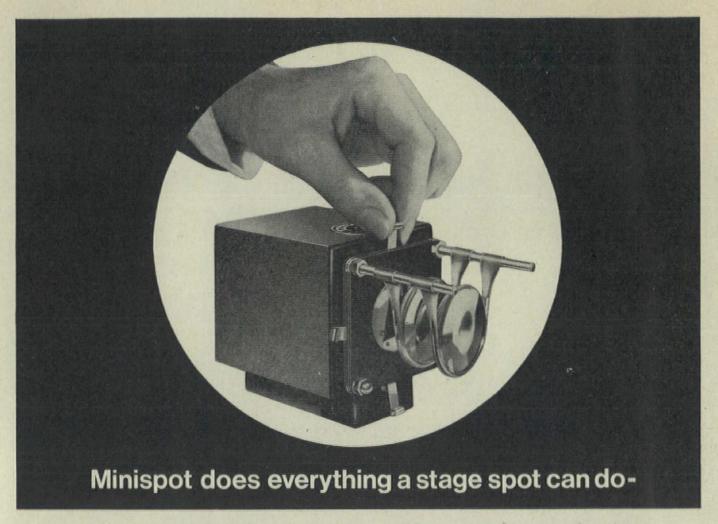








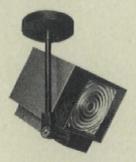




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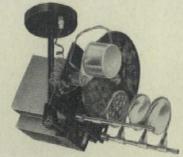
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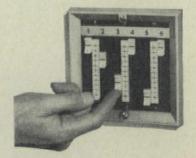


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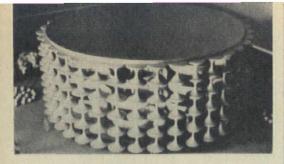
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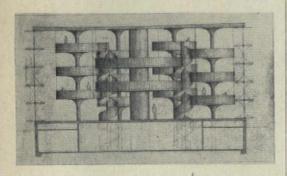
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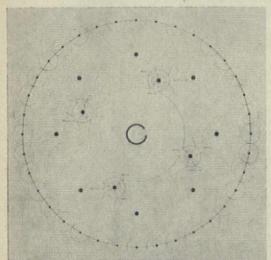


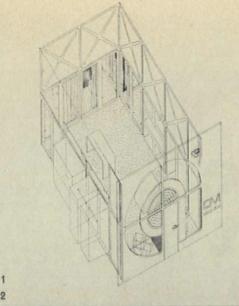


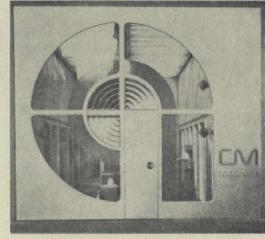
Here we go round

Verner Panton, the Danish designer known for his plastic pouffes and swinging chairs, has turned once again to architecture. He has proposed a circular office building, screened and supported on the circumference by diabolo-like pre-cast concrete elements; internally layered general office areas are encircled by helical stairs and tiered circular offices. He is, it seems, intrigued by 'roundness'.



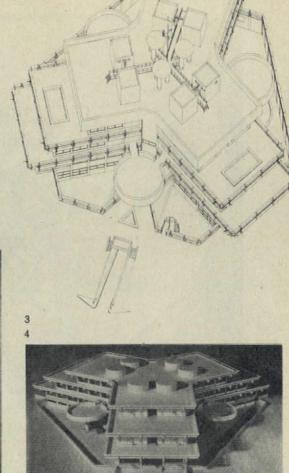






Geometrical relationships

The extraordinary obsession with precise and preferably symmetrical geometric form that characterizes the work of the modish designers of Vienna, has inevitably established that city as the last outpost of orthodox Neoclassicism. Adolf Loos lived and worked there and must no doubt be held accountable for much of the stiff formalism in the work of such architects as Walter Pichler, and Hans Hollein—who has recently finished the Boutique Christa Metek 1, 2*, successor to the award-winning Retti shop (AD, 6/1966),—and Gustav Peichl—who is at present building the Meldling rehabilitation centre for 50 patients with



injuries to the nervous system 3, 4. This icy, formal tradition can probably be traced back to those much duller nineteenth century architects, Peter von Nobile, Joseph Kornhäusel, Ludwig Foerster and Theophil von Hansen. Semper himself ended up in Vienna. Though it is fair to say that the way in which Pichler, Hollein and Peichl manipulate their forms is far more compelling. But their effects clearly derive from graphic rather than architectural or even sculptural means. And for all their attraction, their designs are conceived primarily as formal, geometric compositions.

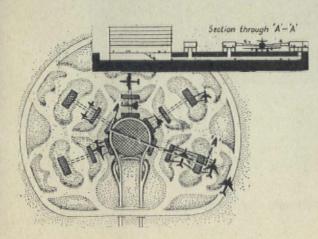
*Bau 3, 1967

Paris development details

Below

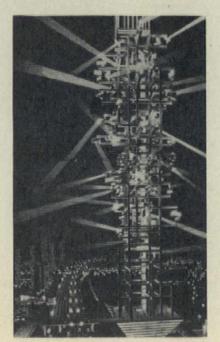
Plan and detail section of one of the centralized passenger terminals proposed for the Paris-Nord airport at Roissy-en-France, 15 miles north-east of Paris. When the airport opens in 1972 only one of these terminals will be in operation, but by the end of the decade there should be five such terminals, capable of handling a total of 25 million passengers a year and 2 million tons of freight

Financial Times, March 8th 1967



Below

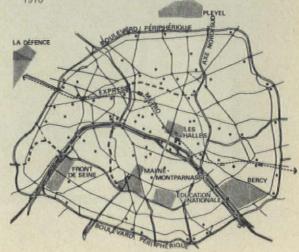
Nicolas Schöffer's cybernetic tower for Paris Paris-Match July 8th 1967



Belov

Primary traffic network proposed for Paris, Double lines indicated expressways (6-8 lanes), the dotted sections being underground or in cuttings. The secondary system is for fast traffic, with no intersections. The dots at the crossings show interchange points and pedestrian tunnel crossings. Independent dots locate underground parking garages, some of which are already built

The express Metro running through Paris from St Germain to Boissy-St-Leger is due for completion in





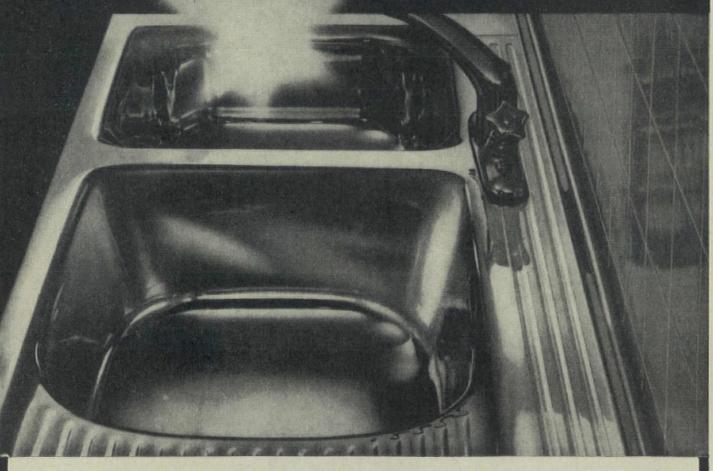
modern planning is full of them!

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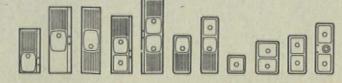
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The cripples are coming

A report on the first conference by CASE (Centre for Advanced Studies in Environment) held at the Architectural Association, Bedford Square, on designing for the physically handicapped.

A swinging subject—a dismal start. Swinging because this subject, in fact, should involve technological innovations of the moment. Dismal, because at no time were these even mentioned.

This is not to say that we learnt nothing during those two sweaty days.

Selwyn Goldsmith led with his discussion of a parallel population (see page 493) that is to be adjusted to its disability by not being forced into the mould of independence. A variety of speakers spoke up, and many facts emerged.

But what are the main problems?

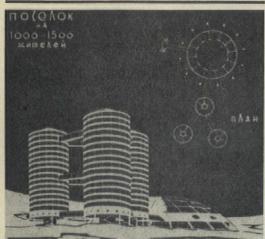
First, the people. Anthropometrics are not enough. We need to know what type of disability leads to what type of movement (e.g. many spastics have long reach, but control is only possible within 6in of the body). Some disabled people consciously lose balance in order to transfer themselves. Minds differ—people have spatial disabilities. Feet take the place of hands. Facts are needed.

Secondly—appliances. Why was no one present from a research group into wheelchairs and other aids? The whole basis of discussion was the wheelchair which might change or be superseded by more sophisticated devices—walking machines, pressure suits, hover and jumping chairs.

Thirdly—the cities and the architectural approach. Why did not one of the Archigram boys insist on being present? Why are they not studying the type of person their cities are for? The cripples are here, and their numbers are increasing inexorably.

Why did the conference not deal with possible changes in cities?

The problem of architecture as a 'barrier' to the disabled was discussed at great length. But only the conventional buildings we know. Why was it not mentioned that, with the development of space techniques and one's own personal waste disposal pack, lavatories may become redundant? Incontinence might not matter. Buildings as we know them, may not even exist. As technology develops, and this is all much sooner than the members of the conference might think, the old 'physical barriers' might not need to be resolved. If money were given for this purpose anyone capable of manipulating one switch (possibly not even that) could be physically independent. This has already been shown with the Possum equipment (see p. 526). Certainly, as from now, it will take all sorts to make a world, and if architects want to make that world they will have to be aware of and able to use effectively all advances in technology. Ruth Lakofski



New town, Russian style

The project for the new town of Mirnyj in Jakutia in the northern USSR, is near one of the richest diamond mines in the world. There is no railway to the town, roads are impassable most of the year so most of the freight is airborne. This housing complex, for 1500 people, is therefore entirely of prefabricated aluminium components.

Arkitektur 10, 1967



Drop City

Buckminster Fuller awarded the 1966 Dymaxion Award for Architecture to Drop City, a cluster of nine assorted geodesic domes made up with timber frames and covered with cut up and hammered out car tops. The inhabitants of this community, 25 miles from the town of Trinidad in south-eastern Colorado, are mainly young people and children. They are dedicated to a communal, creative life. They write, paint and make films. One of them has tried to make a 'solar heater'—modelled on those now manufactured in Israel—with rear-view mirrors mounted on steel rods. Thus far it has failed to generate much heat.

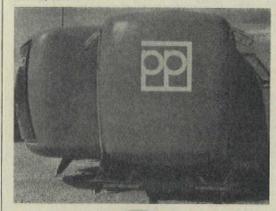
Architectural Forum, September 1967

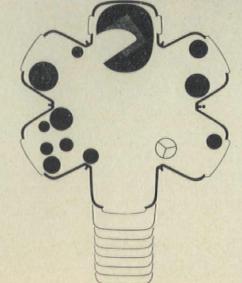


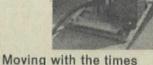
Plastic publicity bauble

For Pré-Magasin Prisunic, Gérard Ifert and Rudolf Meyer, together with the architect Jean Maneval, have devised a publicity pavilion in reinforced plastic that can be towed anywhere like a trailer and opened up to form a sizeable star-shaped room.

Werk 9, 1967







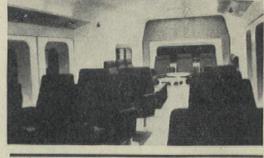
A prototype 'People Mover'—a variant of the Minirail from Lausanne that was re-used at Expo '67—has been developed by WED (Wallace E. Disney) Enterprises and the Goodyear Tyre and Rubber Co and installed at Disneyland. Continuously moving trains, made up of four cars each, seating four people, are boarded from platforms revolving at the same speed as the cars, which is no more than 7 mph. The cars are propelled by electrically powered wheels set at intervals between the concrete tracks. A total of 62 trains moving along a three-quarter-mile track will carry a maximum of 4880 passengers an hour.

Progressive Architecture, August 1967

The 'Skylounge', developed by the Budd Co. to transport passengers either, or both, by road and helicopter from city centres to airports, is to be tested out at the Los Angeles International Airport.

Architectural and Engineering News, July 1967





Home on the Cerro Torre

For the four British climbers who are to attempt the ascent of the Cerro Torre, a stormswept wall of granite and ice at the southern tip of South America, Glass Fibre Laminates of Lancashire have devised a base hut, made up of GRP sections bolted together, with a translucent cap for light and ventilation.

New Scientist, 12th, 10/1967





Skin is wonderfully waterproof. But skin flakes, blisters, wrinkles, damages easily and

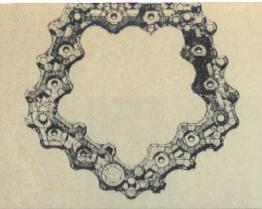
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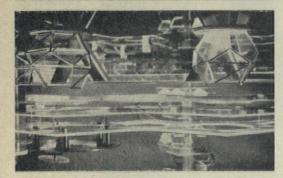
ing fire retardent types).
If you would like samples, and details of these and other applications, please send the reader reply form.



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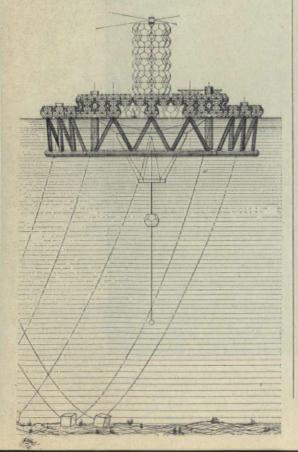


Floating

Monaco can apparently boast oceanographic societies bent on pushing such space-consuming activities as porpoise riding, good high living and even gambling three miles out to sea. It is a financial proposition and it only rocks one degree off the vertical in a gale.

The artificial island, designed by Edouard Albert in collaboration with Commandant Cousteau, is to be made of steel—13,000 tons—having a central yacht basin, ringed with research laboratories, offices, flats and restaurants. Stability and balance is achieved by emptying and filling the 40 private swimming pools.

L'Architecture d'Aujourd'hui, April-May 1967





French rig

The 'Neptune Gascogne' prospecting rig, weighing a total of 7000 tons, is so designed that the platform can be raised or lowered down to sea level by six 50 hp motors.

A derrick

E platform

B security grilles C helicopter platform F pipeline

D supports

L'Architecture d'Aujourd'hui. September 1967

Cristofv

An Anti-Fatigue Device has been invented by Dr Cristo Cristofv. Plugged into the electric main it creates indoors the same positive electric field as that found outdoors. Buildings, cars and aircraft, Dr Cristofv claims, shield man from nature's positive field of electricity, causing him to tire easily and to do less work. With the device switched on you revive. No humming. No flashes. Simple electronics.

Architectural and Engineering News, 7/1967

Here we go again, counting on nuts

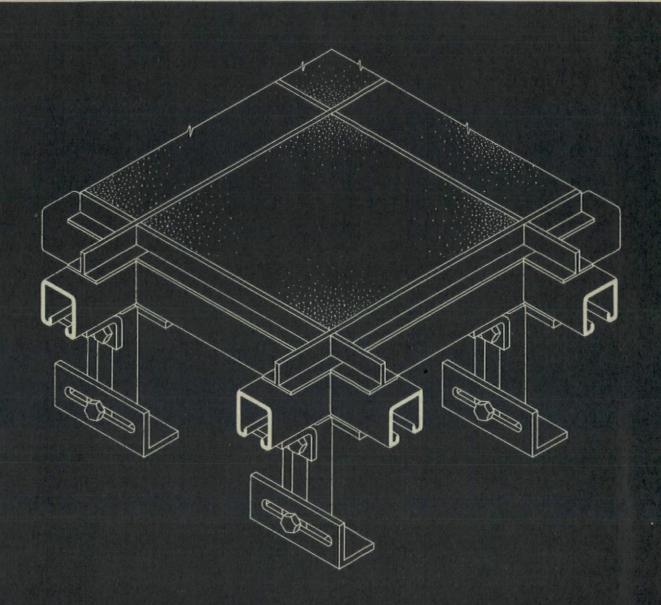
Viollet le Duc having first fully formulated the programme for a doctrinaire, rationalist architecture, was the first to find that it didn't work. The function of a building cannot be clearly enough defined to make it the sole generator of the design. An architect has to approximate, guess and make unverifiable and often entirely emotional decisions. To what degree he should indulge this license has bothered critics for over a hundred years. Most have preferred the most rational possible of architectures. They have demanded honesty in expression. In our prim and chaste period of architecture this became, even, a source of delight. An exposed girder could make us beam with delight. Such delectation in the devices of structure led the Russian architects of the twenties to indulge in a fantastic and fanciful display of girders and braces and struts, gussets and bolts, that had nothing (or very little) to do with the problems of statics, but were expressive of an idea of structural efficiency. We all know that El Lissitsky's and Mart Stam's 'Wolkenbugel' project is impractical and extravagant, but we continue to admire it. Even such monsters as the Eiffel tower have been accepted into the canon. Photographed from the inside it can be seen as an imbroglio of girders and nuts, spiral staircases and inclined elevators. But it is neither efficient nor useful-useful that is in terms of the limited 'rationalist' rubric, which are, after all, those within which it is to be judged and admired by modern architects. They, however, have a quilty belief that the engineer is always right.

From Viollet le Duc onwards critics have been teaching us to admire severe, practical things—railway trains, ocean liners, grain elevators and, more recently, oil refineries and radar stations, floating rigs and space craft. And here we go again: John Johansen introduces



us in the September issue of Forum to two spare and elegant sulphur mining installations, Grand Isle and Caminada, built in 1966 and 1967, in the Gulf of Mexico. What a plethora of grids and girders, cat-walks and bridges! Each platform with its particular function is clearly defined and isolated from the next, but linked to each other by dramatic causeways. There are helicopter landing stages and prefabricated housing blocks. Complete 'towns' it seems, have been created in this way. As living environments they are, no doubt, nightmarish. Workers will put in only a three- or four-day week. Yet one can see the point of Johansen's eulogy. Most of the problems architects have to contend with have been ignored altogether, but a limited goal-to mine sulphur efficiently-has been set and resolved in a simple and practical fashion. The elegant array stands there to remind us that the functional ideal is tenable. And who can wonder that architects should admire so direct a statement when they see all around them the botched, ignorant and pretentious attempts of their peers-and, of course, themselves.





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Books

Cities of Destiny

Edited by Arnold Toynbee. Thames & Hudson. 8 gns. Of the large display-books, with numerous beautiful photographic plates, which have been pouring from Thames & Hudson, this surely represents the ne plus ultra. The most discriminating connoisseur of the outré as presented by modern technical dexterity, will find his attention gripped and held by this almost pyrotechnic display-the modern equivalent, for a company director's reception room, of the bejewelled lions and singing-birds at the court of Constantine Porphyrogenitus. As he browses, he may well reflect that man has satisfied his spiritual and artistic yearnings in innumerable fashions, almost all of them beautiful in their way, up to the dawn of the Machine Age.

The text, too, will surely enthral the curious, Arnold Toynbee takes up civilizations as Fred Hoyle juggles with galaxies, and grades Eridu and Changan, Weimar and Tenochtitlan in scientific, non-chronological classifications based on the fixity of human nature and the predictable recurrence of certain tendencies and situations. He selects critical periods in some twenty cities which he considers about the most important in human history. He displays, indeed, something of Guizot's majestic certainty on remote epochs-the more majestic the more remote they are. But even he is defeated by time. For the cities of today are unpredictable and unparalleled in their enormity. He even unconsciously disagrees with M. Doxiadis, this book's prophet of the twenty-first century. For Toynbee, the city-state has not proved to be 'the wave of the future'; while Doxiadis takes Periclean Athens very seriously indeed, and hopes that its spiritual descendants will arise in the small neighbourhoods, the living cells held together by the bony structure of Megalopolis, the single world-city of the future.

The captious, indeed, might argue that Toynbee has not fulfilled the main purpose of an editor, of ensuring a minimal uniformity of treatment from the eminent contributors. Hale, for instance, can describe fifteenthcentury Venice with hardly a word on its architecture: while Carcopino puts detailed descriptions of buildingtypes in the forefront of his picture of Antonine Rome. Even in his encomium of Tenochtitlan, Bernal rightly informs us that Teotihuacan was the true City of Destiny and creator of culture in Central America. But one would not gather from Douglas that the Paris of Abelard (which by the way is well before 1150, Douglas' professed starting-point) practically invented Gothic architecture. Nor from Fulford that Victorian London had even more efficient free libraries and museums than those rightly praised by Nevins in the cities of the USA. Yet it is surely very important that a man like Bernard Shaw could educate himself gratis in Victorian London. Fulford is sparkling but superficial, and the editor should have provided some depth.

Then, too, though the sources of the illustrations are all given with admirable clarity (a good mark for the book here), the bibliography of each chapter is too short and scrappy, and should have been supplemented by the editor. For instance, Arberry's admirable account of Cordoban life and literature is weak on architecture. Though full of Al-Hakam, it nowhere describes or even refers to his magsura, the crowning glory of the Great Mosque. But he cites no book on Spanish architecture, not even Bernard Bevan, to fill the gap. Similarly Talbot-Rice, writing on St Petersburg, ignores Cameron's buildings and Loukomski's books and is herself no architectural critic. Bowra, on Periclean Athens, treats us to an old-fashioned Victorian-style encomium, with breath duly bated and with no concessions to scholarly researches and discussions during the last half-century. The editor, as a Hellenist, should have goaded him.

Even more seriously, one may question the principles on which Toynbee has selected his cities and periods. The haut monde of company directors is possibly tired of Babylon and Egyptian Thebes, of sixteenth century Venice and seventeenth century Paris (all omitted). But what of Augustan Rome? In the last chapter of the book Doxiadis argues with great reasonableness that we must begin the inevitable large, expanding, dynamic 'cities of the future' well away from the old centres of existing towns. For it is our ancient towns, even more than our countryside that carry the culture of the past and the hope of culture for the future-one point that is very well made by this book. We need a new urban system, growing outside and alongside the old, and allowing the old to rest in civilized peace. This being so, we should study Augustan Rome. For, in the small field of the Ancient World, Augustus consciously achieved what Doxiadis prescribes for the Modern. He created a whole administrative organization, with its material appurtenances and its own 'dynamism', alongside the old centres and governments of the Empire. Trajan, of course, was still governed by the Augustan spirit when he projected his enormous new forum, the culmination of those Imperial Fora which had supplemented the small Forum Romanum of the Republic and made the centre of Rome at last worthy of her Empire. But this is one of the few points missed by Carcopino in his excellent chapter on Antonine Rome. Here, too, one may accuse the editor of failing in grip. All this and more might be urged. But Toynbee does supply an inimitable matrix, in his own peculiar manner, for this miscellany of untidy, stimulating contributions. Every one of them has at least something valuable to say, some exciting questions for the discerning to raise; and paradoxically his correcting passages, with their syntheses and comparisons, leave the reader even more excited and uncertain. Why did Egyptian culture last so long, with so little change? What made the Romans and the Chinese so pre-eminent as great planners on virgin sites? Why are slum's proving so intractable in our own culture? The whole book, in fact, resembles one of the more ambitious plays of Bernard Shaw. It poses innumerable questions, and offers little hope of answering any. We need such books today, to remind us that, for all our technical advance, we still really know less than Socrates, who knew that he knew nothing.

Hugh Plommer

The Region's Growth The Lower Hudson

Regional Planning Association, New York

The Lower Manhattan Plan

New York City Planning Commission

Planning literature in the US is intended to be mainly persuasive and compares rather favourably with a certain arrogance and dogmatism one finds in official British publications. The US planning scene is very complex: authority is fragmented among a vast number of jealously independent communities and authorities. For every new project a new authority seems to be created, and it seems to stay in being. Funds come from all over, and tend to be made available for special projects: a highway, an urban renewal project. For general and apparently obvious planning the planner has to persuade private enterprise.

In the circumstances planning in a European sense is impossible. But in practice the environment is generally no worse than in our own carefully controlled areas, the process has saved everyone a deal of frustration. Planning has therefore become a process of spotting

trends and pointing to opportunities.

In The Region's Growth, there is a simple, and cheerful welcome of the inevitable urbanization of the Atlantic seaboard; of the growth of employment and income. It points out the inevitability of more residential dispersal and more office concentration in Manhattan, though this is probably arguable. Manhattan has many disadvantages such as high rates and costs.

In The Lower Hudson there is a fresh recognition of a great opportunity, due to the change in transport modes, which has now begun to have a real effect on Manhattan and New Jersey. On the New Jersey site the release of the great railroad lines and piers makes another vast area available for regeneration. Shipping, now full containerized, has moved much further downstream. The Manhattan piers have fallen into disuse, and have created a possibility for a new waterfront redevelopment, which is looked at in detail in the Lower Manhattan Plan.

Here the solution of a double sunken motorway allows access to the river, and a new use for flats and marinas, linked to new office building in the dead area just north of Wall Street, which will regenerate through the presence of the world trade centre. Good forward looking stuff. Theo Crosby Designing for the disabled

Selwyn Goldsmith, revised edition. RIBA, £3 10s.

Mr Goldsmith's prime concern in this revision of his unrivalled standard work has been to establish what is euphemistically called 'a new philosophical approach' and to isolate 'a major controversy with the American point of view'.

He would like to see every human being accepted as of equal worth, simply because he is a person. In order to help normal people to accept as one of themselves, the severely disabled, he lays emphasis on the use of signs-for public buildings in particular. These signs would depict a person in a wheelchair and would lead the way to suitable entrances, w.c. accommodation, etc. No abstract symbol would achieve the same result.

For years notices have been around such as: 'Beware of the Children'. 'Slow down-Cripples Crossing'. 'Institute of the Blind-take care'. To any rationally minded person there is no reason why such signs should not be extended.

Mr Goldsmith's second 'controversial' doctrine is sensible too. The American viewpoint is that one can design normal facilities in such a way that all disabled people can use them. They admit only of one population; capable of independence, initiative and determination; able to help themselves and all the rest of it.

But, as Mr Goldsmith, or anyone else who has worked with disabled people is aware, capabilities differ. The Americans have designed for that section of the wheelchair community who will be able to cope independently with work situations. They are evidently not particularly disabled.

Mr Goldsmith believes in designing for two separate populations, i.e., the normal who can cope with anything, and a second-which must also be regarded as a norm-with special needs.

The points are clearly made and quite acceptable. But are they so important that they need so much discussion? For in the later sections of the book there are serious inadequacies.

Mr Goldsmith has not thought the problems out anew, i.e. analysis of types of mind and body; types of movement related to types of disability. Types of props available now compared with those to be expected in the future. What will our new cities be like? Will the all-important w.c. still be as it is today? What has new technology to offer in this context? Will we get rid of our personal waste as we do today? Will we wash in the same way? What will be our pattern of movement? Will those signs be necessary at all? Will we even be visiting public buildings?

But even in detail from the most limited and pedestrian viewpoint the book is muddled with omissions.

Ruth Lakofski

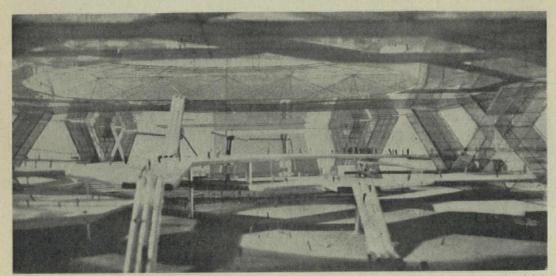
Asymmetric Typography
Jan Tschichold. Faber, London/Cooper & Beatty, Toronto.

Jan Tschichold was 65 last April: this summer appeared the first publication in English of his 1935 classic Typographische Gestaltung, translated with affection, but designed in abominable disregard of all that Tschichold represented then.

When 23, he published a special number of 'Typographische Mitteilungen': elementare typographiethe first statement of an uncompromised frontal approach to a functional, sachlich typography; followed three years later by Die neue Typographie, based both on the relation he made between typography and abstract painting, and on the necessity of recognizing the constraints of Standards (DIN-Normen) in design. Tschichold was later regarded as a 'traitor', since around his fortieth year he was so sickened by the artefacts of militarism that he reneged on his objectordering concept, and transferred his affections to 'good, old-fashioned' typography. Earlier, he had preached approach, not style, but a very sharp hindsighted eye can see in early designs precisely that stylistic emphasis for which his later work is condemned: though a link of freedom, understanding, precision and majesty runs singing through.

He has served himself badly by this book (apart from the very beautiful illustrations from earlier days); but we should be ashamed that it has taken us over 30 years to admit Tschichold to his proper company: Anthony Froshaug Mondriaan, Rietveld and Didot.





Non-denominational architecture

At Montreal, whatever pious intentions the planners may have had, a heterogeneous mess of pavilions was set up, each independently conceived and designed. There was little unifying concept in the general layout. Even in detail design the circulation and transportation systems were inadequate. Whatever small contribution it might have made to architecture, Expo '67 gave no stimulus to urban design. Such, at least, is the opinion of those Japanese observers who are at present preparing designs for Expo '70 at Osaka. Kenzo Tange and his team are determined

to introduce what is termed 'urban technology' into the basic layout. This focuses on a vast area, the Symbol Zone, where people can gather and mingle, can idle and be entertained by one another as well as by ambitious light and sound and water displays. This area, covered with a vast roof so that it can be used in all weathers, will be further enriched with suspended platforms, enclosed air-conditioned areas and restaurants, all linked by escalators. This great framework for collective activity will dominate the exhibition. 'Architecture' will be firmly subordinate.

Japan Architect, 8/1967 AD 9/67, p.390

Oh, tell me where is madness bred?

When a competent and *perceptive* architect approaches a problem, consciously or unconsciously he goes through several stages:

He defines the problem (and redefines it at stages throughout the programme).

He collects all existing data on the subject, and the data he cannot find he fills in with his own research and experimentation.

He then juggles about with the bits, bargaining between them until he finds the best overall solution. He puts these conclusions into a final form and tests the actual performance against the planned performance.

When all these processes are carried out with the aid of computers, parameters, mathematical models and all the techniques and disciplines of science as well as the architect—the process is called Performance Design.

The August issue of *Progressive Architecture* is devoted to Performance Design. The subject is clearly defined. But wading through the lengthy articles is disheartening—they read like any architectural conference before computers, space technology, methodology and operational research were known about. Remove these magic words from the texts and the ideas are little different from those in the *Team 10 Primer*. However, the concept of Performance Design is sensible and

sane. If you analyse something systematically, deeply and expensively you must come up with a rational solution.

The five categories of the URBS components are:

Heating/ventilating and heating/air-conditioning sys-

These items represent 50-60 per cent of building costs

(the SCSD figure was 50 per cent); those excluded from

the programme are site and foundation works, the

exterior cladding, including the roofing, and the

The Educational Facilities Laboratories Inc., who first sponsored SCSD (see opposite) has determinedly pursued its policy of encouraging industry to become involved in private research and development to meet detailed performance specifications for controlled and unified building programmes. EFL has granted \$75,000 to the City of Toronto Metropolitan School Board to develop user requirements and performance specifications for their school buildings. These, unlike the SCSD schools, are intended for urban conditions and will rise to four storeys. The Montreal Catholic School Commission has been granted \$117,000 for a similar project. Both are expected to reach the bid stage early in 1968. But by far the most ambitious venture of the SCSD type is URBS (University Residential Building Systems) for the construction of student housing for the University of California, sponsored jointly by the university and EFL. The architect in charge is, once again, Ezra Ehrenkrantz (who will be speaking in London on November 14th at the Building Centre and on November 21st and 22nd at the Building Exhibition). The URBS project, instigated in 1965, began with a laborious study of user requirements. This was followed by the preparation of a performance specification and an invitation to industry to bid. Bids are at present being prepared, prior to evaluation and the testing of

URBS

prototype components.

Bathrooms.

Structural system above ground floor.

electrical work and plumbing.

tems partitions-fixed and demountable.

Casework and furniture, including light-fittings.

Architectural and Engineering News, June 1967

But is rationality the answer? Our belief in it is possibly the madness of the apparent sanity of 'reason'! As Dr R. D. Laing has written recently in the New Statesman (June 16th, 1967), 'Until a few years ago, the collective definition of European man as sane by his own consent imposed such an iron vice on consciousness that hardly anyone was able to break out without breaking down'.

If a spark of madness were programmed into our computers our cities might perhaps be more fittingly planned for humanity.

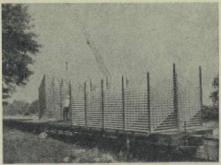
Ruth Lakofski

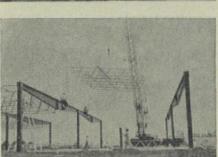
production because many of the school districts that first entered the programme have since been revised and regrouped, making many of the proposed schools unnecessary. Ironically, the Butler Manufacturing Co.,

The Butler system

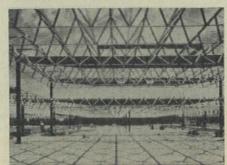
The main component manufacturer of SCSD, the Inland Steel Products Co., is reported to be ceasing

1, 3, 5









who were not one of the lowest bidders, developed their own system 1-4 and have now marketed it with great success. The Macomber system too 5, which is an outgrowth of SCSD, is offered on the American market.

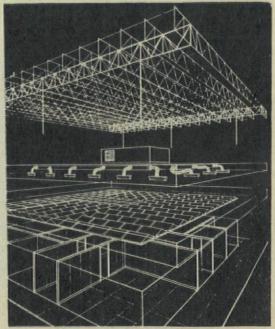


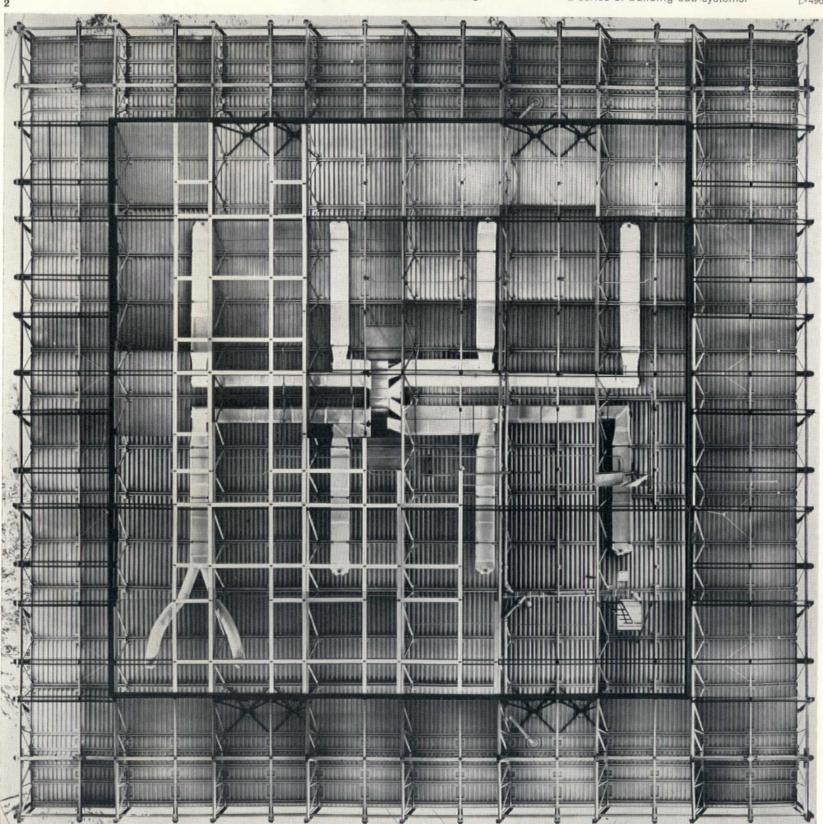


Diagram of the SCSD system, illustrating all the major components

2
Underside of the roof structure of the prototype building before installation of the ceiling.

School Construction Systems Development

School Construction Systems Development (SCSD), discussed and illustrated in detail in Architectural Design, July 1965, is an experimental project set up in September 1962 by Educational Facilities Laboratories, Inc. a subsidiary of the Ford Foundation. The object of the programme, now beginning to take form, was to experiment with new designs in construction procedures for the building of high schools in California. The basic idea was to provide a big enough market to enable manufacturers to design and produce a series of building sub-systems.



Diagrams on this and the following pages from SCSD: the Project and the Schools, a report from Educational Facilities Laboratories. Photo: 2 Rondal Partridge



The SCSD procedure was to group together 13 school districts whose work represented about \$25 to \$30 million in value in a two-year period, and to define the school building problems as seen by these school districts in terms which would be helpful to manufacturers.

The SCSD procedure is a sequence:

Group together a number of school districts, who are committed to the use of components when developed, if price and design are satisfactory. Study the school districts' needs.

Define these needs in technical terms and write performance specifications for the components in the categories required.

At the same time interest relevant industries in this market and find potential bidders.

Bid the required sub-systems competitively and through this bidding procedure select one system in each functional category as successful for the entire project.

Develop the various systems in conjunction.

Hand over complete information on the systems, including unit prices for installing components, to the district architects for them to design their schools.

District architects design schools, incorporating the pre-bid sub-systems. Each school goes out to bid locally to select the general contractor who will supply and install the non-system parts of the school, and coordinate the sub-systems suppliers.

Schools are constructed.

The six SCSD sub-systems are as follows:

Structure, including roofing.

Heating, ventilating and cooling, including equipment, duct work and controls.

Lighting, ceiling, including air diffusers.

Interior partitions, including demountable, and two type of operables.

Casework including storage furniture, tables, counters, and laboratory benches.

Student lockers.

⊳498

The structural system designed by Robertson Ward Jr. and The Engineers Collaborative for Inland Steel Products Co.; deck trusses being lowered into position 2

Diagram of the heating, ventilating and air-conditioning system installed in the roof-deck, designed by Lennox Industries Inc.

Diagram of the lighting ceiling components designed by Robertson Ward Jr. for Inland Steel Products Co.

Self-supporting accordion operable internal partitions designed by the Hough Manufacturing Company

Panel operable partitions designed by Western Sky Industries and subsequently sold to the Hough Co.

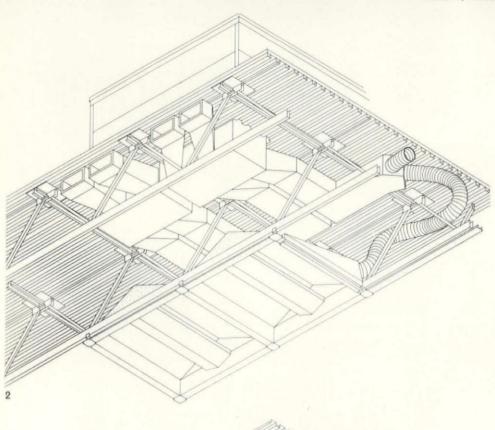
Plan and isometric of the fixed and demountable partition system developed by the E. F. Hauserman Co., consisting of 40in wide panels of steel-covered gypsum board which snap onto a metal stud. The studs are clipped to floor and ceiling channels and the top of the stud incorporates a telescoping section which allows for two inches of structural deflection 9 & 10

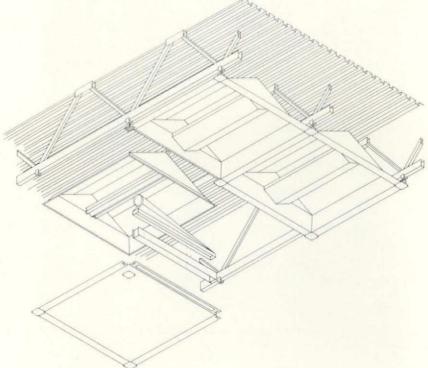
Casework and cabinets. This subsystem encompasses two separate types of cabinets: science laboratory equipment and general cabinets for storage, Components include tables, tops, cabinets, sinks and laboratory accessories, doors, drawers and shelving. The cabinet system is constructed of wood and particle board, with tops in laminated plastic or colourceran. Developed by Educators Manufacturing Company 11 & 12

Lockers, types 1 and 2. This subsystem includes all student lockers, tops, finished ends, shelves, combination locks, number plates, and operating handles. Gymnasium type storage lockers are not included. Type 1: 20in wide, 15in deep, 15in high

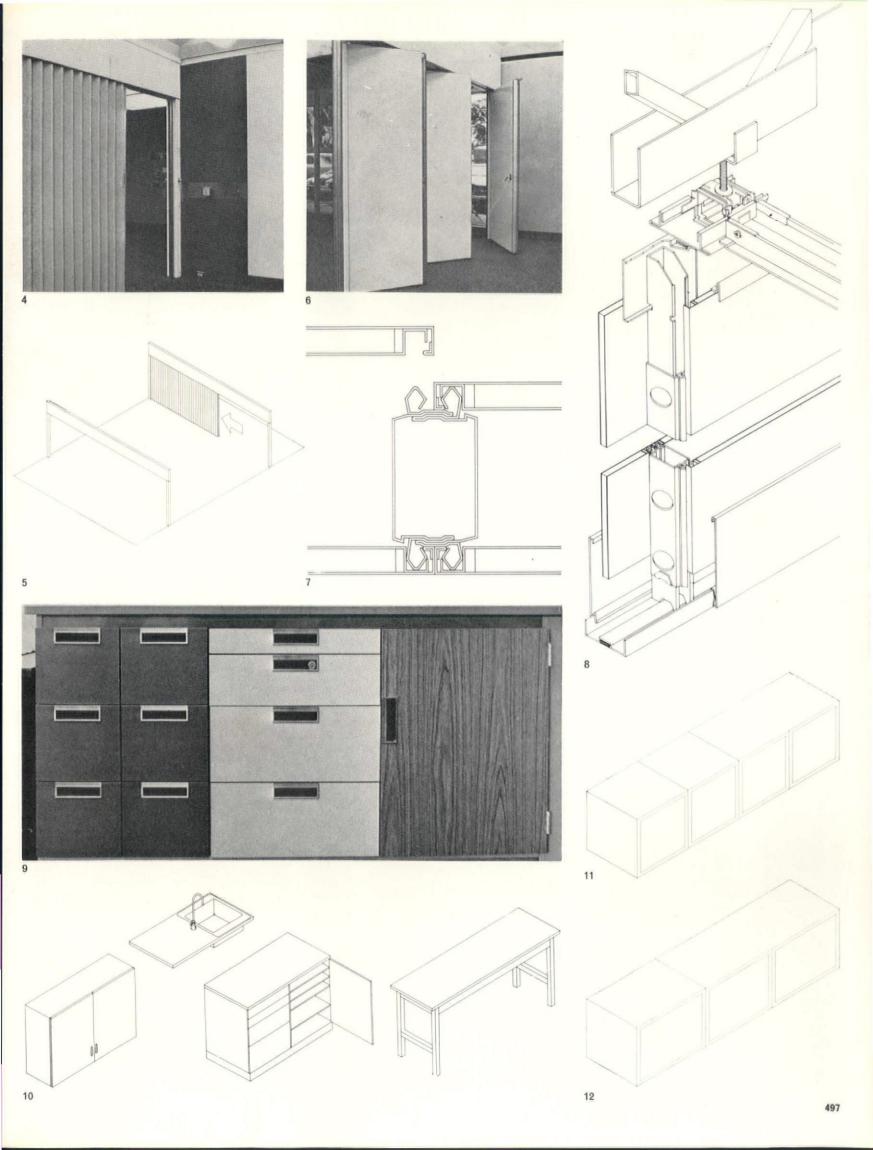


Photo: 1, Rondal Partridge





3 496



The total area of building in the project will be 1,621,600 square feet. This is spread among 13 projects, of which, in June 1967, six are in operation and seven are still under construction. By September 1, 1967, SCSD will have provided places for nearly 19,000 public school students in 13 different schools built with the building system. These schools are not only better than their conventional counterparts in terms of increased performance but will also provide substantial savings in operations and maintenance costs.

The validity of the SCSD requirements is shown by the fact that within 18 months of construction beginning on the first California school, SCSD components were in use in over 400 buildings across the country. More than one half of these buildings were educational. The first school opened was in Barrington, Illinois; other buildings using major portions of the complete system spread from Georgia to the State of Washington. The majority of these buildings utilize the Lennox air-conditioning unit which has been markedly successful in applications in school buildings across the country. It has also proved applicable to a variety of other building types ranging from banks to radar tracking stations. The Hauserman demountable partitions have also been successful, both in the school and in the office market. The Inland Steel Products structural and lighting ceiling systems have been used, at the time of writing in July 1967, in eight elementary school projects, six high school projects, and seven commercial or industrial buildings. These latter are mainly branch bank buildings but include one significant industrial building. This is the Engineering Design building for the Lockheed company in Marietta, Georgia,

An interesting feature of the SCSD programme has been its effect on the market-place. This had been anticipated in the original thinking behind the project, one of the main objects of which had been to make available to architects and school districts a new set of components specially

developed for school building.

The first effect of the SCSD project was to raise the norms against which school buildings were designed. The second effect which is now becoming visible is the transformation of the original closed SCSD system into a semi-open system. This is being accomplished in two ways. First, some of the unsuccessful bidders on the SCSD programme continued to develop their products to ensure that the successful bidders would meet with competition when their components came on the open market. Thus, Butler, who had been second low bidders on structure in the SCSD programme, continued to develop their product and it is now on the market. To date, 11 schools have been built utilizing the Butler structure, which is approximately equal in performance to that of Inland although markedly different in design. Similarly, Hauserman who were the successful bidders in partitions, and an unsuccessful bidder in lighting-ceilings, have utilized their lighting ceiling successfully in conjunction with the Butler structure in later projects.

In addition to the unsuccessful bidders the success of the SCSD programme has brought forth competition through the normal processes of the market. In structure, the Macomber Co. has further developed a structure which was already in existence, to bring it into performance competition with the Inland and Butler structures. In this they were helped by the Engineers

Collaborative, who were the structural engineers for the Inland Steel Structure. To date, three school buildings and one commercial structure have been built utilizing the Macomber structure which is now being advertised nationally as a system in the architectural press. A further competitor in the structure-ceiling area is represented by Compatible Design Systems, a company formed by three ex-Inland Steel employees who have designed a system to meet the SCSD specification and who are now bidding against Inland and Butler in school and other work being designed against the SCSD performance specifications.

In air conditioning, the successful Lennox unit is now meeting with competition primarily from ITT Nesbitt who were an unsuccessful bidder in the air-conditioning category of SCSD. However, rather than develop their unsuccessful system, Nesbitt have developed a unit, very comparable to that of Lennox, which is now providing competition in the market. This competition is very necessary in the American building scene, particularly for public building projects which must be bid competitively. If a product does not have a competitor, there is a danger that as far as public buildings are con-

cerned it may die on the vine.

Thus, the open system seems to be coming about as a part of normal industry competition. The question remains: will the SCSD system as such remain intact, either in its original form or as a transformation into a range of its competitors products, or will it evolve into a group of conventional components? This major issue is as yet unresolved. The original set-up of the SCSD project did not make provision for preserving the SCSD system intact but rather left it to the market place as to whether it should live or die. In this, a healthy tradition of American industrial life was being pursued, but the system idea in this instance may not be well enough understood to survive unprotected. Inland Steel Products, for instance, one of the major component manufacturers is reported to be closing down.

But the precedent of the SCSD programme is now being extended to encompass other building programmes in the USA and Canada. In Toronto, a project is underway to develop a building system for public schools for the metropolitan district of Toronto. Another has started to develop a building system for public schools in the State of Florida. At Pittsburgh, Pennsylvania, a project is underway to develop a building system to construct five large comprehensive high schools for the city.

A system for student housing, is being developed for the University of California. This project, the University Residential Building System (URBS) project, aims to develop components for between 4500 and 9000 student units for the UC campuses, with the final buildings scheduled for occupancy between 1970 and 1972. In this programme the three main goals are:

A reduction in the cost of owning, operating, and maintaining the buildings.

Increased adaptability to provide for changing campus policies and student preferences.

An increase in the variety of building types and configurations to reduce the institutional atmosphere of student housing.

The URBS system will provide for buildings up to 13 stories in height. The majority of partitions will be demountable, by university or contracting personnel. All furniture will be movable, allowing students individual freedom in spatial

arrangement. A self-contained bathroom unit is being sought.

The URBS project is now out to bid. Successful sub-systems will be selected in the spring of 1968. Some one hundred and twenty manufacturers, contractors and suppliers have expressed an interest in bidding.

At the University of California and Indiana University a study is underway to develop a building system for academic and laboratory buildings for the two university systems. The projected volume of building is \$300 million (in

comparison to SCSD at \$30 million).

A significant aspect of the SCSD programme, as yet unrepeated elsewhere, was the use of performance specifications. This process, in which requirements were stated in such language that industry could respond in ways best suited to it, was a major means of securing industry research and development for the SCSD programme. The effort involved by the sponsors in promoting this approach and ensuring its success was considerable, and the resources necessary have probably deterred other groups from following in the same path. However, of the projects noted above, all are pursuing this route of the performance specification, which calls for major industry input into the solution.

A partial exception is the Pittsburgh project, in which the original SCSD team is involved*. In this project, although performance specifications are being written, they will be answered primarily by the design team itself since time does not permit the full implementation of the open performance specification approach. The size of this one project, approximately \$120 million, will permit the development of subsystems for the five schools alone. The organization is much simpler than SCSD, for one school district is involved and one coordinating architect (Hellmuth, Obata, and Kassabaum) who will design all the schools. Thus the systems can be geared directly to the architect's design process instead of having, as in SCSD or URBS, to remain independent and aesthetically neutral. Thus the SCSD products are now part of the architect's vocabulary. At the same time the SCSD process is being extended into other building types and to other scales of work. SCSD was always seen as an experimental project, although of a size to produce useful results.

Some of its success can be attributed to its lack of dogma. It was felt strongly that the requirements should dictate the system, not vice versa. It was decided to develop systems where gains, financial or performance, were necessary and showed a good chance of success, rather than attempting to systematize the whole building. This 'impure' approach, which recognized all the social, technical, and economic constraints present, ensured that the buildings would get built within the stringent cost context of school building. In our money-conscious society this realism resulted in a project that was impossible to ignore. It is the promise of the procedures that has captured the attention of discerning eyes, not the reality of the hardware.

Christopher Arnold

^{*}Most of the original SCSD team of architects are now in practice under the title of Building Systems Development in San Francisco and Washington, DC. This firm is also responsible for the technical management of the URBS and University of California and Indiana

Lockheed factory, Marietta, Georgia by Heery and Heery

The Lockheed building utilizes the four major SCSD sub-systems. It is a building of 280,000 sq ft, and houses the engineering design personnel for the Lockheed C-5A military transport contract, which was signed with the Defence Department on September 30th, 1965. In anticipation of this contract, the architect to Lockheed had decided to utilize the SCSD system in order to provide the facilities necessary in the shortest possible time. The architect started work at the beginning of August 1965, groundbreaking for the building was 10 weeks later, and four months after groundbreaking 180,000 sq ft of the building was available for occupancy. The additional 100,000 sq ft was available two months later.

The Compatible Design Systems structural and lighting-ceiling system (Rheem/Dudley Corporation) designed to the SCSD performance specifications since the original bid process. It is a light steel structure of conventional design, using largely bolted connections. The ceiling is built up from supporting members, acoustical board, and lighting fixtures, and hung directly from the structure. This system has been successfully bid on school jobs in California

SCSD project schools component bid data, March 10th, 1967

An interesting comparison of SCSD versus conventional costs can be obtained from experience with the Huntington Beach School District. This District has two high schools with almost identical plans, both designed by the same architect and located on similar sites. One of these high schools, Marina, was completed in 1963 using conventional construction; while the second, Fountain Valley, was completed in 1966 using SCSD construction. The similarity of the two schools offers an excellent comparison of cost between conventional construction and SCSD. However, in order to evaluate correctly this cost comparison, the prices for Marina have been adjusted upward 10.25 per cent to cover the escalation of building costs between July 1962 and July 1965 when both projects were bid

Cost Comparison	Marina	Fountain
Bid date	July 1962	Valley July 1965
Building area	238,200 sq ft	235,500 sq ft
Total building cost	\$3,773,000	\$3,742,000
Cost per sq ft	\$15.84	\$15.90
Total equivalent		
component cost	\$1,824,000	\$1,492,180
Component percentage		
of building cost	48.9 per cent	39.9 per cent
Component cost per		
sq ft	\$7.65	\$6.34

It will be noted that the SCSD components in Fountain Valley accounted for 40 per cent of the total cost of the school, while the equivalent components used in Marina accounted for 49 per cent. Instead of taking this 9 per cent difference in the cost as a savings, the school district chose to provide additional features not provided in Marina such as:

Carpeting throughout.

Four mechanically operated stages. Five year HVC maintenance contract.

Brick exterior walls (normally too expensive for California schools).

This became the pattern of upgrading in all of the SCSD schools, and though the additional features varied, they all realized them.

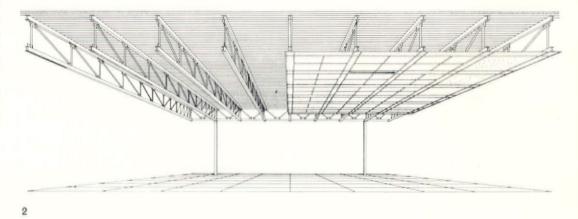
Of greater importance, however, was the variation in the components used in the two schools. Fountain Valley has an average span range of 60ft to 70ft, three types of lighting which gives 70 FC and can be rearranged, demountable partitions, and an air conditioning system with eight separate flexible control zones which can adapt to relocation of partitions.

SCSD professional staff: Initial project coordinator: J. D. Laurits Project coordinator: J. R. Boice Project architect: E. D. Ehrenkrantz

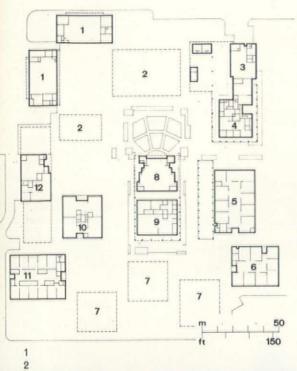
Architects: C. Arnold; V. Boyd; V. C. Bryant, Jnr.; W. Cartmell; B. E. Ray Architectural assistant: P. Kastl

Structural engineer: C. M. Herd





BASE BID BUILDINGS	3AREA IN SQUARE FEET PER STATE AID FORMULA	CEILING AREA IN SQUARE FEET	STRUCTURE AND ROOFING AREA IN SQUARE FEET	COST PER SQUARE FOOT/ STATE AID FORMULA	COST PER SQUARE FOOT/ STRUCTURE AND ROOFING	COST PER SQUARE FOOT/ CEILING	COST PER SQUARE FOOT/ HEATING- VENTILATING- AIR CONDITIONING	COST PER LINEAL FOOT/ DEMOUNTABLE PARTITIONS
\$3,741,830	235,418	220,643	249,303	\$15.90	\$1.58	\$1.49	\$2.281	\$28.53
1,750,000	94,941	85,578	104,304	18.43	1.60	1.54	2.24	27.35
3,172,320	204.644	198,150	200,300	15.50	1.90	1.49	1.80	23.74
1,447,748	79,466	77,011	88,450	18.22	1.77	1.57	2.37	22.97
468,379	40,000	38,775	40,700	4	1,71	1.51	1.646	23.86
625,747	29,050	26,350	31,750	21.54	1.76	2.01	3.051	36.17
4,408,214	230,732	173,100	173,100	19.10	1.86	1.49	2.49	27.81
3,018,000	157,707	157,575	163,325	19.14	1.80	1.63	2.43	22.71
2,184,326	123,238	97,200	138,700	17.72	2.15	2.04	2.35	24.99
1,838,374	104,350	84,375	120,125	17.62	1.96	1.91	2.21	22.13
2,886,525	156,488	149,800	153,600	18.45	1.76	1.59	1.73	25.81
1,323,222	72,790	66,350	76,600	18.17	1.91	1.87	2.47	25.52
1,592,320	92,773	56,625	78,450	17.16	2.16	1.92	1.376	32.85
	\$3,741,830 1,750,000 3,172,320 1,447,748 468,379 625,747 4,408,214 3,018,000 2,184,326 1,838,374 2,886,525 1,323,222	\$3,741.830	SASE BIO PEN STATE SOLARE FEET	SASE BINDS PEN STATE A SOLARE FEET SOLARE FEET	BASE BID BUILDINGS PE STATE AID FORMULA CEILING BOURRE FEET AND BOOFING AREA IN SOLARE FEET SOLARE FORT/ STATE AID SOLARE FEET STATE AID SOLARE FEET STATE AID SOLARE FEET STATE AID SOLARE FEET STATE AID STATE AID SOLARE FEET STATE AID STATE AID STATE AID STATE AID STATE AID SOLARE FEET STATE AID STATE	BASE BID BUILDINGS PER STATE AID FORMULA CEILING SOURAR FEET AND ROOFING SOURAR FEET STATE AID STATE AID	BASE BID BUILDINGS PR STATE AID FORMULA CELING SOURRE FEET AND ROOFING SOURRE FEET SOURRE FEET STATE AID SOURRE FEET COURSE FEET SOURRE FEET COURSE FEET STATE AID SOURRE FEET COURSE FEET STATE AID SOURRE FEET COURSE FEET SOURRE FEET COURSE FEET COU	SAME AIN SOURCE FEET CELLING AREA IN SOURCE FEET SOURCE FEET



El Dorado High School, Placentia

W. E. Blurock & Associates

Structural engineer: John Martin Mechanical engineer: Nack & Sunderland Electrical engineer: Henry Hickok

The SCSD project involves the first increment, for 1000 students, of a high school for an ultimate enrolment of 1500 students. The plan groups academic departments in small one-storey buildings in an informal campus layout. Focal point of the scheme is a building combining library and little theatre, with the latter relating to an outdoor theatre.

Classrooms are grouped around an expanded circulation space which provides space for individual study, seminars, exhibit area, etc. Classrooms have a 10 ft wide opening to the central 'court' so that the whole building has a spatial continuity designed to contribute to class and teacher interaction. Carpeting helps to keep sound to acceptable levels; all academic areas are fully air-conditioned.

A variation of this layout may be seen in the

academic areas of Sonora High School by the same architect.

The first increment of the school was completed in September 1966; construction began August 1965.

Plan of El Dorado high school

lockers

8 lecture theatre future gym

9 library 10 art and home 3 kitchen 4 administration economics

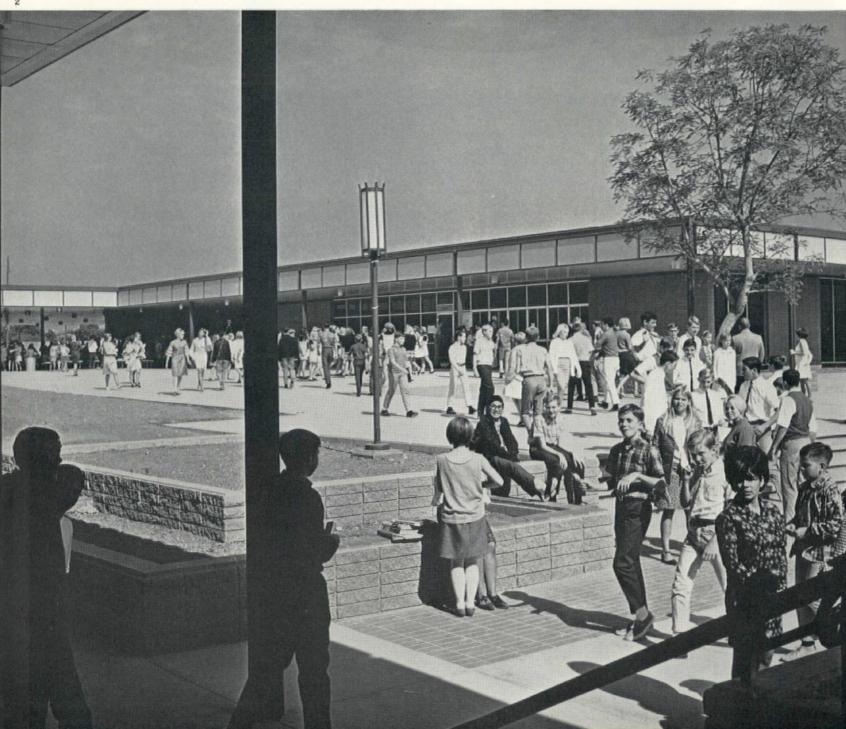
English department science social science 12 shops

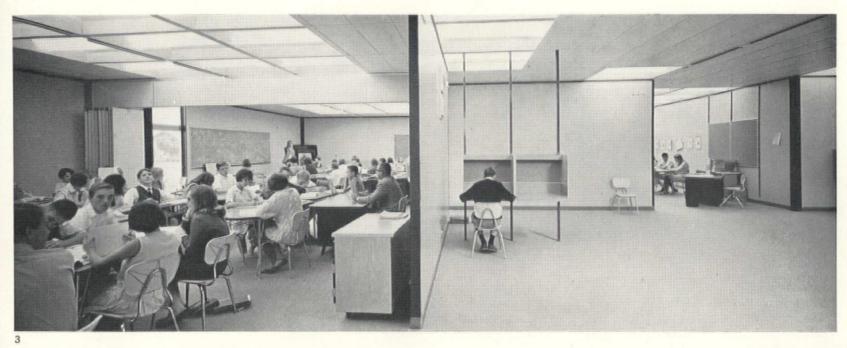
7 future classrooms

Exterior view of El Dorado

View of a classroom at El Dorado adjacent to a circulation court, in which are placed carrels for individual study. Note that the classroom has a small window for view only, basic lighting being artificial

Interior at El Dorado, showing 10ft wide openings into central circulation areas instead of doors. The floors are fully carpeted Photos: 2, 3 & 4 Rondal Partridge







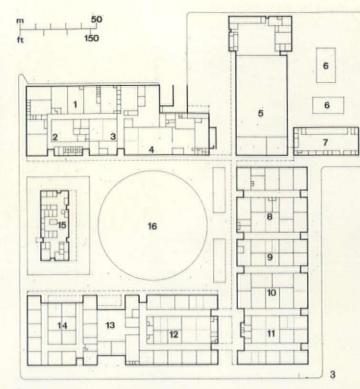


Fountain Valley High School, Huntington Beach

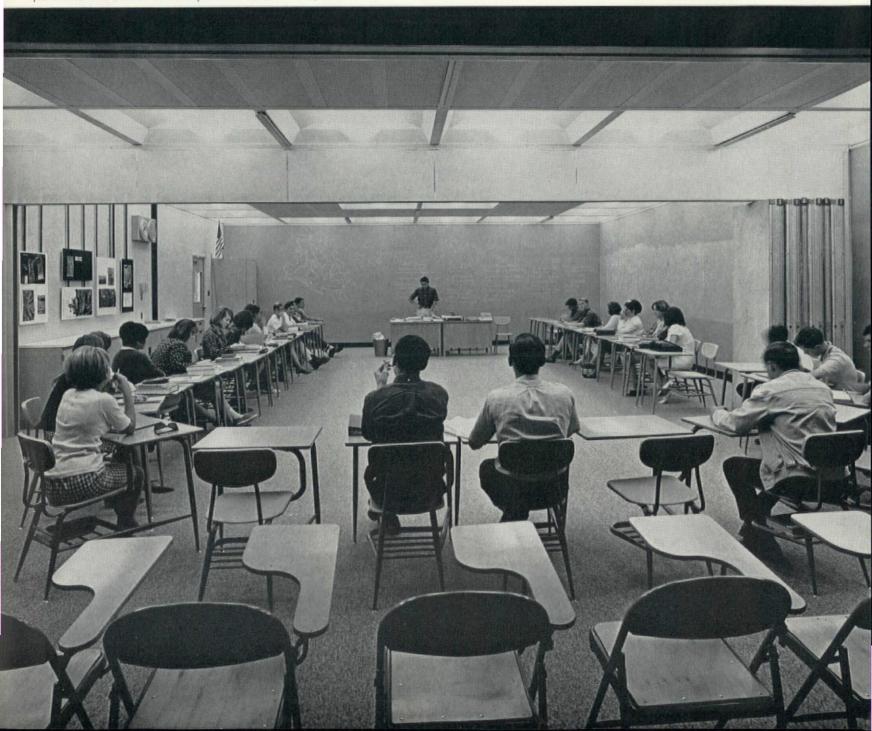
Neptune & Thomas

Mechanical engineer: Nack & Sunderland Electrical engineer: Henry Hickok

A high school for 300 students (see p. 499), Fountain Valley is identical in plan arrangement with an earlier school, designed by the same architects completed in 1963. The plan groups one-storey loft type buildings, around an outdoor amphitheatre. Many of the teaching spaces are interior, and those on an outside wall have no windows. Classrooms are conventional in size and arrangement, though extensive use is made of operable partitions. The school was completed in 1966.



- 1 shops
 2 music
 3 drafting
 4 dining
 5 gymnasium
 6 pool
 7 lockers
 8 home economics
 9 business education
 10 science
- 9 business education
 10 science
 11 mathematics and languages
 12 English
 13 library
 14 social science
 15 administration
 16 open-air amphitheatre



Bertha Ronzone Elementary School, Las Vegas

Julius Gabriele

The Bertha Ronzone School uses the Butler structure, Hauserman partitions and ceiling, and Lennox air-conditioning. For the SCSD project Butler was second lowest bidder for structure and Hauserman also competed for the lighting-ceiling contract.

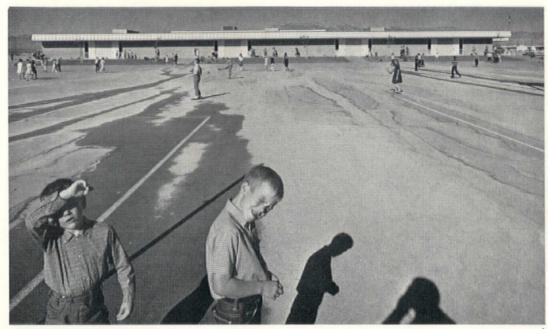
Exterior of Fountain Valley High School

Interior of large, sub-divisible classroom at Fountain Valley. Note the floor to ceiling chalkboards

3 Plan of Fountain Valley High School

Bertha Ronzone school. The structure used is the

Large multi-purpose central space at the Bertha Ronzone school Photos: 2, 4 & 5 Rondal Partridge





Sonora High School, Fullerton

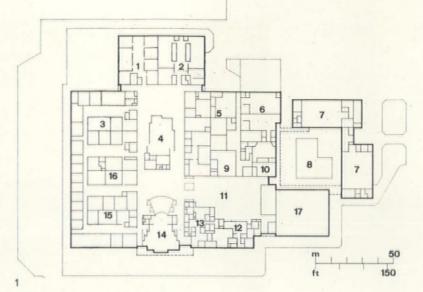
W. E. Blurock & Associates

Structural engineer: John Martin Mechanical engineer: Nack & Sunderland

Electrical engineer: Henry Hickok

Sonora High School is designed for an enrolment of 2000 students. All the academic accommodation is contained in one single-storey building (with a mezzanine library) of 185,000 sq ft. One other building houses the gymnasium lockers. Departments are grouped around a central 'mall' area, which has an 18ft ceiling height and is air-conditioned. The mall is artificially illuminated. Small skylights provide additional light. The mall encompasses general circulation between departments, areas for dining and general assembly.

The academic teaching spaces are arranged around 'courts' which provide space for individual study, exhibit area, and inter-departmental circulation. Classrooms have a 5ft wide doorless opening to the court. All academic areas are carpeted. This school opened in September 1966; construction began October 1965.



Plan of Sonora High School

Interior corridor at Sonora with five foot openings to classrooms

1 mathematics

science social science

library

5 home economics 6 workshop

lockers

8 pool 9 art 10 music

11 dining

12 kitchen

13 administration 14 lecture theatre

15 commerce

16 languages

17 gymnasium



De Laveaga School, Santa Cruz

Leefe & Ehrenkrantz

6, 7

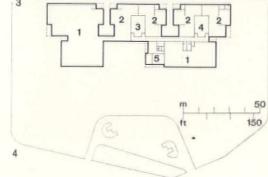
Structural engineer: C. M. Herd Mechanical engineer: G. L. Gendler Electrical engineer: Stanley Anderson

De Laveaga, the only elementary school in the programme, opened in October 1966.

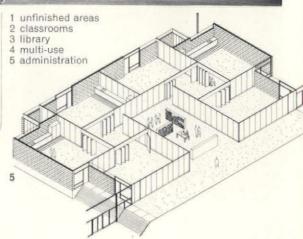
Originally, De Laveaga was intended to be a tenclassroom school. However, the SCSD programme enabled the school district to move far beyond this and to plan for future growth as well as present needs. Within its budget allowance the district was able to complete nine classrooms, a library, theatre and administration office—plus a shell consisting of roof and outside walls to accommodate an additional 13 classrooms and multi-purpose area.

The school is now divided into three 3-classroom complexes. A typical complex comprises about 3000 sq ft of space divided into four areas by demountable walls. The three open classrooms surround the remaining space, known as a 'wet and sloppy' area (for arts and crafts).





3
De Laveaga elementary school
4 & 5
Plan and isometric of De Laveaga school
6 & 7
Interior of classroom cluster and multi-use room



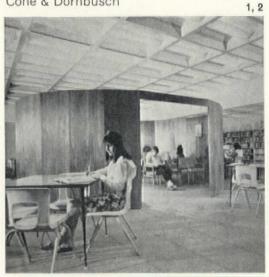
Photos: 6 & 7 Rondal Partridge

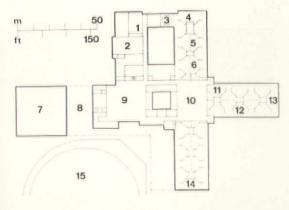




Barrington Middle School, Barrington

Cone & Dornbusch





A 'meditation circle' installed at Barrington by the district school superintendent, Dr Robert Finley, who nonetheless believes that a school should have no interior partitions and be totally non-graded

Plan of Barrington School, one of the first SCSD schools to be completed

- Key: 1 music 2 home economics 3 planetarium
- 4 typing
- 5 science 6 mathematics 7 physical education
- 8 service court with locker rooms beneath
- 9 dining, creative pro-gramming and stage 10 learning centre and
- stage 11 social studies 12 English

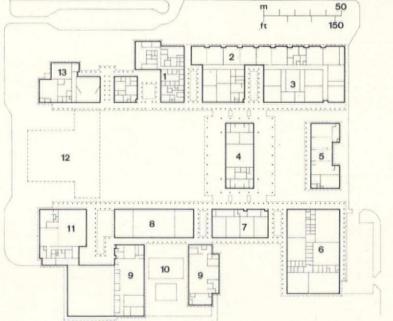
- 13 languages
- 14 grade six
- 15 car park

F. Kennedy High School, Sacramento under construction

Stafford & Peckinpaugh

Structural engineer: J. S. Barrish Mechanical engineer: Lester O'Meara Electrical engineer: McPherson & Norberg





Plan and three-storey wing of the J. F. Kennedy school under construction. The ground floor is of concrete construction with the SCSD structure above it

Key:

- 1 administration
- business education
- 3 science 4 library with two floors of classrooms above
- 5 home economics
- 6 workshops
- art
- 8 auxiliary gymnasium 9 lockers
- 10 pool 11 cafeteria
- 12 future auditorium

Oak Grove High School, Santa Jose under construction

Allan M. Walter & Associates

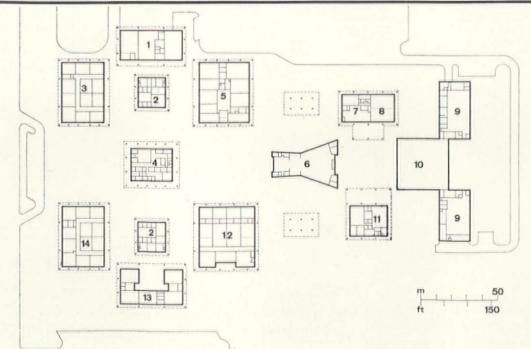
Structural engineer: Pregnoff and Matheu Mechanical engineer: George Greene Electrical engineer: David Arrigoni

Plan of Oak Grove High School

- 1 industrial arts 2 teachers' office
- 3 mathematics and business education
- 4 administration with library above
- 5 physical sciences 6 lecture theatre 7 kitchen

- 8 girls' gymnasium 9 lockers
- 10 gymnasium

- 11 music 12 social studies and home economics
- 13 arts and crafts
- 14 languages



Failure of industrialized building in housing programme

Alexander Pike

In an enthusiasm, born of awareness of a backward past, the building industry may have injudiciously plunged ahead along the wrong path. Flying the flag of mechanization and shouting the catchword industrialization, it has deluded us—and perhaps itself—into the belief that something is at last happening. Unfortunately, assessment of the results reveals an almost static situation in housing, which has (or should have) a very high priority.

The annual average rate of house-building for the years 1934 to 1938 was 358,000. The ensuing thirty years have seen prodigious increases in production rates in almost every other industry, but in spite of the increased use of mechanical equipment, a larger labour force and improved organization, the building industry has been unable to show a significant improvement.¹

Industrialized Building is a catchword to replace its unpopular predecessor prefabrication, which signified similar objectives, but in spite of the implied undertones of increased productivity, reduced costs and transference of labour from site to factory, it is doubtful whether the new methods are making appreciable in-roads on the problems of cost, speed of construction and quantity of production.

The poor rate of progress is a sad reflection on the industry as a whole and a fault for which the architect cannot disclaim some proportion of responsibility.

As a profession, we prefer to consider architecture as the creation of a unique building—the grand statement as a monument to our ego—and ignore the enormous volume of essential accommodation which is urgently required, but which by our present methods, restricted by labour and finance, we are unable to provide.

In terms of positive assessment of the problem of creating sufficient units, housing as a subject is almost ignored by architects as a body, a weakness for which they have been justly criticized.2 Paradoxically enough, this selfimposed isolation does not prevent these same individuals from paying lip service in support of the idea of mass-produced buildings, and offering comments and opinions, undisturbed by the fact that most houses are not designed by architects, and that whilst many industrialized building systems benefit from architectural design in their planning and in some cases the design of components, few, if any, derive any advantage from architectural services with an underlying technological basis.

Can we blame the manufacturing organizations when they fail to ask architects to collaborate with production teams, if there is not specialist knowledge within the profession to provide the necessary advice?

The root cost of this detachment may be attributable to weaknesses in our education which leave us with voids in the knowledge of production methods and manufacturing processes which are obviously vitally necessary if the architect is to make any contribution to the mass production of buildings.

If improvements are to be made the architect cannot be content merely to choose and assemble standard items from a manufacturers catalogue.³ He must not only be capable of assessing a product and knowing the method of manufacture, he must eventually acquire sufficient familiarity with the production processes to be able to design the unit. If the architect is not prepared to learn these methods

he must eventually abandon a very large section of an increased total building output to the manufacturer and contractor.

Most of the so-called systems now employed for housing merely display a belated degree of organization and do not in any way exploit the high quantities of production that the term 'industrialized' suggests when used in relation to other industries. It is, of course, too easy to underestimate the problems facing manufacturers. The transfer of work from site to factory obviously involves the use of skilled and highly paid factory labour against semi-skilled site labour. Therefore factory production must utilize machines to the maximum, and the output of the product must be high. The vicious cycle of low volume of production-high unit cost-small market, is one which has defeated the marketing of many other products, many of them with a far lower capital cost than that of a house.

Throughout the history of prefabrication many attempts have been made to draw comparisons with the mass production techniques evolved and employed in the car industry, but the few attempts that have been made at borrowing the technology have failed. Although the determining influences in each case are not identical it must be remembered that the car industry was the first⁴ to initiate and develop the techniques which have now been adopted by all other industries meeting the demand for commodities in great quantities.

The adverse factors against such a comparison have been clearly stated by Burnham Kelly:

The bulk and weight of the product has a direct influence on the optimum degree of factory assembly and distance for transportation.

Most new products which have been mass produced have either offered a quality of service differing from that of existing products intended for the same purpose, or they performed a service never before provided; for example, the radio, the telephone and the car.

The life of the house is such that the manufacturer must compete not only with the conventional builder but with the vast supply of existing housing which at any time far exceeds the annual production. The comparatively short life of the car enables a smooth transition from initial demand to replacement demand, and whereas the average life of the car has been established at about nine years and that of the radio of about seven years, a house is expected to last perhaps 60 years and in many instances the life exceeds 100 years.⁵

The degree of factory assembly to be employed is obviously a factor which will determine the design break-down of the product. Clearly the house is too large a product to be fabricated and transported in one piece, particularly in the congested road conditions experienced in this country, and a very precise balance must be maintained between the proportions of sub-assembly work to be carried out in the factory and on the site, bearing in mind the complications arising from adverse site climate conditions and the ratios of labour rates for factory and site labour.

The question of a new quality or service, which appears to be a prerequisite for the successful marketing necessary to sustain a high volume of production, is one which architects should study diligently. The present potential for technology

¹ Houses completed during the first eight months of 1967, 250,000. Average for the year, probably less than 370,000.

² 'Architects have been too wrapped up in "style", in bricks and foundations and whatnot, to devote their attention to the only solution of the housing problem—the production of decent and convenient mass-produced houses.' John Betjeman, First and Last Loves.

³ Proponents of 'open' systems usually evade the major problem of abuse. Components within these systems can be assembled to provide an unsatisfactory result just as easily as bricks and metal windows.

⁴ Excepting perhaps the Chicago meat industry, which in the 1870s evolved the disassembly line for meat production.

⁵ The Prefabrication of Houses. (Chapman and Hall, London, 1951.)

to provide houses differing widely from the accepted versions, providing facilities and environment incomparably improved, is retarded by two factors: our inability to translate house manufacture in terms of machine production, and a degree of public prejudice fed on a firmly established preconception of the form and function of a house. However a sufficiently exciting product could capture the imagination and might dissolve prejudice. Furthermore, the present urgent need for houses provides a hitherto untapped market that must surely exist in the vast numbers of people who at present live either in slums, or at best, in highly unsatisfactory housing conditions. Also, the concomitant reduction in the price of the product that must be confidently expected from mass production would reveal an even wider market amongst those people for whom the cost of a house is beyond range.

The argument has frequently been put forward that whilst there was a demand for the first cars, no demand exists for mass-produced houses. The experience of the manufacturers of the early cars disproves this, but indicates that an urgent need existed for a new means of transport. Having once determined the existence of this need the demand was created by producing the right article at the right price.

The problems created by the life of the product and the period of replacement cycle are not sufficient to cause concern in the case of a successfully marketed mass-produced house. The obsolescence and physical depreciation of motor vehicles were barely considered during the formative years of the industry, the sole aim being to produce enough to meet the initial demand. The argument presupposes that the life of a house will exceed 60 years for a long time hence, but startling reductions in price might modify this opinion and improved technology in the future may well render such durability ludicrous.

Comparisons between car production and house construction have always terminated at the financial level. Here the problem seems insurmountable. To build from scratch a new car factory costs between £70 million and £100 million It is doubtful whether any firms engaged in house construction would have capital of this value available. Even if they had, it is unlikely that they would be prepared to risk investments on an item so untried and unproven.

Once built, the problem of maintaining production still exists. The cost of tooling-up for a new car may cost as much as £7,000,000.6

Even modifications can be very expensive, a new body shell with modern mass production multi-welding techniques might cost £1,500,000. If we cannot imitate the process—and it is one which cannot be efficiently scaled-down—it is probably more fruitful to seek answers by separating the organizational procedures from the techniques.

The organization in car factories is unquestionably superb. Precise quantities of parts are delivered at the correct position on the production line at exactly the correct time. Pricing is carried to extremely fine limits, and the manufacturer is usually in a strong bargaining position when discussing component prices with the supplier. The assembly process in a car factory produces one car in approximately 120 man hours. Compare this with the figure for houses, in which the complexity is far less, but which in

many cases exceeds 2000 man hours. The value added to the materials in the assembly process for a car is approximately 30 per cent. In a house it is about 100 per cent, indicating that similar techniques might reduce the cost of houses by something like 35 per cent.

Wastage of materials, labour and storage space has been virtually eliminated. For example, in one Rootes factory, one engine is produced every 72 seconds, and once the components have been assembled the complete car takes only $2\frac{1}{2}$ hours to build. No manufacturer carries more stock than he needs. One factory holds only enough trimmed and painted bodies for one shift, and another carries a mere four-hour supply of tyres.

The complexity compared with house construction is enormous. A car has approximately 10,000 components which have to be ordered, scheduled and processed through the production line to arrive in the correct position at the right moment in the right quantity. Nevertheless the organization is still flexible enough to permit variations in the product.

Taking into account changes in type of engine, type of drive, body and interior colouring, de luxe versions, etc., the finished product may have hundreds of variations.

One manufacturer claims 1800 permutations on a single model. These achievements indicate that the mass-produced house need not be a chimera. Many other industries have profited from the example, and have proved that the principle has very wide applications. A far more serious factor impeding advances is a widespread attitude of mind within the architectural profession, which opposes the design principle adopted in the mass manufacturing industries.8 This appears to place the architect or design team in a position where, lacking sufficient knowledge of the subject to become an active, or even dominant, member of the overall design production and assembly team, he chooses to act independently, using the components of an open system and thus avoiding the necessity to understand the methods employed in production. This practice is acknowledged as a compromise between the extreme points of view of the designer, who wishes to have at his disposal a building technology which allows him freedom of choice and gives him the opportunity to realize new forms of building and new concepts of environment, and the manufacturer, who realizes that a high degree of standardization is necessary if he is to achieve high efficiency in production. Thus, even in this specialist field, the striving for the creation of the unique work of architecture emerges as a deterrent to the development of the mass produced house.

Whilst this viewpoint is prevalent radical advances will not be made, but stronger footholds in design know-how will be made by manufacturers' teams, eventually assuming control over a very high proportion of the total output of housing.

The best defence the architect can adopt against this occurrence is to arm himself with a sound knowledge not only of the methods employed in high volume production, but also of the new materials that can be used by these methods.

Then, and only then, will he be able to assume a position enabling him to share responsibility for the design of our entire built environment.

It is now becoming clear that industrialized building has made little or no contribution to the advancement of the technology of the finished product. It has merely introduced long overdue mechanization to the building process, making the same product in a slightly different way. For example, the factory production of doors has altered the method of manufacture and, taking advantage of the techniques possible in the factory, the system of construction, but the basic form of the product remains unchanged. Again, windows are produced in reasonably high quantities and new forms of construction, particularly in aluminium, are employed, but the principle is unaltered.

In contrast, technology in the car industry has become a built-in by-product of the organizational system. The high volume of production has enabled large sums of money, made up of minute amounts on each car, to be used for developing and introducing improvements.

To take one example, car doors have changed considerably from their antecedents in carriages. Not only have higher speeds demanded far more stringent performance specifications, but manufacturing principles have entirely changed the form. The standard product is now (normally) provided with a very efficient gasketing system, capable of withstanding rain penetration at speeds up to 100 mph, a locking and latching system devised specifically for the function it is to perform, and in some cases two mechanical methods for controlling ventilation. To accommodate these items the form of the product has been considerably modified. Whilst the elevation of the door may have a square, or for that matter any other profile, the rebates of the door and frame are always rounded to simplify the fitting of the gasket. Thus the form is derived not only from its function but also from the manufacturing process.

Any attempt to use the car industry as an example for a mass-produced house industry must obviously expose problems of tremendous magnitude. It is unfortunately an all-or-nothing situation in which solution of some of the problems is of little value. In spite of all the adverse influences weighing against them, proponents of the movement have one important factor in their favour, the enormous potential market for houses. In spite of our inability to meet the target production of 400,000 houses a year our actual needs are far in excess of this figure if we are to rid our larger cities of the thousands of acres of obsolete slums and carry forward the ideal programmes for urban renewal.

⁶ Tooling costs for the Triumph Herald cost £5,000,000 and for the Ford Anglia £5,500,000.

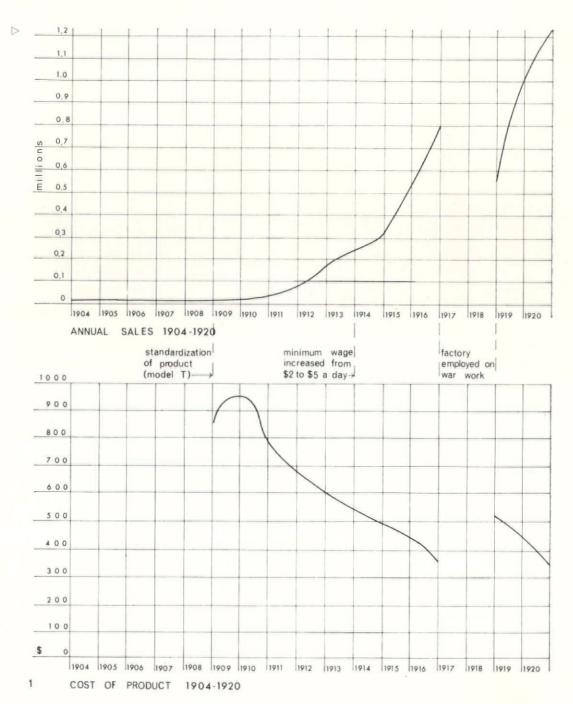
⁷ Variations can of course only occur within a limited framework. For example, to build two cars in a special colour in the factory would cost about £200 for each car, for paint alone, because the entire pipeline system would need to be emptied and reloaded.

s 'If the "model" approach were to be applied to all types of building and standardized whole buildings were widely used, this would suggest the setting-up of permanently integrated organizations in which design, production and assembly were all carried out under unified control. This is the typical pattern in product manufacturing industry where the end product is standardized. But since this is not feasible in building, and since the "component" approach seems to be the way ahead for the majority of building types, the structure of the industry is likely to remain differentiated.' Roger Walters. General Principles for Industrially Made Building Components. An introductory paper prepared for the Economic Commission for Europe Seminar on the Future Design, Production and Use of Building Components. Paris 1967.

Graphs on the right show the inverse ratio of cost to

In 1909 the Ford Motor Company abandoned the method of manufacture which we still employ for the construction of houses. The figures for sales and cost of product for the following years are eloquent justification for the mass-production principle.

'Every time I reduce the charge for our car by one dollar, I get a thousand new buyers,' said Ford. To take the lower profit on the larger volume was of course an old principle in manufacturing, and thousands of companies in hundreds of industries had proved its validity; but never on the scale of the Ford Motor Company. For what Ford had proved was that every time the company cut its prices it tapped a new layer of demand; and that the number of these successive layers was greater than men supposed; and that as they went lower the layers grew bigger. Further price reductions meant new enlargements of the market, and the acceleration of mass-productions larger economies, and greater aggregate profits. Allan Nevins. Ford: The times, the man, the company. New York, 1954.



Graph on the right shows the comparative costs for >

the building and car industries.

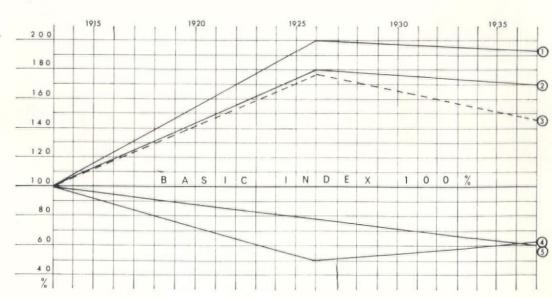
1 represents building costs, average cost per family dwelling. US Bureau of Labour Statistics

2 represents materials costs, wholesale building material prices. Real Estate Analysis Inc. St. Louis

3 represents living costs. US Department of Labour

4, 5 represents car costs, Ford only and generally Automobile Manufacturers Association, New York

The record of achievement during the formative years of the car industry in the USA. Between 1913 and 1926 the average building cost was doubled, whereas the price of the Ford cars was halved. By 1937 building costs had fallen very slightly but car prices generally had maintained a steady rate of decrease.



COMPARATIVE COSTS: BUILDING & CAR INDUSTRIES

CECA steel housing competition winners

In 1965 the High Authority of the European Community for Coal and Steel announced an international competition for the design of a prefabricated house. Designs were submitted by no less than 3128 architects—the Italians being the most enthusiastic (801 entries), followed by the Germans (462), the French (431), the British (234), the Americans (175), the Belgians (134) and the Hungarians (131). Entries came from most other countries: from Russia five designs were sent, from Malta two, from China, Madagascar, Mexico and Ghana one each. The jury was a mixed gathering representing diverse interests:

P. Vago, secretary-general to the IUA.

I. Gardella, architect, Milan.

R. Lentz, president Ordre des Architectes, Luxembourg.

L. M. J. R. Štynen, architect, Antwerp, Prof. W. Henn, Instituts für Industriebau, Brunswick.

A. O. Schuil, Afdeling Technisch Onderzock, Holland.

M. Baesenlin, secretary-general to the Europäischen Konvention der Stahlverbände, Zurich.

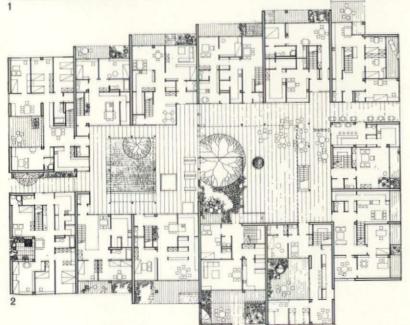
J. Bender, president Société française de préfabrication, Paris.

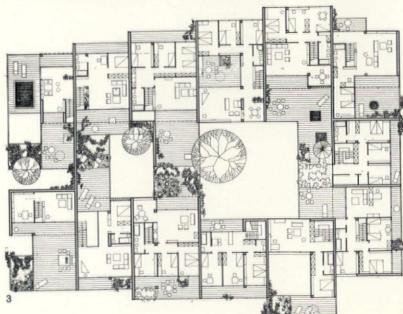
G. T. Wuppermann, Gesellschafter der Theo Wuppermann GmbM, Leverkusen. Prof. A. Palazzi, deputy director of the Centro Sperimentale Metallurgico, Italy. L. Ceccarelli-Balbo, sociologist, Milan.

Together they chose ten designs that were further developed and judged—all of which are illustrated here.

The winners of the final stage of the competition were the 34-year-old German engineer, Jochen Brandi, and his team of five. Their design, shown on this page, is simple—surprisingly so—and very easy to manufacture and assemble. The jury approved, in particular, the way in which the high degree of standardization envisaged nonetheless allowed for considerable variety in building. The first prize of 80,000DM was awarded at a ceremony in Luxembourg on September 14th of this year. During the following week all designs submitted were on show.







Architect: J. Brandi, Göttingen Engineer: Peter Schwanitz

Engineering consultants: K. Duwe and G. Mietzner of Kohlhaas-Duwe-Bergmann Advisers: H. Gladischefski, G. Schramm

Details of the structural system are not at present available; it consists, however, of RSJs, floor and ceiling panels and staircase components. These are arranged on a grid of 150cm, with a module of 30cm. The cladding panels, the internal wall panels and partitions form a distinct sub-system. They can be fixed, mounted and dismounted at any time, allowing considerable flexibility in the internal arrangement. The jointing system consists of special plastic profiles (patents applied fcr) which allow for assembly without the use of screws, bolts or clamps.

Equipment units, for heating, ventilation, sanitation and electrical power are inserted last, rather like items of furniture, and can be as easily replaced.

Service pipes and air extraction ducts are to be incorporated in the structural framework and panelling.

Heating is by electric underfloor panelling. The various components can be used for single houses, for group housing and for high-rise flats.

Perspective of housing groups assembled using the components designed by the winners of the CECA steel housing competition

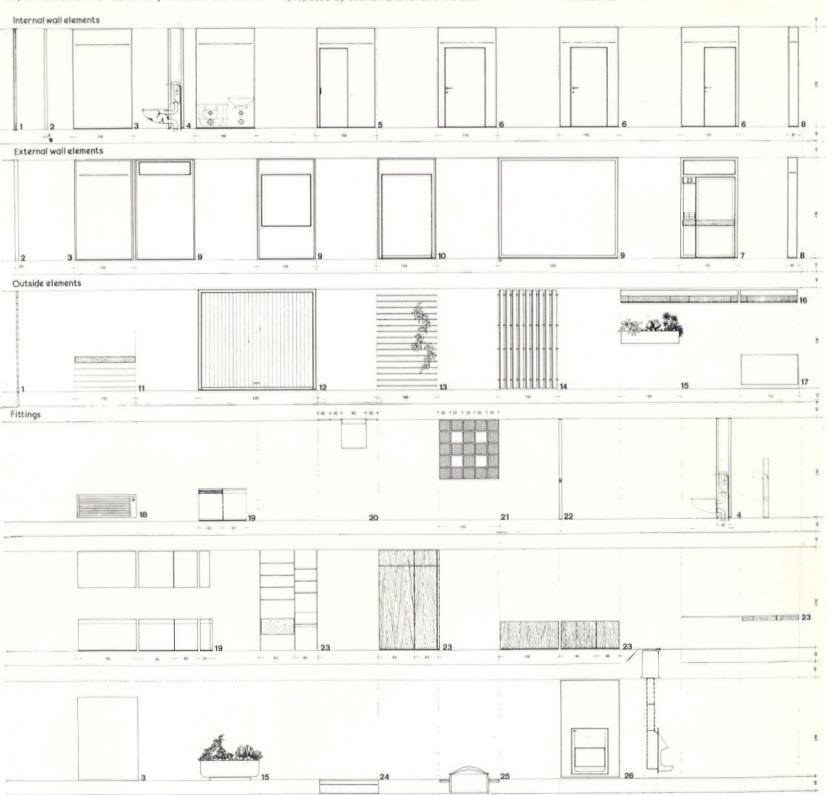
Ground- and first-floor plans of a housing group, as proposed by Jochen Brandi and his team

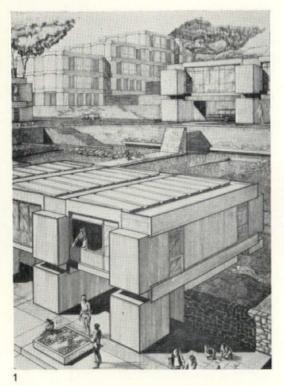
Cladding components, internal panels and equipment units designed to be inserted on a 150cm structural grid, with a 30cm module

Photo: Hans Wilder

- 1 post 2 cover strip
- wall
- sanitary wall
- sliding door
- swing door front door
- filler
- 9 wall with window
- 10 wall with glass door
- 11 rail
- 12 garage door
- 13 trellis
- 14 louvres

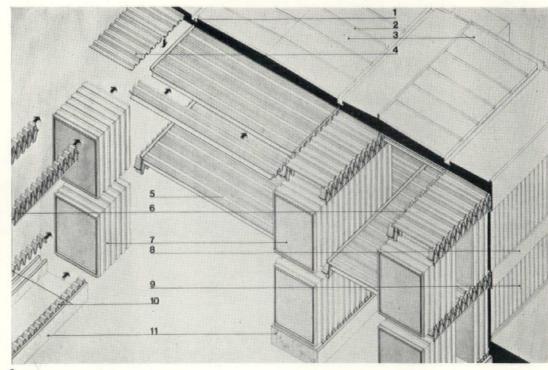
- 15 plant box
- 16 blinds 17 fence
- 18 radiator
- 19 kitchen fittings 20 extract hood
- 21 lighting panels 22 cover strip with switch
- 23 furniture
- 24 pergola 25 skylight
- 26 fireplace and flue (in asbestos)

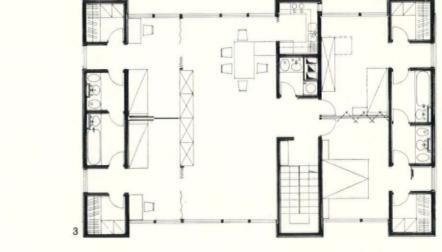


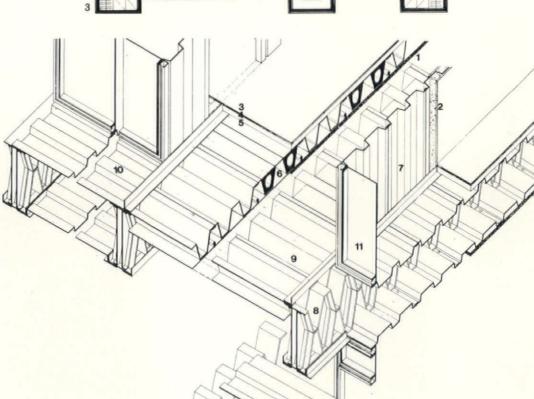




Engineer: Guiseppe Pestalozza







Perspective showing possible housing configurations

Assembly diagram of main structural components

1 main gutter

2 secondary gutter

3 roof cladding

4 floor and roof components for minor spans

5 floor and roof component for major spans

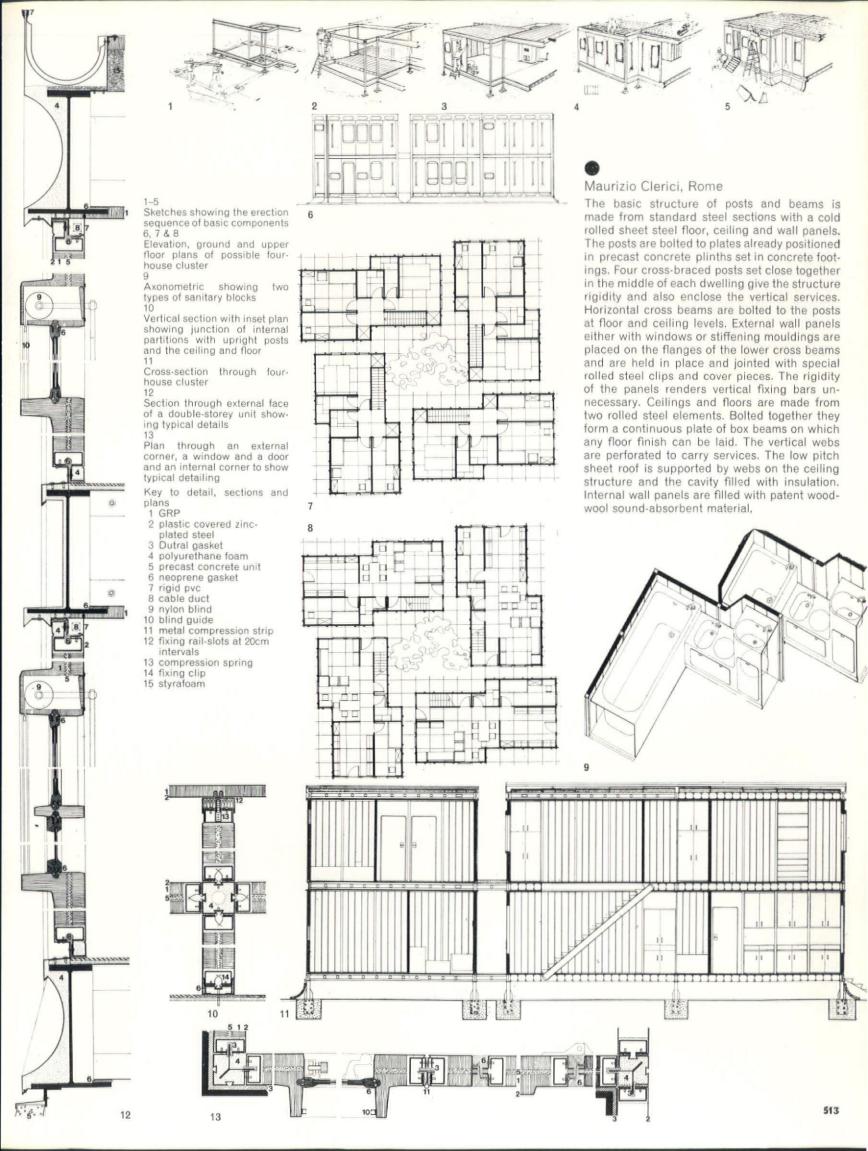
6 steel girders

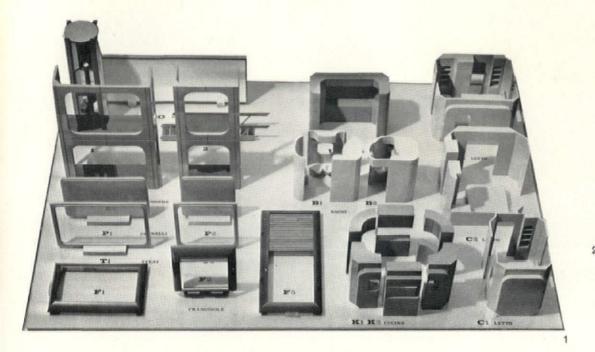
- 6 steel girders 7 structural box components
- 8 fascia
 9 plastic coated laminated cladding
 10 bearing girder bolted to footings
 11 concrete footings

Typical house plan, 118-2 sq metres

4
Isometric showing junction of structural components
1 sound-absorbent woodwool ceiling
2 wall panel with plaster fill behind
3 linoleum flooring
4 1cm asphalt screed
5 4-5cm chipboard sub-floor
6 expanded polystyrene around ducting
7 structural box component
8 steel supporting girder

- 8 steel supporting girder
 9 floor and roof component for major spans
 10 floor and roof component for minor spans
 11 panel closing end of box component







Architect: R. Severino

Engineers: B. Conti, M. Indiati Architectural associates: R. de Rubertis, F. Vescovo, E. Masi, M. Salvia, N. Pazzi

Engineering associates: L. Lanari, M. Desideri, F. Conti

Interior designer: C. Briganti Sociologist: A. Spreafico

Steel consultants: Terni Steel Corporation

A set of factory-finished components has been designed, each corresponding to a particular use or function. The structural units are loadbearing frames with windows or sheet steel cladding, plastic coated. All ductwork and service runs are integrally incorporated. The floor slabs, of sheet steel and lightweight concrete, also have ductwork built in.

Kitchens, utility rooms, bathrooms and bedrooms are all formed with sets of components. These can be rearranged at will, long after the completion of the building.

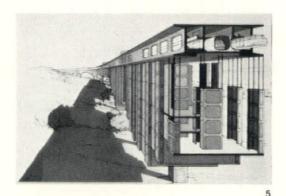
The system is applicable for both individual dwelling units and large-scale housing strucModel showing all components of the system, Phase Two

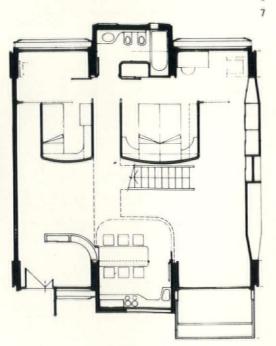
2, 3, 4
Diagram showing assembly of vertical bearing elements, floor slabs and panels and, lastly, inner linings and room components

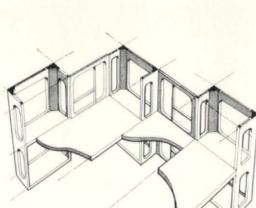
Linear city project using the basic components

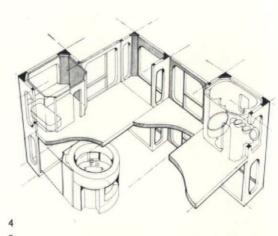
6 Model of typical dwelling unit

Ground and upper floor plans of typical dwelling unit

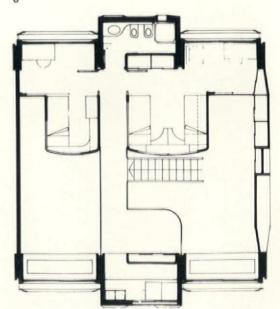


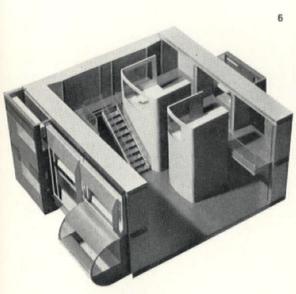


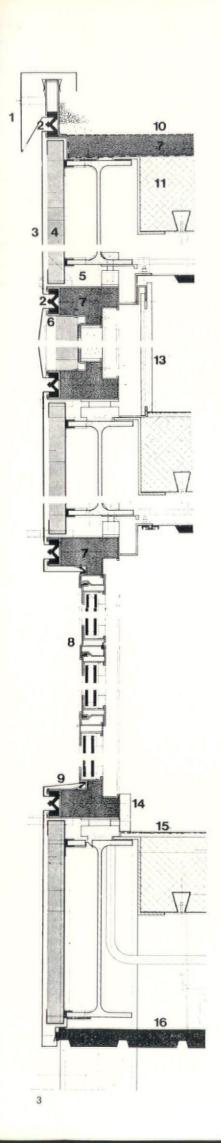




3







Hans U. Güeblin, Michael Schweifert Structural engineer: Mathias Luchsinger Steel consultants: Josef Meyer Eisenbau Sanitary consultant: Karl Bösch Heating consultants: Schmid Amrhein Electrical consultants: Baumann, Koelliker

Every building put up by man, the designers consider, is an assault on the environment in which it stands. They have therefore conceived their buildings in contradistinction to nature, so that each might retain its independence and distinctive qualities.

Colour consultant: Hans Blättler

The dwelling units are largely independent of topographical restrictions. Access is allowed for on all sides. The main living rooms, lit from two sides, can be oriented east-west or north-south. The focus of each house is the service core. Kitchen, bathroom, w.c. and heating units are grouped around a central duct. The bathroom contains a w.c., shower, wash-basin and washing machine. The kitchen, in addition to the usual equipment, contains a refrigerator and has provision for a dish-washing machine.

The main supporting elements are hollow, square section steel columns of variable length. and the three service panels, main and secondary beams are fixed to these elements to form a rigid framework. Standard floor and roof panels, made up with steel frames and hollow ribbed sheet steel filled in with lightweight concrete, are mounted on and screwed to the main framework. The internal wall and window panels are also fixed to this frame-with a bolt and pin device. The external sheathing consists of sheet steel panels pressed in a rhomboid fashion to allow for thermal expansion and to allow for the play of light on the surface. These panels are to be painted carmine red. The main framework is to be a rusty brown. Rubber gaskets set between the exterior panels and the main framework are designed to prevent the transmission of the sound of the expanding and contracting sheet steel.

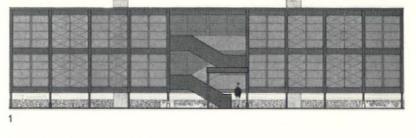
Elevation and upper floor plan of a four-house building

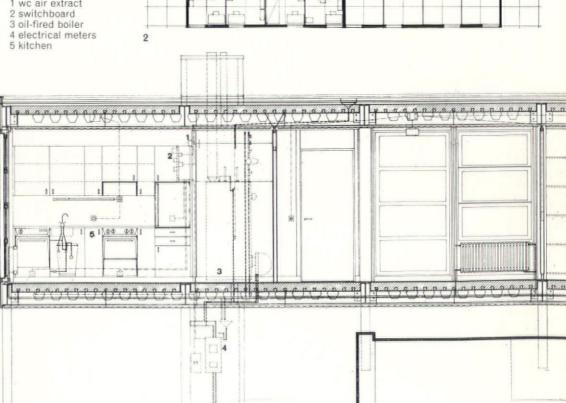
Detail section through external wall

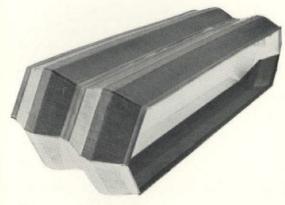
- 1 cor-ten fascia
- 2 plastic strip seal cor-ten cladding panels
- 4 foam plastic
- 5 injected foam insulation
- 6 steel frame
- 7 cork insulation
- 8 double glazed windows
- 9 cor-ten sill 10 20mm sand
- on pvc sheeting 11 lightweight concrete
- 12 ribbed steel shuttering
- 13 timber wall panel
- 14 timber skirting
- 15 felt carpet
- 16 ribbed steel sheeting, no soffit

Part section through a typical house

1 wc air extract





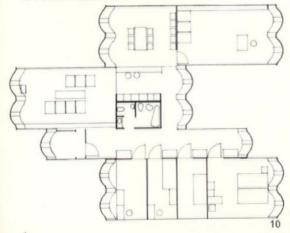


Leszek Lésiniak, Poland

For complete flexibility of planning, internal supports are eliminated. The structural unit consists of wall, ceiling and flooring panels, flexibly jointed, that are folded together during transportation to be opened out on site to form a complete dwelling unit. To provide dwelling units of greater size, two variants are proposed. Variant A: components 2 metres wide, 10 metres long, are joined to make dwelling units of varying sizes. Two components make up the minimal spatial unit. When opened, these are fitted with kitchen and bathroom and service units and then stacked together or laid out alongside one another.

Variant B: In principle, this involves 'one element, one house' (weight 11 tons). The structural components, of maximum size 30×14 metres, are delivered to the site folded and there unfolded by means of a crane. The joints are automatically fixed by a lock-joint.

The walls, the floors and ceilings and the roof are all made in the same manner—a sandwich of two sheets of steel with a 4cm filling of polyurethane foam.



Model of structural unit

Model of one version of the structural components stacked together 3 & 4

Longitudinal section through six structural units, showing them in their closed and open positions

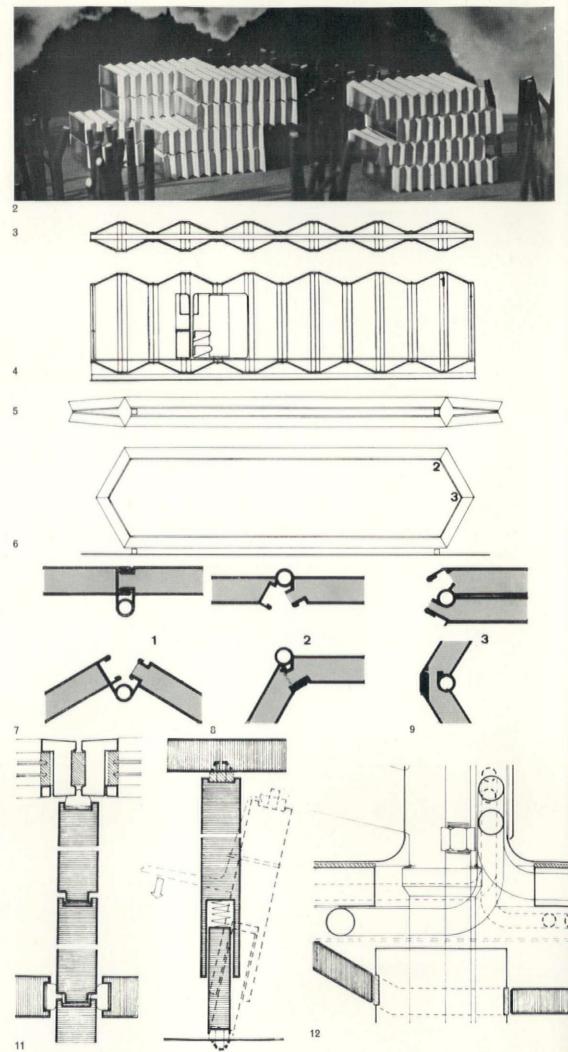
5 & 6 Cross-section through a structural unit, closed and open 7, 8 & 9

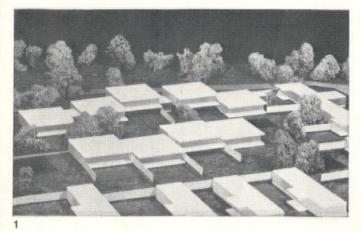
Open and closed position of the joints marked in diagrams 4 and 6

Plan of a typical house plan

11
Plan and vertical section showing the fitting and junction of the internal partition panels with the main structural component

Section detail at floor level, through a structural component, showing how service pipes and runs are to be incorporated













The basic dwelling is made up of four identical structural cells, 6 metres square, each with four columns, eight beams and floor and ceiling panels. Cells are subdivided into five modules. Cladding and internal partition panels complete the structure.

The basic dwelling is made up thus:

Cell 1, entrance-hall, w.c. and wash-basin, kitchen, spare room and heating.

Cell 2, living room.

Cell 3, two children's rooms with storage and study area.

Cell 4, main bedroom, bathroom, w.c. and storage.

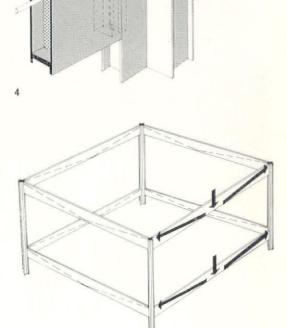
This dwelling can be put together, without welding, bolting or screwing, in 150 hours. The total weight is 23 tons.

Structural cells can be set alongside or above one another to form larger dwellings, duplex or terrace houses or blocks of flats.



Model of the basic structural cell unit

Diagram of basic structural cell indicating position of tension rods within the beams. The direction of stresses are shown with arrows



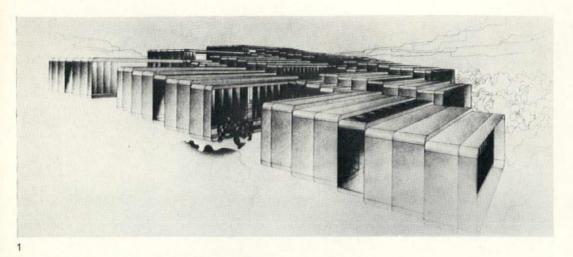
Models showing possible combination of housing units

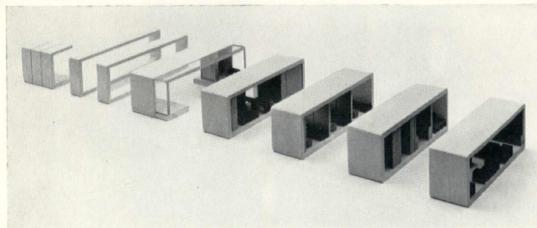
Isometric, viewed from the interior, showing the junction of beams and columns achieved, without bolts, screws or nails

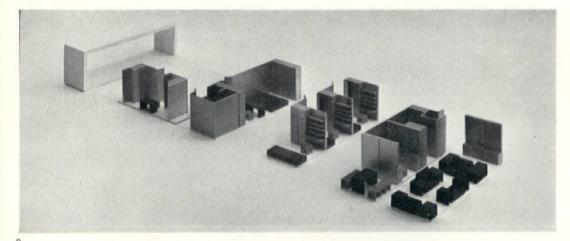
3, 4

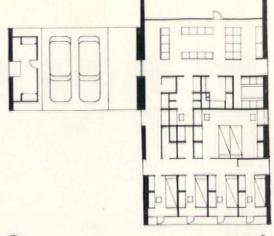
Views from the exterior showing junction at ceiling and floor levels, of uprights, horizontal beams and











Herbert Ohl, HfG, Ulm Associates: B. Meurer, M. Kopf, W. Niederastroth, H. Stumpp, R. Zirker Consultant engineer: Reinhold Hagmann Associate engineer: Sebastian Blaue

Mechanically driven piles are used for the foundations, greatly reducing the site work, but the living units themselves are made up of selfsupporting, factory finished and fully equipped tube-like sections of steel, 1, 2 with a semi-rigid plastic infill and flexible jointing and sealants. Maximum weight of the units is 4.25 tons. The factory-finish includes not only wall, floor and ceiling coverings, internal walls, sanitary and kitchen units, but all furniture and services 3. The services are incorporated either into the main structure (heating, ventilation and airconditioning ducts) or in the junctions of the secondary structural units, where the walls meet the ceilings 4 and floors.

The assembly of the living units on site consists simply of tensioning the main structure in both directions, by means of cables threaded through tubes, joining the services and packing the joints with gaskets or mastic. The erection time for a house, 130 sq m, 5, is 3 days.

Using the system for multi-storey buildings demands either additional fire-protection (lightweight fireproof cladding or flame extinguishing paints) or the acceptance of a Swiss fire code.

Key to roof section 4

riveted steel gutter

glazing Thiokol strip seal Perbunan strip seal

5 tension rods 6 GRP insulation window wall

8 spot rivet, Thiokol seal

9 plastic coated steel 10 rubber strip

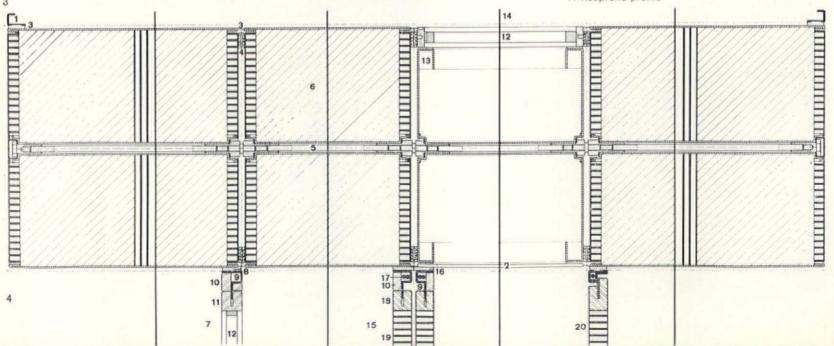
11 neoprene profile

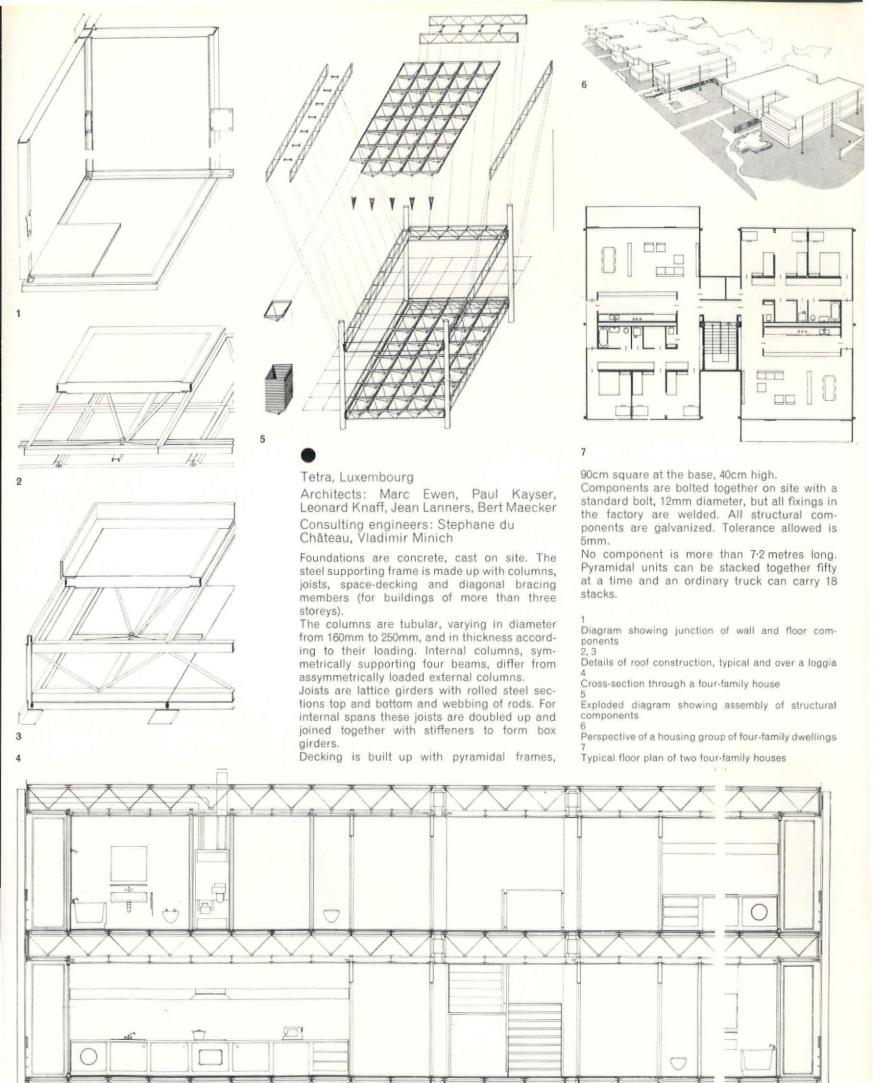
12 double glazing 13 plastic coated steel 14 skylight

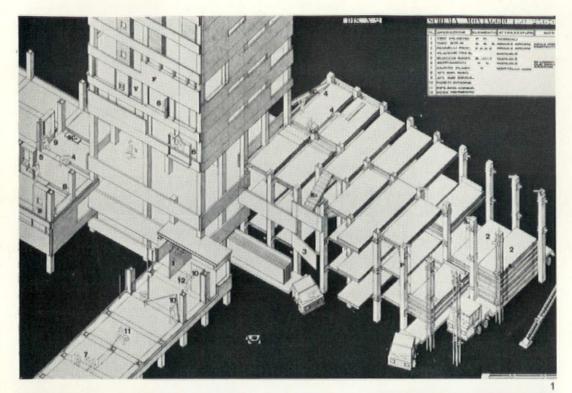
15 double partition 16 rubber strip

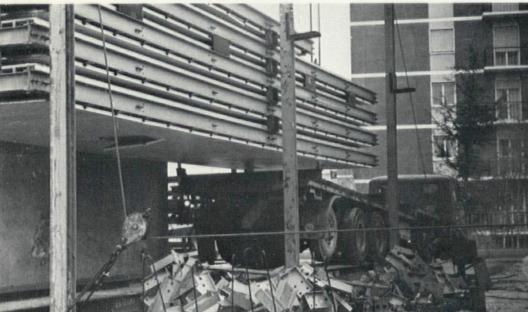
17 electrical conduit 18 timber lip

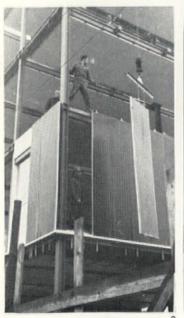
19 steel faced partition, plastic cellular core 20 internal floorway

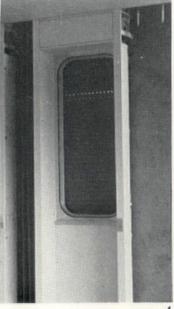


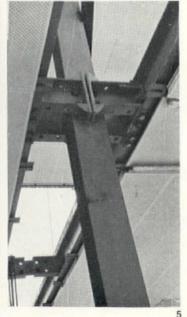












Franco Sironi, Steel Plan, Milan

Associate architects: Lorenzo Martinoia, Poitr Sobotta, Jacek Sokalsky

Assistant: Ulisse Bulgarelli Consultants: Soc. Innocenti SPA

The distinguishing feature of the system is the use of standard floor and ceiling panels. These are made up of rolled steel joists, the floor finished in sheet steel, the ceiling made up of perforated steel elements covered over with compressed glass wool. The infill is of reinforced concrete.

The panels are delivered in stacks from the factory and raised directly into position by means of cables—cranes being unnecessary. The elevation panels are then mounted on rods set in a series of holes in the perimeter beams. Plumbing blocks, heating and electrical units complete the system.

The junction between the ceilings and the internal walls is not considered satisfactory by the designers and this detail is being refined, but already the system has been tried out and even adapted for a factory for Olivetti. Begun on July 10th the factory was opened on August 15th.

Construction diagram
2
Delivery of flooring components
3
Cladding panels being hoisted
4
Interior view of window panel

Junction of columns and beams 6 Construction sequence

7 Detail of main structural junction

Detail plan of column and cladding panels—internal angle

Detail plan of column and cladding panels—outer angle 10 Typical cross-section through floor and ceiling component

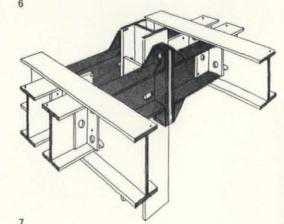
floor and ceiling component 11 Isometric showing conjunction of various components

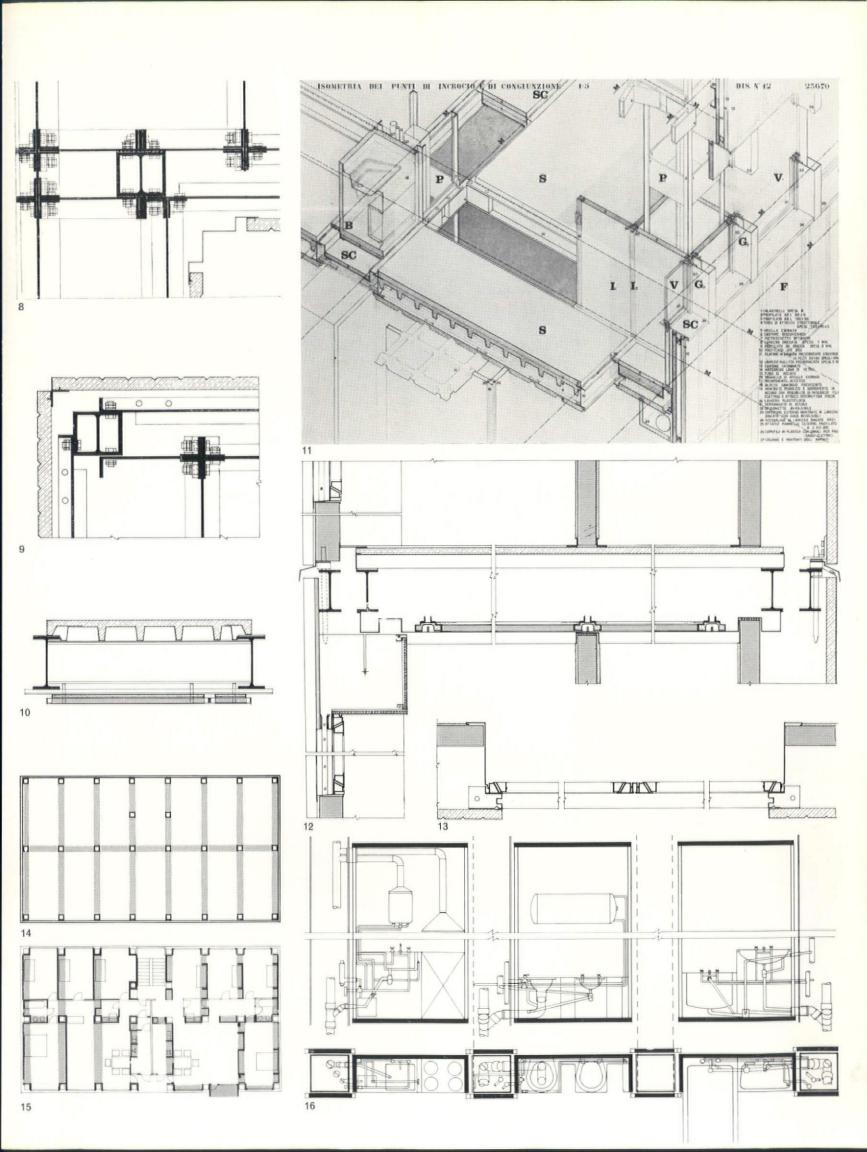
12 Detail section through typical window walls, flooring components and external cladding

Plan of window component

Typical floor plan—possible position of service units shaded 15

Typical plan of two dwelling units—service runs shaded on l.h. side; position of service units, built-in furniture, balcony and window units shaded on r.h. side







Fun palace, Camden, London

Fun Palace Trust, pilot project Director-Joan Littlewood Architect—Cedric Price Chief assistant-Stephen Mullin Quantity surveyor-Douglas Smith Consulting engineer-Frank Newby

Joan Littlewood's brief

A new attitude to the use of time and space. A springboard for the needs and objectives of the community.

A space to try new skills, waste time pleasurably, extend interests.

The educational aspect of the pilot is an emergency measure and cannot cater for long-term studies. Nevertheless, sufficient interest should be aroused for the participants to develop their talents elsewhere or in some cases initiate their own versions of the experiment in different contexts.

The project to be multilateral rather than comprehensive.

Scientific gadgets, new systems, knowledge locked away in research stations can be brought to the street corner.

During the preliminary design stage of the major Fun Palace on a Lea Valley site (AD Nov, 1964) a variety of methods of determining requirements for various activities was used, ranging from a public questionnaire poll to work by the Cybernetics Group led by Gordon Pask. However, it was also realized that programming equipment, facilities and staff for a range of activities capable of being named was insufficient to provide the degree of environmental flexibility desired, since-if it were to work at all-it was essential that the Fun Palace should create situations, circumstances and conditions under which activities, hitherto unimagined, would occur. It was essential that, prior to the detailed design of the variable enclosures and equipment, the minimum duration of activities be determined.

Concurrent with this work, during 1961-62, two of the Trust's committees were working on methods of co-operation with existing bodies for activities requiring personal tuition, instruction and supervision. Such activities ranged from learning to operate complex machinery to children's playtime.

In mid-1963 it was decided that, as the main project was being further delayed due to difficulty with the Lea Valley site, the social and educational content should be made available, in part, in urban areas. In addition some of the

information and experience required for the major project could be gained through the establishment of a series of pilot projects.

Sites (1/2-6 acres) were investigated in London, Liverpool, Glasgow and Manchester, and in July 1964 the site in Camden illustrated here was made available by the LCC Parks Division subject to the normal processes.

While the LCC and sections of the St Pancras Borough administration gave great support to its establishment, a small group of local residents caused such an outcry that the project on that particular site was abandoned, and the planning application withdrawn, since part of the validity of a short-term mobile toy is lost if in its very first resting place it is not wanted.

Design thesis

The provision of a serviceable environment in which visitors may choose from and participate in varied activities.

The structures and equipment are designed so that the arrangement of any particular site will take into account both the availability and the lack of communal facilities adjacent to the site. Rapid and inexpensive alterations and additions can be made as more land becomes available or conditions change.

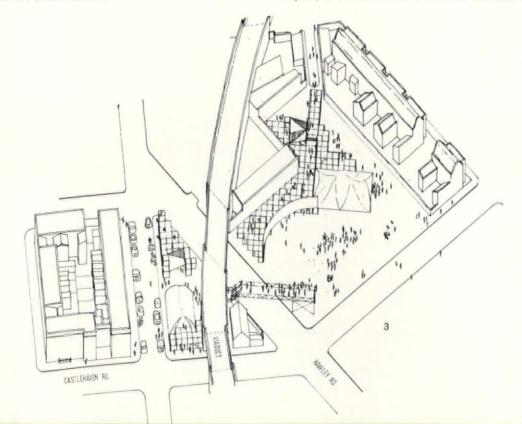
It is considered essential that any such development proposed should be of a sufficiently temporary nature to ensure that long-term development plans are not impeded by its presence.

However, its mere existence and successful operation should suggest, for larger and more permanent developments, methods by which provision for public open spaces could be made consistent with an ever-changing metropolitan use and living pattern.

Since the sites available vary in size, the means of achieving enclosure and environmental control require to be both adaptable and adjustable. The resultant 'kit of parts' must also make possible variable usage.

Environmental control in the pilot project is achieved partly by the juxtaposing of different units and equipment, thus enabling a reinforcement of barriers-cf. the main Fun Palace which achieves control and flexibility of enclosure by means of a 'permanent' serviced space-grid.

This 'reinforcement' procedure will also be followed in the zoning of activities-eg an enclosed activity requiring moderate protection from external noise will be used as a blanket to a further activity requiring a high degree of sound insulation. The same principle is applied to heat conservation, light control and predictable movement patterns.



Kit of Parts (see diagram 4 below)

Mobile electronic projection units 1. External lighting banks 2. Triodetic spaceframe structures with thermal, visual and acoustic baffles 3, 5, 7. Free-standing flooring panels 4. Projection screens for external use 6. Standard demountable cubes with various panel infills, stairs, floors, doors, etc. 8-14. Inflatable structures—purpose-made 15. Plasticized nylon tensioned canopies 16. Chair, table and 'bench' units. Storage and lavatory accommodation. High level prefabricated footbridge.

1 & 2

Day and night views of the main approach to the proposed Camden Town fun palace, seen from the

Axonometric of the Camden Town fun palace, stage I

Kit of parts

Layout of the Camden Town fun palace-shaded area indicates position of new equipment and building the dark area represents the upper level walkway formed among the box units

Key to plan PH public house

traffic flow

decision point for vehicular traffic

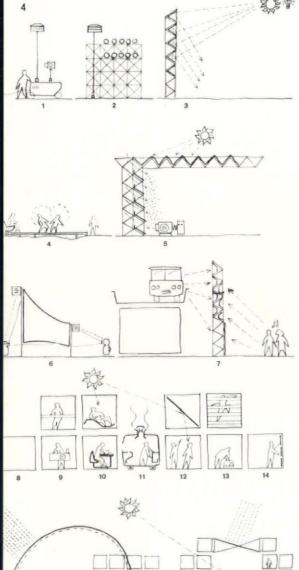
booths, small scale music and dance activities 2 Inflatable auditoria morning and afternoon overflow assembly halls for primary and secondary schools, technical colleges and institutes for further education evening theatre, music, dancing, wrestling, etc. 3 Projection screen

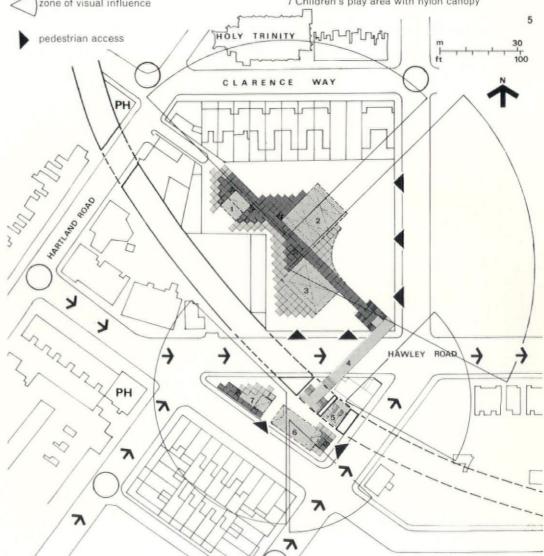
evening multiple slide, film and light projection. Changeable backdrop to open air theatre, music or dancing activities
4 High level bridge and observation platform (17ft

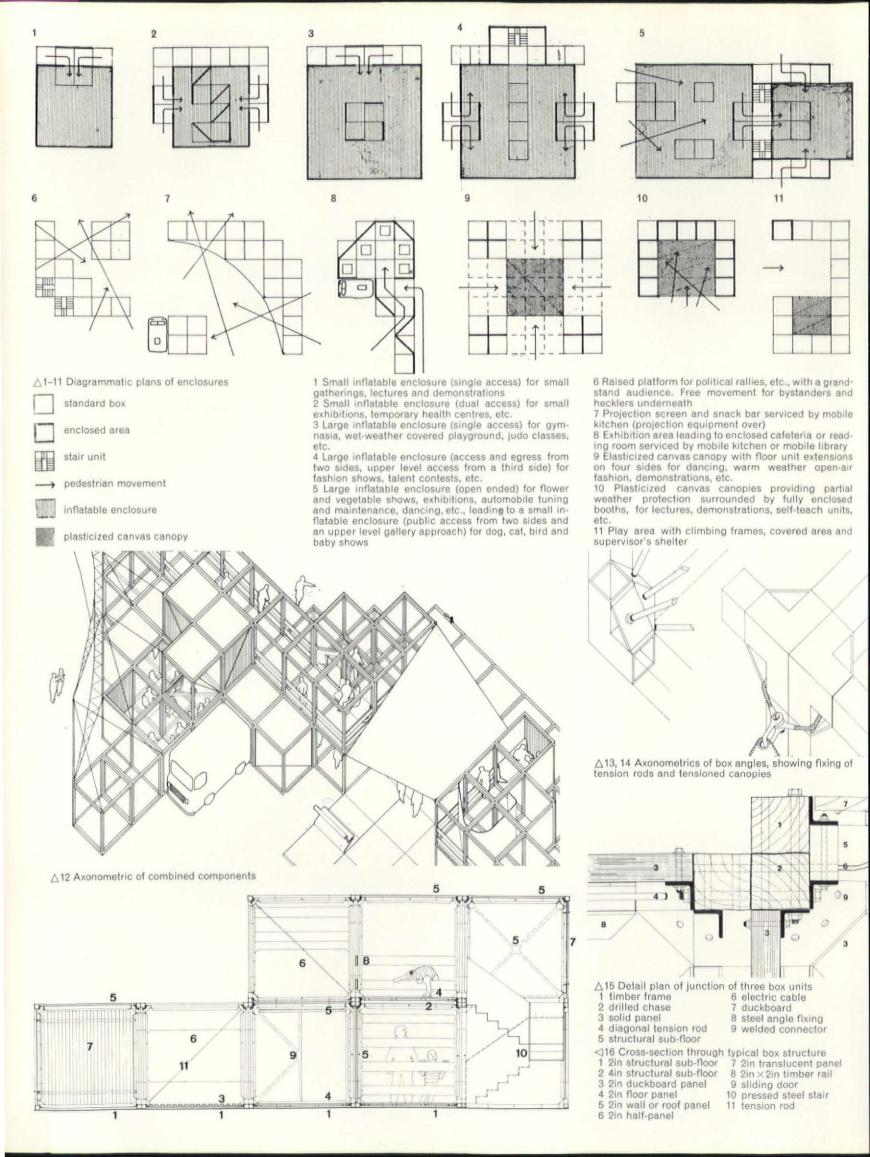
headroom under existing railway bridge)
5 Lavatories and store for inflatable structures and electronic equipment

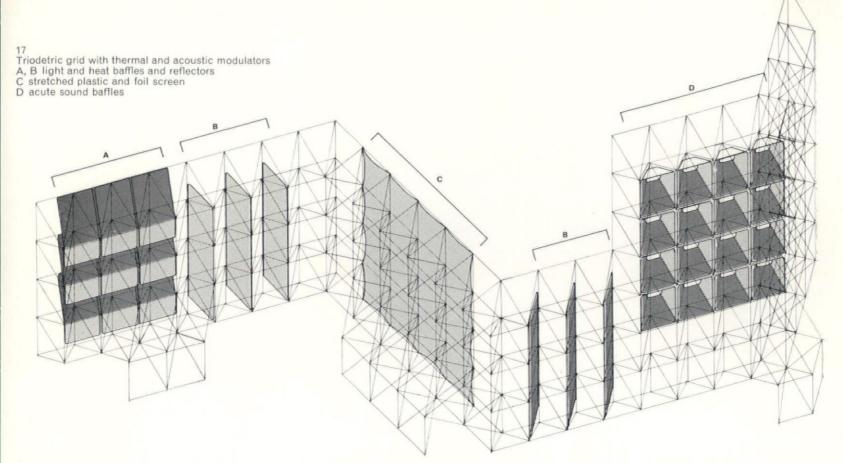
6 Small inflatable auditorium morning children's play/nursery school afternoon old people's meeting place

evening theatre, music and lectures
7 Children's play area with nylon canopy zone of visual influence









Site conditions

The general conditions already referred to applied to all the sites, but the following siting conditions are relevant to particular urban sites.

Riverside site

The social usefulness of rivers in urban areas has steadily declined to the point where their relevance to everyday city life is ignored. The use of large rivers as a means of both public communication and enjoyment is exploited in such sites.

Railway sites

With the continual re-organization of rail communications, dismantled marshalling yards, cleared or redeveloped forecourts and derelict depots have been investigated. Such sites with their built-in communication links and services are well suited to such temporary development during the time that a long-term plan is being considered.

Central industrial

As with railway sites, several large commercial developments are now finding their centrally placed sites difficult to service or are being re-sited by the local authority. Such sites, if developed, can increase the validity of neighbouring social amenities, and again give a clue to long-term development.

Public parkland

At present most municipal parkland has taken little or no account of the increasing range of open-air leisure activities or the increase in personal mobility. Such a temporary development could further enrich the range of facilities available.

New development

Various cities during their period of major rebuilding and replanning have areas which are suitable for experimental development of a temporary nature, while awaiting a decision on final use.

Inter-wars city housing areas

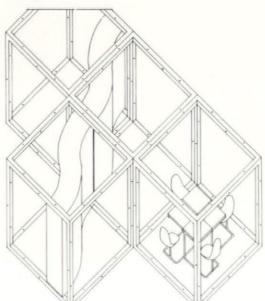
Frequently such areas are desperately under-provided with open space and social amenities, and require immediate attention.

▷18 & 19

Axonometric and plan showing introduction of curved panel units into a box-unit space frame

Preliminary estimate of costs

Standard 7ft 6in cube demountable structures with ancillary components £40,000 per 100 units Prototypes, loading tests and initial erection £3.000 Composite chair and table units £1000 per 80 units Inflatable structures (2 No. $45ft \times 103ft \times 25ft$ and 1 No. 30ft × 70ft × 16ft and 12 No. 45ft × 15ft canvas canopies) £12,000 Servicing inflatable structures -flooring, heating, lighting and ventilation (2700 sq ft) £7-10,000 Space frame and baffles £10,000 Storage and lavatories £6000 Projection screens £5000 Mobile electronic projection unit and amplifiers £2000 Electric power and lighting and distribution including external connection boxes £2000 Drainage and water supplies £2000 Signs and traffic indications £1500 Bridge over Hawley Road £12,000 Demolition, site levelling, tarmac surfacing by LCC (1964 prices)



Press comments

Fun Palace 'will increase amenity' North London Press 5.2.65

'Church slams "funpalace" project for Chalk Farm.

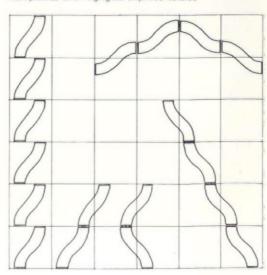
Parents, teachers and clergy in the parish of Holy Trinity, Chalk Farm, are alarmed. The vicar listed five grounds for objection. (Two of) these were:

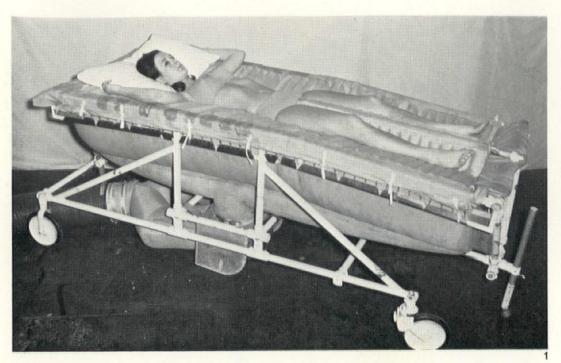
It would have the effect of destroying the existing church youth organizations, whose members would be weaned away and lost to church teaching. "I don't suppose the LCC will bother about this one."

The building would attract the most undesirable type of rowdy and hooligan from other areas. "We have quite enough of our own to put up with." Hampstead and Highgate Express 12.2.65

'I read with great weariness the report (February 12) of the Clarence Way Estate Residents' Association and their protest against Joan Littlewood's Fun Palace. It is depressing to read about such narrow-mindedness and snobbery—what's so exclusive about Camden Town anyway—with the usual dreary catalogue of complaints about "undesirable elements"?

Good luck to Joan Littlewood. She might bring some life to an area which, if the residents had their way, would become another dead, dreary and "respectable" suburb.—Richard Perry, 43d Nightingale Lane, S.W12.* Hampstead and Highgate Express 12.2.65





Levitation

Heywood Hill

New inventions can be observed, not only for their performance in fulfilling the function for which they were designed but also for the development of the societies which might follow their birth. An invention which offers nothing to the evolution of society is merely a gadget. Architects are interested enough in gadgets. But they should be especially interested in inventions with environment potential. They are suckers for the monorail yet it is evident that it will impose the tightest ever strait-jacket on planning. The current favourite is the GEM (ground effect machine or hovercraft), a freemoving vehicle requiring minimum hardware (roads, etc.) which might lead to the population of hitherto man-hostile parts of the globe. The

new trend suggests the increasing independence of the individual and an increasing awareness of each of us as a free-ranging subsystem rather than a fixed assessable unit in the bureaucratic machine. Equipment already exists which can link even the severely disabled to the global communication networks.

The Possum system, or Patient Operated Selector Mechanism, enables a human totally paralysed except for the mouth to control mechanisms and electric apparatus 3-6, 13. This is done by blowing or sucking to act on a diaphragm-operated microswitch or pressure transducer which gives on/off control. The patient can switch lights, bells, tune in televisions and radios, operate a page turner or microfilm projector. The Post Office has cooperated by providing their new Loudspeaking Telephone in a suitably amended form. The electrical apparatus required is small in size and fits on a trolley. Another device can operate an ordinary electric typewriter fitted with a solenoid box, Selection



of the characters to be typed is made with the aid of a grid. The most used characters require fewer puffs and sucks. To the nimble fingered this may seem a laborious process, yet it is possible to type 30 words a minute by this method. Another technique using a kind of morse code system permits speeds of up to 100

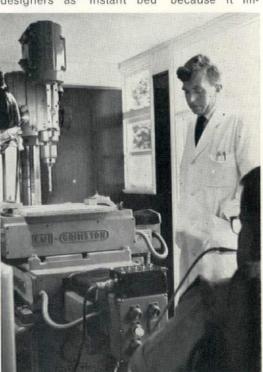
words per minute.

Other research projects for the sick and injured also point to more general applications. The bedsore problem is being overcome conveniently in parallel. The National Research Development Corporation has sponsored the 'hoverbed' 1. Immediately useful for treating patients with badly burned skins, it would appear to be the ultimate in prone comfort. 'The body floats gently upon sterile air at a pressure of 13 to 17mm of mercury, preheated to 30-42°C, and appropriately filtered.' Environmentalists will be pleased to hear that 'a sterile plastic tent envelops the entire bed.' It is known to its designers as 'Instant bed' because it im-













mediately adjusts itself to bodies of any size and weight, using a seal of fine fabric pockets to prevent the air escaping between the body and the bed. Mounted on nice big castors the bed is highly manœuvrable. Motorization would give a Possum operator full horizontal mobility, if not vertical also (remember the Flying Bedstead? 2). The plazas of a post Design-for-the-Disabled age might be populated by a new, all media, executive class of bedridden persons, pollution-free in their own sterile environments. The rest of us could indulge in the athletic but wasteful pursuits of driving up and down motorways and grouting the joints of precast maisonettes, for to be mobile is to be unproductive, viz. the Neolithic revolution. Yet to become more than a medical case a Possum operator must become mobile, and the effort output required to achieve this has to be through a mind-to-machine system and, as such, nonrecreational in the sense that the more fortunate need mobility for exercise, foraging and



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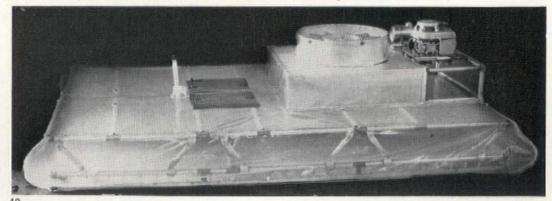


investigation. Progress in the mobility scene is unlikely to render us more creative, just more inspired. With a Bell Hip Pack 7-10 on your back you have a range of 860ft with a maximum altitude of 80ft, with speeds from zero to 60 miles per hour and the fun lasts for 21 seconds. So far seven men have been trained to use the machine. It works by hydrogen peroxide being forced under pressure into a gas generator where it contacts a silver catalyst bed and decomposes into super heated steam (no flames). The steam escapes through two rocket nozzles providing thrust. Main thrust is directed downwards while jetavators induce yaw control. Pitch and roll are controlled by movements of the operator's body. If the pinnacles and turrets of Balmoral were re-assessed in terms of this invention they might be found just relevant, the sheer façade of a curtain wall and an obstruction.

Without favouring the decorative too much it would help if more architects moved out of



the building side of life and tried to observe the destructive forces eroding the solid world. Even the Archigram group flowers on the engineered megastructure, another attempt to rebuild Troy and continue the laying of heavy foundations under the feet of responsible citizens. However the Archigram designers are groping for a way out, Michael Webb and David Greene in particular (see AD 11/66). Under their tuition a group of third-year students at the Virginia Polytechnic Institute state that 'the architecture of today will not do' and have designed a 'Mobile Environment on a recreational level' consisting of a GEM 12 and a plastic bubble house 11 for one man. Bubbles may be linked to form a 'colony' of individuals with common interests, by removing one of the doors and zipping the units together. The design offers more flexibility and choice as to where you switch off the engine, but from that moment on the opportunities for a better life are no more than they have ever been.



The Hoverbed was designed by the Institute of Ortho-paedics to support badly burned patients Photo: Hovercraft Development Ltd.

The Flying Bedstead Photo: Rolls Royce Ltd.

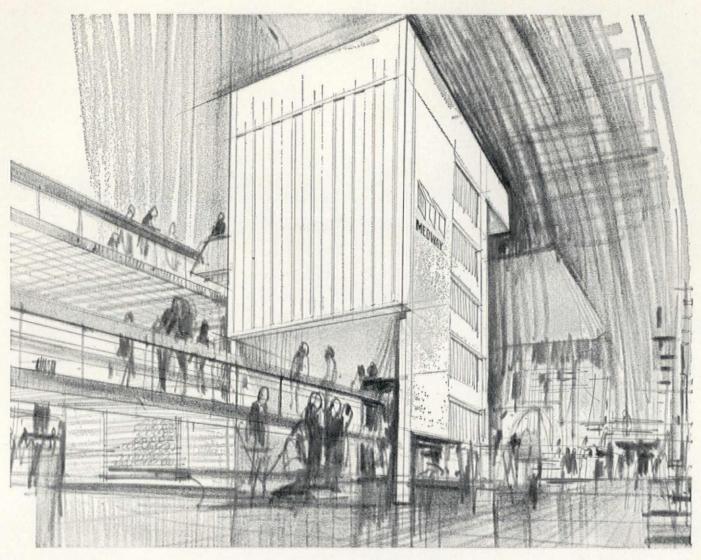
3, 4, 5, 6 & 13 The Possum system makes use of the breathing apparatus of an otherwise totally paralysed person. By blowing only 1cc of air onto a diaphragm switch he can control any communications media or electronic-ally-operated mechanism. The chart shows how typewriter keys are selected according to number of puffs and sucks

Photos: 3, 4 & 5 Polio Research Fund; 6 Bucks Advertiser

Invented by Wendell F. Moore of Bell, the Rocket Belt is manufactured by Textron's Bell Aerosystems Company. The one-man 'pogo stick' weighs 114lb, including fuel, with a total thrust of 300lb. It has a range of 860 feet, altitude of 80 feet and flies at 60 m.p.h. The fuel lasts for 21 seconds. To prevent the possibility of running out of fuel a small vibrator is fixed behind the the pilot's helmet 7, transmitting signals onto his skull and reminding him how much time has elapsed

Photos: Bell Aerosystems Co.

third-year design project at Virginia Polytechnic, US, titled A Mobile Environment on a Recreational Level by C. Ansell, J. Bradford, J. McBride, B. Sumption



at the centre of COMPONEX'67

BUILDING EXHIBITION-NOVEMBER 16-29 1967

the new Medway Building Method



Information on the new Medway Building Method and all Medway Systems and Components at Medway Stand No. 103, Avenue A, Building Exhibition, Olympia, London.

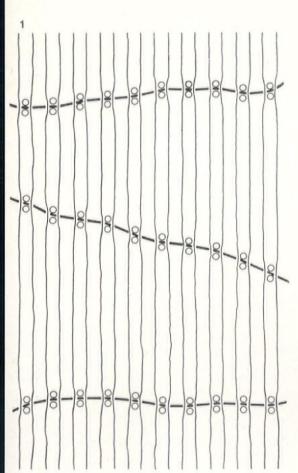
MEDWAY BUILDINGS LIMITED, PHOENIX WHARF, ROCHESTER, KENT. TEL: MEDWAY 79701

The pattern of streets*

Christopher Alexander

The pattern presented in this paper, is a modified form of the pattern first described in the Journal of the American Institute of Planners, September 1966.¹ The modifications are based on criticisms by Daniel Carson and Peter Roosen-Runge. These criticisms and my reply were published in the AIP Journal, September 1967.²

The pattern is presented in a standard format which has been introduced by the Center for Environmental Structure, Berkeley, California. In this format, each pattern has three parts: Context, Pattern, and Problem. In addition, the Pattern is preceded by a Summary.



The streets and freeways are deliberately drawn crooked. It is not essential that they be straight, only that they be roughly parallel. Their exact alignments will be determined by local variations in land-use and topography.

* First published in the Journal of the American Institute of Planners, XXXII, no. 5, September 1966. †In Great Britain and left-hand drive countries the loops would, of course, be anti-clockwise. No alterations have been made in this article to adopt such factors for left-hand drivers.

Summary

The present net-like pattern of streets (whether it is a formal grid like Manhattan, or an informal net like London) is so well fixed in our minds, that it hardly occurs to us that city streets might have an entirely different pattern. Even the coming of the freeways has not changed our thinking. So far the freeway has been superimposed on the existing street pattern; the pattern of ordinary streets below the freeways has not changed at all.

Yet the net-like pattern of streets which we are used to is obsolete. Congestion is choking cities; the demands which now exist require a totally new geometry for the relations between streets. This paper describes a new pattern for the streets in a metropolis. Average speeds in an area laid out according to this pattern would be 45 mph, as against 15 mph typical for urban areas today; yet mean trip length is increased by only 7 per cent. The principal features of the pattern are: all streets are parallel, there are no cross streets, streets are connected by freeways three miles apart 1.

Context

The low and medium density areas in any urban region where the number of cars/capita is greater than 250/1000.

Pattern

1. All streets are parallel. There are no cross streets, and no two streets intersect. At two- to three-mile intervals multilane freeways run under the streets, at right angles to them.

2. The streets are one-way high velocity arteries. Alternate streets run in opposite directions. Pairs of streets are connected to the freeways by clockwise† 360-foot diameter loops.

3. The streets are 500ft to 1200ft apart. Loops are placed at 1500–3000ft intervals along the freeway. Near the freeways, alternate pairs of streets converge onto the loops. The two outer freeway lanes are reserved for weaving.

4. Neither pedestrians nor parked cars are allowed on the streets. The strips of land between the streets, where the buildings are, are continuous pedestrian areas.

5. The buildings are on access driveways which go all the way from one street to the other. The driveways meet the street in fishtails. No two driveways face each other across a street.

6. The middle 200-400ft of each driveway has a bumpy surface, designed to slow vehicles to walking speed.

7. The streets themselves are sunken, or separated by a raised earth mound from the area between them. Those buildings which are immediately next to the streets are oriented towards the inner area, and made to form a continuous wall which shields the inside area from noise.

Problem

Congestion is choking cities. Though cars and trucks can average 60 mph on freeways, most trips across town have an average speed of 15 mph.³ Commuters spend as much as two hours driving. The failure is exhausting; and it is a major economic failure also. Low speeds waste salaried time; constant starting and stopping doubles driving costs.⁴ Above all, economic and

social development is frustrated by the fact that parts of the metropolis are virtually inaccessible to one another. People only 10 or 15 miles apart cannot reach each other when they want to because they are an hour apart by road.

Rapid transit cannot solve the problem. People like their cars. The desire for cars is a force so potent that we cannot possibly ignore it.⁵ Even when cars and trucks as we now know them have become obsolete, people will always insist on being able to use some equivalent form of individual vehicle.

Freeways cannot solve the problem. They improve flow only along certain lines of movement. First, they attract so much traffic that they themselves become congested at rushhour. Second, travel on city streets is as slow as before, so that few trips less than five miles long are speeded up at all. Third, the freeway pattern fails to recognize the essential fact of modern urban society: namely, that it is a pluralist society. In a modern metropolis anybody may want to reach anybody else. The trips that people take are largely unpredictable, and cannot be well served by a few specially chosen flow paths. The flow must be essentially two-dimensional.

Multilevel street schemes cannot solve the problem either. In science fiction it would be possible to build all north-south streets at one level, and all east-west streets at another level, with ramps between them. In practice the costs would be prohibitive, and the ramps would eat up too much space. In the low and medium density areas which occupy nine-tenths of a metropolis, such solutions will simply not get built.

We therefore face the following demands:

 Origins and destinations are more or less randomly distributed.

 People like their cars, and will insist on being able to use some equivalent form of individual vehicle.

 Economy requires that the streets be essentially at ground level.

 People want to be able to travel as fast as possible—average speeds must be as high as possible.

We shall therefore assume that we are dealing with large numbers of private vehicles, travelling in all directions, on a two-dimensional street network.

Abstractly the problem may be stated like this: Given a plane in which origins and destinations are more or less randomly distributed, how can streets be arranged in such a way that each driver may drive at high speed, and without stopping, from his origin to his destination.

Let us note first that congestion and loss of speed are mainly caused by intersections.⁷ (They are also caused, by turns across traffic, by on-street parking, and by the possibility of pedestrians suddenly stepping out.⁸) In order to solve the problem of congestion, we must therefore create a pattern of streets which has no intersections in it.

A pattern of parallel streets, crossed only by infrequent freeways, is essentially at ground level, and contains no at-grade intersections. At first sight it seems that the detours on this pattern will be impossibly large. This is mistaken. In order to study the detours, let us assume that the freeways occur at constant intervals, m miles apart. Call each area between two freeways a 'band'; each band is m miles wide. There are now essentially two different kinds of trip:

(a) Those trips which start and finish in different bands. These trips are the same length as they would be on a regular grid pattern.

(b) Those trips which start and finish in the same band. These trips are longer than they would be on a grid pattern.

In order to estimate the overall disadvantage of the parallel street pattern, we must estimate the total amount of detour which it creates, summed over all trips taken in a city during a given year. We first define an exact measure of this total detour.9

Consider some city whose streets are laid out on a grid pattern. Assume that the probable density of trips of length l is given by p(l). The total distance travelled by all vehicles in this city, in miles per year, is then given by

$$K$$
. $\int_{-\infty}^{\infty} I \cdot p(I) dI$ miles

where K is some constant

Let us now imagine replacing the grid pattern by the pattern of parallel streets. Assume the origin and destination of each trip remain the same as before. For a given trip, whose length measured on the grid was I, the trip length will now be $I+\Delta I$. We call ΔI the detour on this trip. ΔI is always positive. Let us call the average detour for all trips of length I, ΔI .

The total distance travelled by all vehicles in this new city, in miles per year, is given by

$$K. \int_{0}^{\infty} (I + \overline{\Delta}I). p(I)dI$$
 miles,

and the total number of extra vehicle miles per year which the pattern of parallel streets creates is given by

$$K$$
. $\int_{0}^{\infty} \overline{\Delta}I.p(I)dI$ miles.

The percentage increase in total vehicle miles per year is given by

$$D = \frac{\int_{0}^{\infty} \overline{\Delta} I. \rho(I) dI}{\int_{0}^{\infty} I. \rho(I) dI}$$

We shall now estimate D. For the purposes of this estimate we obtain p(l) empirically, and we obtain $\overline{\Delta}l$ by computation.

p(/)

The following values of p(l) were obtained from the Chicago transportation study, and represent all trips taken in the Chicago metropolitan area. Essentially similar values have been obtained for vehicles entering and leaving a given subdivision in San Diego. The mean trip length, 4.1 miles, is typical for most metropolitan areas in the US and Europe.

/(in 5 7 10 14 miles)
$$(4\frac{1}{2}-5\frac{1}{2})$$
 $(5\frac{1}{2}-8\frac{1}{2})$ $(8\frac{1}{2}-11\frac{1}{2})$ $(11\frac{1}{2}-16\frac{1}{2})$ $p(l)$ 7% 15% 7% 7%

41

3

2(m-y)

24

2(m-x)

We have already observed that trips which start and finish in different bands have no detour, and that only one-band trips have a detour. The amount of this detour is twice the shorter distance to the nearest freeway. It is clear that the average value of this detour will depend on *m*, the distance between freeways.

We now compute 4/ in two steps.

First we show that the average detour on a one-band trip is m/3.

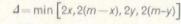
Second, we obtain q(m,l), the probability that a trip of length l is a one-band trip, when the freeways are m miles apart.

If we then choose a value of m, we get the average detour for all trips of length l, as

$$\overline{\Delta}I = m/3.q(m,l).$$

Let us first compute the average detour on a one-band trip, if the freeways are *m* miles apart.

Say that the start and finish are at distance x and y respectively from one (arbitrarily chosen) freeway. Then the nearest freeway is either m-y x or m-x from the start, or else y or m-y from the finish, whichever of the four is least; and the detour, which is twice this shortest distance is thus



If we plot x against y, we see that this function gives $\Delta = 2x$, 2(m-x) 2y, 2(m-y) respectively, in the labelled triangular regions of the graph. If x and y are random variables, taking values between 0 and m with equal likelihood, then we may find the mean value of Δ by integrating Δ over the whole square

0 < x m, 0 < y m, and dividing by m^2 . Since the integral is the same for each of the four triangular quarters, we get

$$\overline{\Delta} = \frac{m/2}{m^2} \int_{-\infty}^{\infty} 2y (m - 2y) dy = m/3$$

To obtain q(m,l) let us think of trips as lines of length l, falling at random onto the city, and assume that trips are equally likely to fall at all angles to the freeways. The probability then that a trip of length l will fall entirely with a band is the same as the probability that a matchstick of length l, thrown at random onto a pattern of parallel lines, m apart, will fall entirely between two lines. This is given by the standard formula:12

$$q(m_i) = 1 - \frac{2l}{\pi m} \text{if } l < m$$

$$= \frac{2}{\pi} \left[\arcsin \frac{m}{l} - \frac{l}{m} + \sqrt{\frac{l^2 - m^2}{m}} \right] \text{if } l > m$$

For m equal to 1 mile, 2 miles, and 3 miles respectively, this function yields the following values of q(l,m)

1		1	2	3	4	5	7	10	14
	1	.36	·16	-11	.08	-06	.03	.03	.03
m	2	-68	.36	.22	116	.13	-10	.06	.05
	3	.79	.58	.36	.25	.20	.15	.11	.07

If we now use the formula

$$\Delta l = m/3.q(m,l)$$

for different values of m, we get the following values of $\overline{\Delta}l$:

/		1	2	3	4	5	7	10	14
	1	-12	.05	.04	-03	-02	-01	-01	·01
m	2	.45	.24	.15	-11	.09	.07	.04	.03
	3	.79	.58	.36	.05	.20	-15	-11	.07

For m=1, this gives $\int \overline{d}I \cdot p(I) dI = .05$, $\int I \cdot p(I)dI = 4.1$ and D=1 per cent.

For m = 2, it gives $\int \overline{A}/.p(l)dl = \cdot 20$, $\int |.p(l)dl = 4\cdot 1$ and D = 5 per cent.

For m = 3, it gives $\int \overline{d}I \cdot p(I)dI = \cdot 41$, $\int I \cdot p(I)dI = 4 \cdot 1$ and D = 10 per cent.

Since these estimates of *D* are based on the assumption that the origins and destinations are randomly distributed, they pay no attention to the pattern of land use which the street pattern will induce. They also fail to include the additional detour created by the loop connectors between streets and freeways.

As we shall see from arguments given below, the loops add an average detour of ·21 miles to every trip, and the induced land use pattern reduces the number of trips with detours by 50 per cent. The combined effect of these two corrections gives:

$$D_{m=1} = 3$$
 per cent
 $D_{m=2} = 5$ per cent
 $D_{m=3} = 7$ per cent

We see, therefore, that the detours are quite reasonable. Even if the freeways are three miles apart, the total annual mileage on the pattern of parallel streets will only be 7 per cent greater than on the present grid pattern. At the same time, speeds will be enormously increased. On the parallel street pattern, each driver will be able to drive from origin to destination at high speed, without stopping once. Average speeds should be as high as 45 m.p.h.—three times the present speeds.

The huge savings in time and fuel costs will more than offset the slight increase in distance. The total time spent on travel, in vehicle-hours per year, will be only 36 per cent of the vehicle-hours per year for a grid pattern.

We have established the fact that the pattern of parallel streets radically decreases trip times, without creating unreasonable detours. The basic conception of the pattern is therefore correct.

However, the pattern itself gives rise to several secondary problems. In order to solve these problems, a number of subsidiary patterns are required. The problems are: (numbers correspond to pattern section)

- 2. The problem of connection between streets and freeways.
- The problem of driver stress on the freeways.
 The problem of pedestrian imprisonment in the strip of land between the streets.
- 5. The problem of access to the land between the streets.



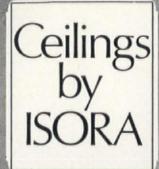
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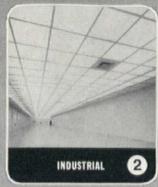
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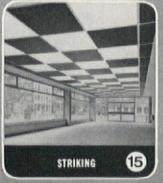












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6. The problem of child and pedestrian safety.

7. The problem of noise.

The following further problems also need to be discussed. They require no special sub-patterns.

8. The psychological problem of the detours.

9. Land-use transportation interaction.

10. The densities for which this pattern is appropriate.

11. The problem of introducing this pattern successfully into an existing city.

2. Connection between streets and freeways

(a) Since there are no cross streets, the freeways must allow access to and from every street.

(b) Drivers will want to make the transition between street and freeway without severe loss

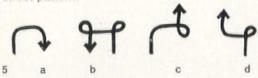
of speed, or long detours.

Under normal circumstances, the transition between streets and freeways would be by means of cloverleaf interchanges. However, these interchanges take up too much land. It would be impossible to put one on every street.13 To solve this problem, let us observe, first of all, that the streets must be one-way streets. We have agreed that the streets must allow no lefthand turns across traffic, and no U-turns.14 There will certainly be driveways off the streets. If the streets were two-way, they would have to be split down the middle by a barrier. This is clearly wasteful, since the land between the streets would still only have access to what were essentially one-way streets. There is, therefore, nothing to be gained from making the streets two-way. Each street is a one-way street-and to give each piece of land access to and from both directions, alternate streets run in opposite directions.

Given the fact that the streets are one-way, the simplest connectors between the streets and the freeways will be clockwise loops, tangent to the freeway, each serving two streets. To help entry and exit from the freeway, the freeway should pass under the streets. This means that the whole loop will slope towards the freeway; entry to the freeway will be downhill helping the required acceleration, exit from the freeway will be uphill, helping the required deceleration.

Carson has pointed out that these loops create an additional detour on every trip. In order to estimate this additional detour, we argue as follows:

As far as the loops are concerned, there are essentially four kinds of trips possible on this street pattern.



(a) A same-band trip in which you go to the freeway, turn right twice, and come back. On this kind of trip there is no loop detour.

(b) A same-band trip in which you go to the far side of the freeway, go round a loop, go along the freeway, go round another loop and come back. On this kind of trip there is a two-loop detour.

(c) An interband trip where the first movement is towards the right. On this kind of trip there is a one-loop detour.

(d) An interband trip where the first movement is towards the left. On this kind of trip there is again a one-loop detour.

On the average, there will be a detour of one loop-circumference per trip.

It is therefore clearly important that the loops be as small as possible (also to prevent land waste). The lowest tolerable loop speed compatible with the overall pattern design seems to be about 35 mph For this speed, the minimum safe turning radius is 180ft, so that the loops must be 360ft in diameter. This will create the additional detour of 21 miles per trip, already discussed.

3. Driver stress

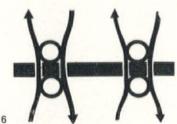
Carson has pointed out that there are two possible sources of driver stress in the pattern. (a) In the weaving sections where the loops are tangent to the freeways.

(b) In the close spacing of the loops, which may give drivers too little decision time between

oops.

In order to solve the first of these problems it is clear that the outer lane of the freeway (or, if the freeways are large, the two outer lanes), should be reserved for weaving. Provided that each loop is tangent to the outer lane for at least 200ft, the weaving conflict will be no worse than it is on any standard cloverleaf.

To give drivers enough decision time between loops, successive loops must be at least 1500ft apart. This means that distances between successive streets near the freeway will be 360ft, and x—360ft alternately, where x is the distance between successive loops. If the streets are to be evenly spaced further away from the freeways, pairs of streets must converge near the loops, as shown in diagram 6. Where they are evenly spaced, they will be at least 750ft apart.



4. Pedestrian imprisonment
The pedestrian is no longer free to wander at

will from street to street. Since the streets are high-velocity arteries, the pedestrian must stay within the strip of land between the streets. Will he be able to tolerate this imprisonment? In the present net-like street pattern you can walk from any point to any other point. Let us ask ourselves, however, under what conditions this came about. It came about at a time when most people walked wherever they went. A person's friends, his place of work, and the stores and institutions which he visited were close to his house. Under these conditions it was natural, and essential, to be able to walk in all directions. But these conditions no longer exist.19 In a modern metropolis friends, job, and stores are usually beyond walking distance. To reach them we must drive or use public transport. The spatial neighbourhood community no longer has the social meaning which it used to have. People walk for pleasure and in cases of emergency, but it is no longer necessary to be able to walk in all directions. It is true that the spatial neighbourhood still plays a minor part; it provides useful 'neighbourly' conveniences, help in times of sickness, the opportunity to borrow tools, mutual support in times of trouble. However, it has been shown that these kinds of neighbour contacts are generated most often between houses on the same side of the street, and that they hardly ever develop across streets.20 It is therefore clear that pedestrian access to houses across the street adds nothing to what remains of neighbourhood community, and there is no reason to preserve it. The creation of streets which are impassable to pedestrians is perfectly all right, provided that the following requirement is met:

It must be possible to take long walks from any house; and it must be possible to walk to neighbours' houses, to borrow things and to get help.

The requirement will be met if the area between the streets is a continuous, publicly accessible, pedestrian area.

There is of course no reason why streets should not be bridged by occasional pedestrian over-passes. However, it is known that such over-passes are not used, unless they are approximately level.²¹ This gives a further reason for sinking the streets below grade (see section 7 below).

5. Access to the land between the streets

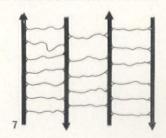
(a) Drivers want, as nearly as they can, to drive right up to the door of the building they are going to.

(b) People turning on and off the streets, must be able to do so without endangering the highspeed traffic on the street.

(c) Since streets are one-way, drivers will want to be able to approach a building from either street, and to leave by either street.

Since the streets are at least 750ft apart, and since cars are not allowed to park on streets, buildings will not front on the streets directly. Since people want to be able to drive from door to door, it is therefore clear that every building must be served by some kind of internal driveway opening off the streets. Furthermore, since each building must be accessible from both streets, this means that these internal driveways must cut all the way across the strip of land, from street to street. In some respects, these driveways function like low-speed cross streets. However, since movement across the main streets is not allowed, no two of these internal driveways may face each other across a main street-we call them driveways to emphasize this fact.

Finally, since vehicles turning on and off a street must not endanger high speed traffic on the street, every movement on or off the street must be a smooth curve. The driveways therefore meet the streets in fishtails, 7



6. Pedestrian safety

Since the area between the streets is a continuous pedestrian area, people will be walking on it, children will be running about unpredictably, and old people with bad eyesight or poor co-ordination will be there.

These people must all be safe. In spite of current planning dogmas, this does not require rigid separation of vehicles from pedestrians. It does require that:

(a) Cars are always moving slowly, when they are near pedestrians.

(b) Cars never come suddenly and unexpectedly round corners.

(c) Cars never have to reverse.

These safety features can be easily guaranteed by good layout. Driveways can be surfaced in such a way that people can always hear a car coming. Further, the surface can be deliberately roughened, or waved, or crossed by gentle bumps, so that cars will be forced to slow down to walking speed. Since the streets are usually more than 750ft apart, the driveways cannot have this slow surface all along their lengththis would slow drivers too much. The driveways are therefore slow only in the middle-the ends are faster. The pedestrian area crosses the middle section only. 8



7. Noise

(a) People will demand quiet on the land between the streets.

Carson points out that the increased speed of vehicles on the streets will make it necessary to protect the land between the streets from street

There are four possible remedies. First, the streets should be far apart (at least 1000ft if possible), so that less of the land is close to the streets. Second, the streets should be sunken (or perhaps separated by a raised earth mound from the inner area). Third, where possible those buildings which are immediately next to the street should form a continuous wall, so that the buildings themselves shield the inside area from noise. Fourth, all buildings immediately next to the streets should be oriented towards the inner area.

8. Psychological problem of detours

The pattern solves the stated problems. However, the detours, even though they may be quicker and cheaper, will be hard to get used to. In extreme cases, houses which are only a few hundred feet apart as the crow flies, may be two miles apart by road. Will this distortion of geometric distance be psychologically acceptable? Much evidence suggests that the geometric conception of distance has already disappeared in the modern automobile city and has been replaced by a conception of 'time-distance'. Consider the following examples:

(a) On trips within the city distances are rarely expressed in miles, since the fluctuation of traffic gives physical distance no useful significance. Instead we express distance in minutes of driving time, and say that we live 35 minutes from the airport, two minutes from downtown, and so on.

(b) Even when we do speak of physical distance in the city, we do not mean Euclidean distance but street distance. If two places are ten blocks apart (five along and five across), we call them ten blocks apart, even though the Euclidean distance is seven.

(c) Finally, in many hilly areas too steep for streets directly up the slope, streets follow contour lines.23 In such places there may be two houses no more than a few hundred feet apart, that are more than a mile apart by road because they lie on parallel streets, one above the other. Does anybody even notice?

These examples strongly suggest that the Euclidean distance between two points is immaterial; it is the time taken which really counts.

Carson has stated the psychological problem of the detours in another way.24 He defines the bias of a trip as the percentage difference between the trip length on the street pattern and the Euclidean distance between the end points. He observes that in the pattern of parallel streets the bias is large for short trips, and smaller for long trips, and claims that this violates the psychological requirement that bias be proportional to trip length.

Of course, we want to reduce the bias as far as we can. But why should the bias be proportional to trip length? Careful consideration of the relationship between circulation paths, and the land between them, shows that bias must increase as distances decrease, since the land will otherwise be entirely eaten up by circulation. On a 2500-mile trip between San Francisco and New York we go almost as the crow fliesand the bias is less than 5 per cent. On a tenmile trip within a city, if the city has a grid pattern, the bias is of the order of 30 per cent. On a 50ft trip between a downstairs living room, and an upstairs bedroom in the same house, the bias is often of the order of 200-300 per cent. In these cases, the bias is inversely proportional, to trip length. We tolerate it very well, and I know of no psychological evidence which proves that we find this inverse relationship stressful.

9. Land-use transportation interaction

The areas immediately next to the freeways may be reached without a detour from all points. Since 70 per cent of all trips start or finish in commercial areas, it seems almost certain that commercial land uses will accumulate in these areas.25 If three-quarters of all commercial land uses are next to the freeways, this will reduce the number of trips with detours by 50 per

10. The densities for which the pattern is

It is clear that the pattern of parallel streets will. not work for very high density areas. In these areas the relationships between high buildings, parking garages, and streets become critical. Moreover, the assumption that a multi-level pattern costs too much, which is essential to the foregoing argument, does not hold in high density areas.

Although the distinction between high and medium-low densities seems right in principle, it is not possible, at this stage, to define it

11. The problem of introducing this pattern successfully into existing cities

It may seem that the foregoing argument is correct in theory, but useless in practice, since there is no way of converting an existing city to this pattern. This is mistaken. The conversion may be undertaken incrementally, by gradually making existing streets one-way, and by closing off cross-streets. This process has in fact been going on steadily in London, New York, Los Angeles, and other major cities all over the world. However, the advantages of one-way streets and fewer intersections have so far only been noticed piecemeal. The pattern of parallel streets is a well-defined archetype, which can guide these piecemeal efforts.

Like all archetypes (like the grid for instance) it is infinitely variable. It may be pummelled, pushed, and distorted locally, to make it fit the details of existing land-use or topography. All that matters is that the global features of the pattern, as described, should remain invariant throughout these local variations.

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8 Ibid. and G. F. Newell, 'The Effect of Left Turns on the Capacity of Traffic Intersections', Quarterly of Applied Mathematics, XVII (April, 1959), 67, 76.

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11 Edward M. Hall, 'Travel Characteristics of Two San Diego Suburban Developments', Highway Research Board Bulletin 2039, (Washington, D.C., 1958), pp. 1–19,

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12 M. G. Kendall and P. A. P. Moran, Geometrical Probability (London, 1963), p. 70.

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14 See text leading to notes 7 and 8 above.

15 Carson, op. cit.

- 16 Traffic Engineering Handbook, published by the institute of Traffic Engineers, New Haven, Connecticut,
- 1950, p. 364.

 Carson, op. cit. 18 Leisch, op. cit.
- 19 Webber, op. cit. and 'Order in Diversity: Community without Propinquity', in Lowdon Wingo, Jr. (ed.), Cities and Space. Published for Resources for the Future, Inc. (Baltimore: The Johns Hopkins Press, 1963), pp. 23–54.

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Thesis prepared for the University of Nottingham, England, 1957. Also described in Paul Ritter, *Planning* for Man and Motor (New York: Macmillan, 1964) pp. 27–32. ²¹ Traffic Engineering Handbook, op. cit., p. 109.

22 Carson, op. cit.

²³ There are many excellent examples in the Berkeley

24 Carson, op. cit.

Frank B. Curran and Joseph T. Stegmaier, 'Travel Patterns in 50 Cities', *Highway Research Board Bulletin* 203, *op. cit.*, pp. 99–103, Table 8.

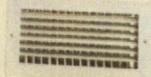
system there is.

Table by Arkana. Chair by Maples Warm-air central heating by Electricaire

Electricaire is warm-air central heating by electricity. Many modern homes have it now, and many more will have it. It's extremely efficient, surprisingly flexible and accommodating, quiet, and cheap to install and run. One compact thermal storage unit is the core of it. Ducts deliver the warmth to each room through discreet grilles. No pipes, fumes, flues, radiators, fuel stores or trouble. Simple programming controls it. And, being electric, Electricaire is the cleanest central-heating

Electricaire is specially designed to run on the off-peak tariff. That's why it's so cheap, because it runs on half-price electricity. Ask your builder or architect about Electricaire; your local Electricity Board or an approved installer. The best homes deserve the very best central heating, don't they?

Better things are electric

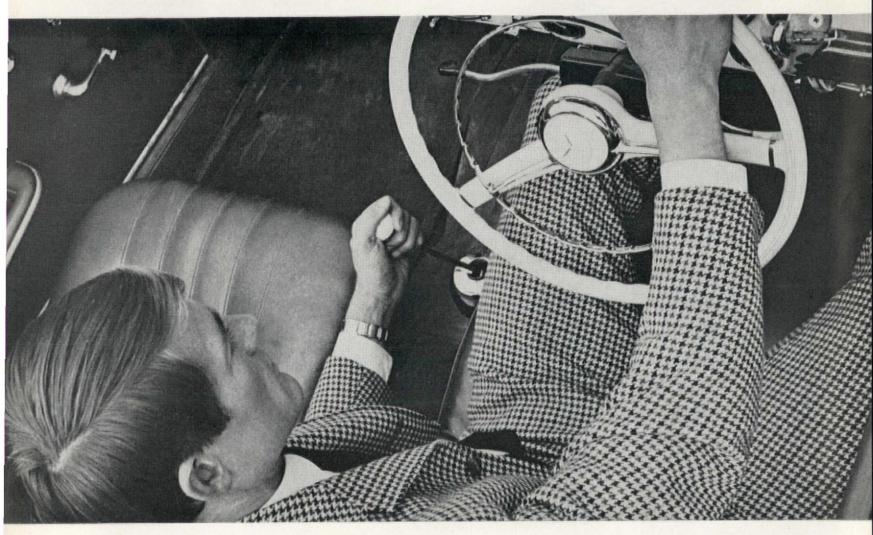


Electricaire warm-air central heating-runs on half-price electricity

Issued by the Electricity Council, England & Wales



take a quick run through the high performance range



Vectair

Natural convectors for wall mounting or freestanding. 12 lengths, 3 depths and 5 heights provide a model to suit every location. The new casing makes Vectairs the ultimate in convector heaters.

Warmline

Continuous run perimeter convector heating which is robust in manufacture but flexible in installation to allow for building tolerances.

Forceflo

Fan assisted convectors available as freestanding, wall mounting, recessed, remote and ceiling mounting models providing from 10,000 to 62,000 BTU/hr.

Uniflow

Unit heaters for horizontal or downward discharge on low, medium and high pressure hot water or steam systems. 12,000 to over 300,000 BTU/hr.

Radiant Panels

Individual panels for spot heating or continuous strip for an even heat distribution. Both types are available in a full range of sizes to suit all installations.

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HARROGATE—69a Station Parade, Harrogate 66016. NEWCASTLE—10 Neville St., Newcastle upon Tyne 1. Newcastle 21955
GLASGOW—3 Annfield Place, Glasgow, E.1. Bridgeton 4871-2

Design

Box of tricks

Dieter Schempp (Germany) has designed a set of elements that can be used, like a child's 'tinkertoy', to make up chairs or tables or shelves at short notice 1-3. Pine frames, padded seats, aluminium rods, glass shelves, bolts comprise the outfit, and the easy chair can change its nature, the table can grow or shrink or turn into bookshelves-or the whole lot can take to bits for storing away.

Md 7/67

Fernchair

G. N. Burgess & Co. Ltd. include in their current catalogue of chairs and tables a knockdown chair, 'Fern' 4 designed by John Pound, with a

flexible, satin polished stainless steel tube frame supporting a shiny seat and cushions in canvas or hide. Prices approx. £26 and £51 respectively.

Hanworth Trading Estate, Feltham, Middx.

Plastic tube

Geoffrey Harcourt's latest chair for Artifort 6 (Maastricht, Holland) successfully exploits plastic tube.

Mobilia, 3/67

Outdoor

Lurashell heavy duty glass-fibre chairs and settee, claimed to be virtually indestructible, come in cobalt or powder blue and can be bolted to the ground. The Acorn 7 costs £162s 9d, while the Oberon chair 5 and settee cost

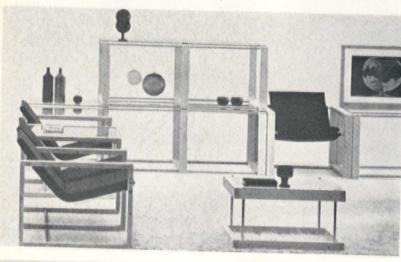
£16 19s 6d and £31 10s 3d. The seat holes are for drainage. London Road, Ware, Herts.

Utzon build-it-yourself

U-shaped, triangular-section, beech ply loops and a board are the basis of another build-it-upyourself series of chairs and tables 8-10, this time devised by architect Jørn Utzon of Denmark. Stiff foam rubber cushions are used for sofas and chairs; the hoops are dimensioned in relation to their span, and are joined by counter-

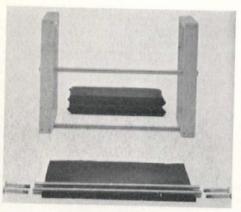
Design Progression Ltd. now market the complete range of Design Associates' furniture and have a showroom in London where it can be

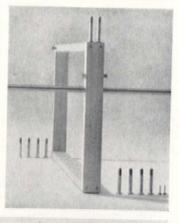
7 Paddington Street, London, W1





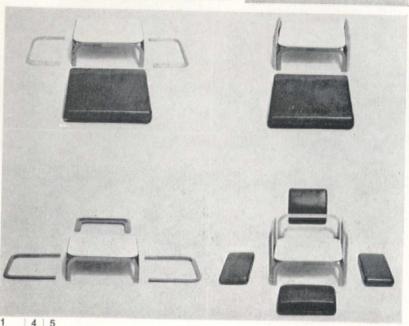


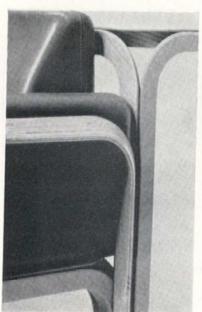


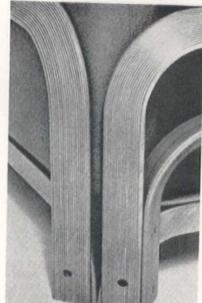












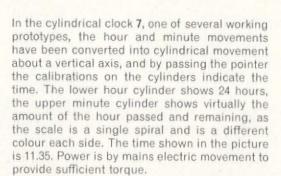


Mathson classic and new

Bruno Mathson's famous 30's Permilla chair 1 has turned into a range of seats and has developed loose cushions; while his new Jetson 2 has a nylon seat slung from a stainless steel



frame, and a seat cushion and head rest. Marketed by Bra Bohag AB (Malmö, Sweden). *Mobilia*, 3/67 and *MD*, 5/67



Paul Clark Designs, 275 Kings Road, London, SW3

Messrs Acrylic Products use brilliantly coloured acrylic sheet (red, black, orange, green, navy) for their battery-operated cubic clock 8 with its gold face design on a contrasting colour.

5A, Prince of Wales Terrace, London, W8

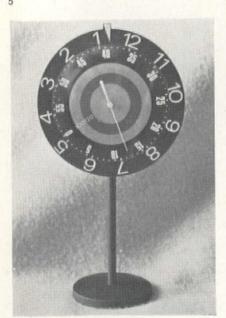


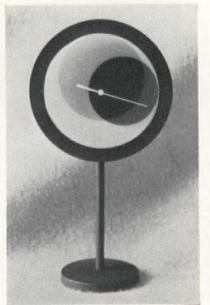
Paul Clark has found himself specializing in designing unconventional clocks.

His Revolutionary clock 5 is 12in high on a matt black steel stand. The face has two discs, one for minutes and one for hours, which rotate past a fixed pointer indicating the time (12.39 in the picture). The minute disc is printed with transparent blue, the hour disc with magenta pink; the overlap, produces a deep blue, there is also a sweep second hand.

The *Disc* clock **6**, more decorative than accurate, has two transparent coloured discs, the smaller indicating the hour, the larger one the minutes, where their outer edge touches the circumference of the white background. The time in the picture is 3 o'clock. There is also a sweep second hand.

Both clocks are based on year-long battery movement and retail at £9 17s 6d.





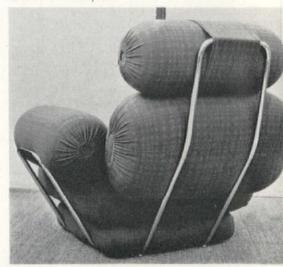




Pillar box

Two hundred new pillar boxes 3 will appear in Britain early next year, designed by David Mellor, developed with the Postal Engineering Development Section of the GPO Engineering Department.

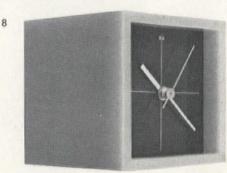
Easier for postmen to open and operate than the present cylindrical one, it consists of an inner steel frame mounted on a black concrete plinth, and a red vitreous-enamelled sheet steel outer casing of five removable panels (including door and roof). The information panel is black with white lettering, the pillar box is $62\frac{1}{2}$ in high and 18in \times 18in on plan.



Panton bulbous

Bulgy loose-covered cushions casually stacked in a chromed tubular steel frame make up a new Verner Panton creation 4.

Mobilia, 3/67



We'd like to put ourshelves in your place...

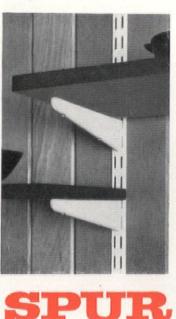
Invite us!

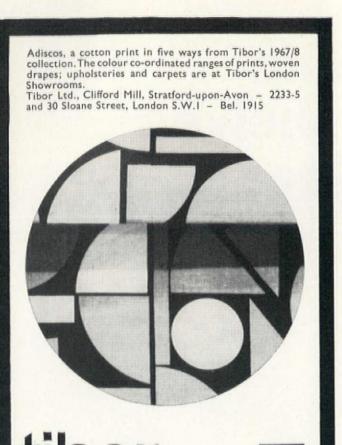
Spur is the shelving system of all time. Precision made in high-grade steel, Spur is simple to install, easy to adapt to meet changing needs. Spur is modern in appearance, incredibly strong and everlastingly durable.

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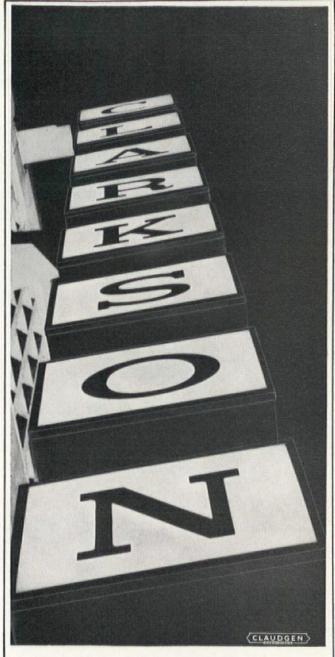








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Trade Notes

To obtain additional information about any of the items described below, circle their code numbers (A1, A2...etc.) on the Readers' Service Card inserted in this magazine.

A1 G.R.P. panels Glasdon Signs Ltd., 119–123 Talbot Road, Blackpool, Lancs. Blackpool 22378–9

A three-dimensional design with simulated cast bronze finish in G.R.P. is available in panels 9ft × 4ft, weighing approximately 45lb per panel.

A2 Outsize Stramit panels Stramit Ltd., Eye, Suffolk. Diss 2821

Installation of new machinery now enables hardboard faced Stramit panels to be produced in sizes 7ft 10in × 6ft 6in.

A3 Decorative building board Adrian Marchant Ltd., Britannia Road, Surbiton, Surrey. Elmbridge 4152/4

Estoclad is a relief patterned laminate bonded to a stabilized G.R.P. backing. The decorative pattern can be either a metal finish with a genuine cold cast metal surface or in simulated ceramic. Pattern size 8ft × 4ft with thicknesses between 3 and 4mm. Guide price 11s 10d per square foot.

A4 Wood wool slabs British Gypsum Ltd., Ferguson House, 15/17 Marylebone Road, London, NW1. Hunter 1282

To avoid forming a cold bridge at the joints between channel reinforced slabs, Gypklith wood wool roofing slabs are now provided with a rebated edge, forming a recess in the upper surface 2in wide and 1in deep, which is filled with a poly-urethene strip. Prices, slabs 18s 7d a square yard, polyurethene strip 4d a foot.

A5 Fibrous plastics

J. Van Tilberg, c/o Howard Hotel, Norfolk Street, Strand, London, WC2

The provisional specification covers a method of making fibrous sheets of plastic material by extrusion of a thin sheet of material in which the polymer emerges at a temperature higher than the normal boiling point of the solvent. The fibrous effect is caused by violent evaporation of the solvent, and as the high sheet is taken away at fibres are mainly in line with the direction of flow. Sheets can be cross laminated to provide a fabric. The inventor claims that any polymer capable of accepting an admixture of liquid or gas, not necessarily a solvent, can be subjected to the

A6 Single layer roofing

Marley Ltd., Sevenoaks, Kent. Sevenoaks 55255

Marleydek consists of a flexible vinyl sheet with a backing of asbestos fixed to virtually any type of roof deck by a cold adhesive, all joints solvent welded. The material is available in rolls 72ft × 3ft 2in ×0° 040in.

A7 Screed ventilation

Fulbora Ltd., 79 St Albans Road, Hatfield, Hertfordshire. Hatfield 5521

The Screeduct system accelerates considerably the evaporation of moisture from screeds by vastly increasing the area of vapour release surfaces within the screed. Absorbent tubes are laid within the insulating concrete layer leading to a number of ventilators, fitted in the roof surface, designed to induce currents of air to circulate within the tubing system. The ventilators are solid die cast aluminium and are spaced 25 and 35ft apart.

A8 Double glazing units

Emile Regniers & Co. (London) Ltd., 4 Broad Street Place, Blomfield Street, London, EC2, London Wall 4727

Thermopane double glazing units hermetically sealed with the metal-to-glass soldered seal have now a guarantee period extended from five years to ten

A9 Folding door

Shapland and Petter Ltd., Raleigh Works, Barnstaple, Devon.

Designed for use in hospitals or in situations where space is limited, the Bi-fold Laminlight door has hinges at the side and centre, needing only half the opening space occupied by traditional doors. Constructed of red cedar frame with mesh honeycomb infill and faced with in Arborite laminate. Available in standard and non-standard sizes.

A10 Automatic door opening gear Dekon Electronic Systems Ltd., Chilon House, King Edward Street, Macclesfield, Cheshire. 0625 5644

Suitable for use as a control for opening electrically operated doors, the Autotec Ultrasonic sensing device consists of a receiver unit, connected to the mains, and a portable battery-operated transmitter. A sensing head in the receiver picks up the ultrasonic signal and actuates the door mechanism. Transmitter size, 4in \times $2\frac{3}{4}$ in \times 1in. The operating range is 70ft and no GPO licence is necessary. Retail price £49.

A11 Door closer

William Newman & Sons Ltd., Hospital Street, Birmingham

The Briton 2000 is enclosed in a small aluminium shell, on fixing screws concealed with black clip-on polypropylene covers. The closer is reversible to suit clockwise and anticlockwise closing Recommended limits for doors, doors. × 2ft 9in, 110lb in weight. Standard finishes, silver, light gold and brown bronze.

A12 Plastic nuts 1

I.T.W. Ltd., Fastex Division, 470/474 Bath Road, Chippenham, Slough, Bucks. Slough, Bucks. Orchard Grove 543

Two types of plastic nuts are available for a wide range of applications. The Lokut snaps into place in a prepared hole and tightens with the insertion of the screw. They are corrosion-free, eliminate cross threading and provide protection against damage to mating surfaces. The captive nuts are intended for use in fibre glass panels. They provide similar torque locking action to the Lokut nuts and can be used for $\frac{3}{32}$ in fibre glass or similar material.

A13 Stair nosing Gradus Ltd., Brookside Mill, Brook Street, Macclesfield, Cheshire. 0625 3095

An extruded aluminium nosing with rubber composition treads is provided with hooks and an edging bar on the tread for restraining the edge of the carpet. Projections at the rear of the nosings hold carpeting on the riser. Rubber inserts in black or white. In standard lengths in 9ft or 10ft 6in, or cut to length and drilled. Price 13s 6d a foot.

Centralized vacuum system SF Air Treatment Ltd., Heathrow House, Bath Road, Cranford, Middx. Skyport 9872

The SF system has a central vacuum plant with tubular ducts and hose connection points in floors or walls. The dust passes through a two-stage collector and is then mixed with water to form a sludge which is drained off. Indicative costs for an office block of 100,000 sq ft are between 1s 10d to 2s 3d a square foot.

A15 Polystyrene drawers

Greenman Ltd., 280/282 Old Street, Shoreditch, London, EC1. Shoreditch 2121

Injection moulded in polystyrene and provided with round corners, Mod-U-line drawers are available in sizes from 18in \times 20in to $32\frac{1}{2}$ in \times 20in in $4\frac{1}{2}$ in and 6in depths. Divider strips can be supplied. Prices from 28s 3d.

A16 American type switch boxes Egatube Ltd., St Asaph, Flintshire. 2431/4

The new Egatube switch box is provided with $3\frac{1}{4}$ in fixing centre for American switches. It can also be used for an adaptable box complete with cover and has standard §in diameter knockouts in each short side. Size $4in \times 2\frac{1}{2}in \times 1\frac{1}{2}in$ deep. Price 19s 6d per doz.

A17 Replaceable lighting reflectors George Whitehouse & Co. (Birmingham) Ltd., Worcester Road, Kidderminster, Worcs. Kidderminster 0562 4924

To avoid the high maintenance cost of removing, washing and replacing the normal type reflectors for industrial fittings, the Whitehouse system reflector employs stiff disposable paper reflectors supported on a light framework. For use with 5ft and 8ft single or twin tube fittings, the costs of the units are 22s 6d and 26s 3d, replacement reflectors costing about 3s, claimed to be a fraction of the normal maintenance cost.

A18 Gas central heating unit Richard Baxendale & Sons Ltd., Bamber Bridge, Preston, Lancs. 0772 36201

The Bermuda-Plus unit combines radiant convector gas-fired unit and a gas back boiler. The fire radiants with a total output of 11,500 Btu/h can be controlled to work in groups of one, three or five. The boilers with an output of 40,000 Btu/h is thermostatically controlled and is designed to provide a heating surface of up to 175 sq ft plus domestic hot water. Price £85.

A19 Heating control Solstat Ltd., 45 Church Crescent, Finchley, London, N3. 01-346 8094

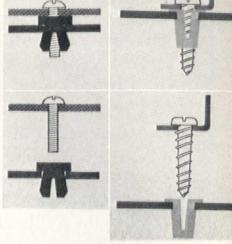
For use with gas- or oil-fired boilers, the Solstat Heatsaver increases the flow temperature in cold weather to balance increased heat losses by taking into account both the water temperature and the temperature of the outside air. The calibration can be adjusted to cover a variety of temperature ranges. A time clock to control overnight decrease in temperature with an automatic shutdown at weekends is provided. Prices, complete with sensing devices is £40.

A20 Combined heating appliance Falks Ltd., 91 Farringdon Road, London, EC1. Holborn 7654

The Mexicana is claimed to provide a combination of radiant heaters, convector and fan heater, and has piano keyboard switches enabling a wide range of heating levels to be obtained from the two 1kW radiant bars, the internal 1kW heater and the silent tangential fan. Size $8\frac{3}{4}$ in deep \times $28\frac{1}{2}$ in wide \times $17\frac{3}{4}$ in high. Provisional price £20 10s.

A21 Gas-fired central heating Radiation Central Heating Ltd., Radiation House, North Circular Road, London, NW10. 01-459 1234

The Heatmaster 6600 models, rated at 60,000 Btu/h, incorporate the modulating control system which allows the unit to turn itself up or down automatically in accordance with the temperature requirements of both the radiators and the hot water system by measuring how much unused heat is returned to the boilers. Size $15\frac{5}{8}$ in deep, $28\frac{5}{8}$ in wide, 36in high. Price £137 10s 2d.



A22 Split level electric cooker The English Electric Co. Ltd., English Electric House, Strand, London, WC2. Covent Gdn. 1234

Consisting of separate hob and oven assembly the Rapide 55 units can be mounted on kitchen cabinet equipment of many well-known manufacturers. The hob unit has four 7in radiant hot plates rated at 2000 watts each, one of which is fitted with a 'Sentry Disc', having a thermostatic control. Cooking smells are filtered through a ventilating system which is removable for cleaning.

A23 Bonded glass baths Godfrey Bonsack Ltd., 14 Mount Street, London, W1. Mayfair 9981

A new process for making baths stipu-lates criteria of lightness, flexibility of form, and scope for decorativeness. The bath is made in three layers, the first of bonded liquid glass, the second consists of decorative materials in the form of patterned silk or cotton, copper or silver leaf, stencilled or hand-painted designs of any type. The design layer is a reinforcement of fibre glass. Decoration can be a matter of individual and original selection and a variety of different shapes are available.

A24 Protective rails

P.J.P. Trading Ltd., 79a St Albans Road, Hatfield, Herts. Hatfield 5521

Intrad PVC trolley rails are designed for wall protection in hospitals, offices, schools, etc., where damage is caused by mobile equipment. The rail section is 8in wide with 1in deep flanges, and is snapped into place flush with the wall on steel brackets at 36in centres. Standard colours are grey and white.

A25 Drinks vending machine Ditchburn Vending Machines Ltd., Dock Road, Lytham, Lancs. 0391-6 7421

The Tablespa drink vending machine is suitable for staffs of up to 25 people, provides tea or coffee, with or without milk and/or sugar, chocolate or soup. The cabinet holds ingredients for 400 drinks and measures 29in high x 19in wide 20in deep. It may be coin or push-button operated and uses disposable cups or standard office crockery. Price £196, or may be hired for about £8 a month.

A26 Ozone generators Westair Dynamics Ltd., Thames Works, Central Avenue, West Molesey, Surrey. 01-979 3244

The Homozone range of ozone generators consists of 15 models providing controllable outlets from 150 to 2400 milligrams per hour for rooms from 5000 to 150,000 cu. ft. The units are self-contained and operated with very low consumption on 200/240 volts. The generating element is robust and silent in operation providing ozone free from impurities. The units are constructed from stainless steel and aluminium and do not require refilling or any change of chemicals. Prices vary from £37 to £167.

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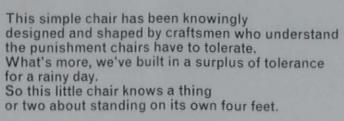
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Pop up upon a Polyprop...

Polypropylene bar stools can be supplied with three different types of base. Type S black stove enamel frame with a chromed foot rest, seat height 29 ins. Type T pedestal with cruciform base and foot rest, all chromed. Type U with chrome centre column and black nylon coated floor fixing plate. The latter has a seat height of $29\frac{1}{2}$ ins., with or without foot rest, or 24 ins. (type V). Special adaptations can be provided for any specific requirement.



Pedestal types have a self-return swivel action, so when not in use all seats face forward. The injection moulded Polypropylene shells will not crack, chip, distort or strain and can easily be wiped clean. They are available in charcoal, light grey or orange vermillion. Shells can also be supplied fully upholstered, fitted with a clip-on front cover or alternatively a pvc covered 'throw-in' seat cushion. These bar stools are ideal for use in bars, restaurants or canteens. Call at our showrooms and pop upon a Polyprop.

London: 41 Albemarle Street, London, W.1 Hyde Park 9576. Birmingham: 24 Albert Street, Birmingham 4. Midland 7378. Manchester: 50 Sackville St, Manchester 1. Central 6829. Edinburgh: 25a South West Thistle St. Lane, Edinburgh 2. Caledonian 6234. Watford: 132 St. Albans Rd, Watford, Herts.

SHS conquer problems in space

SHS are Structural Hollow Sections made by Stewarts and Lloyds. Square, circular or rectangular they combine high strength with light weight.

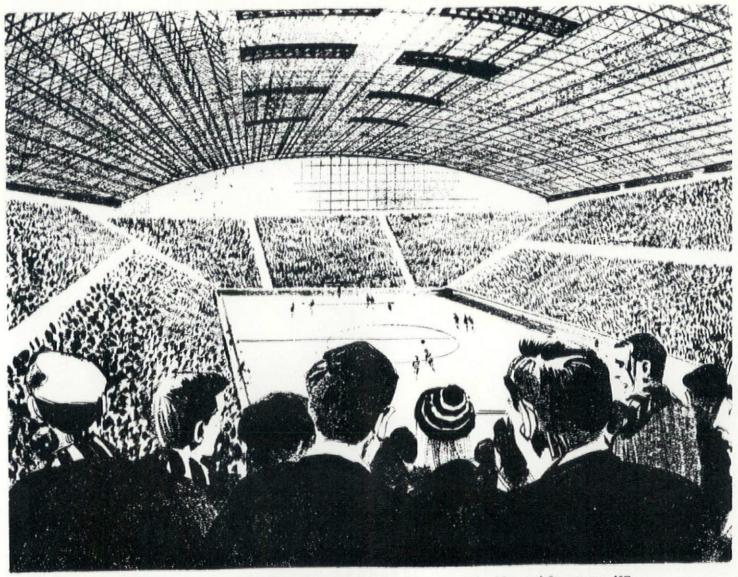
When used in the construction of space frames this high strength/weight ratio means that large areas can be roofed in extra wide spans without intermediate stanchions. Providing space. Space to plan. Space to work. Space to develop.

Stocks of SHS are held in S & L warehouses and by leading stockholders throughout the United Kingdom.

If you would like to know more about SHS, write to:—
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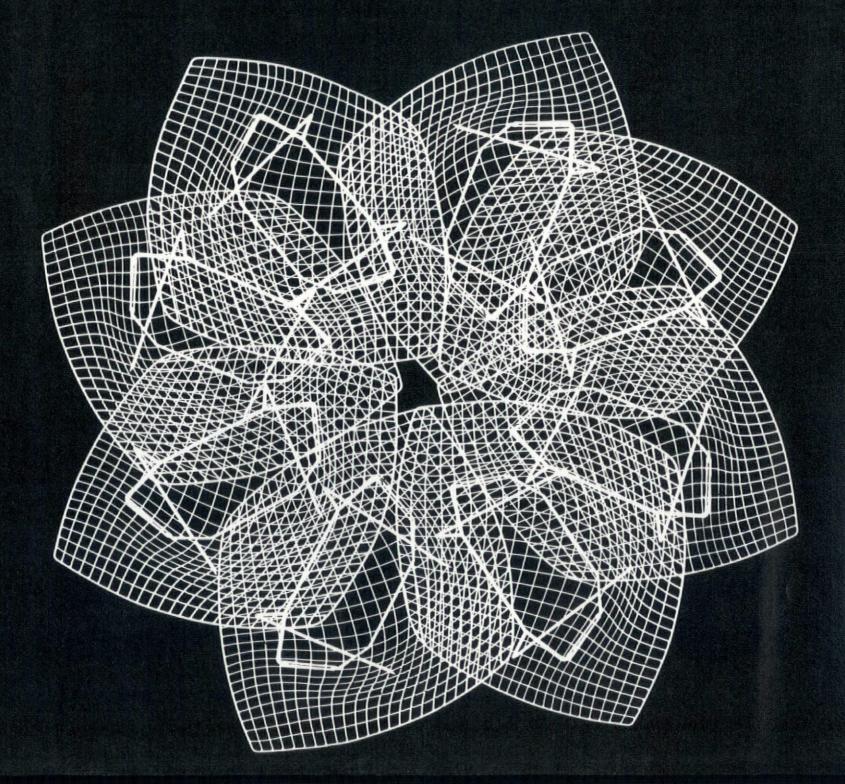


International Building Exhibition, Grand Hall, Avenue D, Stand No. 180, and Componex, '67

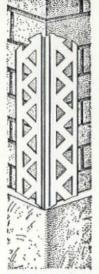
Harry Bertoia, sculptor, designs furniture for

Form International 28 Avon Trading Estate Avonmore Road, London W14







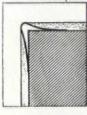


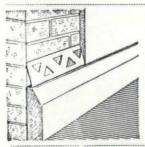
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Designed to the suggestions of leading architects, Blakey Angle Bead fits snugly and easily over breeze blocks or bricks; gives phenomenal keying power; and substantially reduces plastering costs. (One well-known firm of plasterers reports saving of 5d per foot run - £5 per house - compared with concrete angles).

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A system that will give years of trouble-free operation even under extremes of heat, steam, corrosive atmosphere and hard-wear. A system that on medium to large jobs, is as competitive as any other on the market.

WHAT TYPES OF WINDOWS AND VENTILATORS CAN BE CONTROLLED?

All types.

Windows, ventilators, ducting dampers, louvres, north lights, roof lights or lantern lights. Horizontal, vertical or angle hinged; top, bottom or centre hung; steel, aluminium or timber framed.

Whatever the construction and design, (hinged or hung...)
they can be controlled by Armstrong hydraulic systems.

OPTIONAL FEATURES

Armstrong hydraulic systems can include many sophisticated extras.

Like thermostatic control which opens and closes windows and vents automatically as the temperature warrants. Timing and security locking devices which act similarly at pre-set times. Audio, fume and smoke sensing devices which act on outside sounds or inside smoke and heat.

CONTROL POINTS

All versatility bonuses from Armstrong.

Control points can be as sophisticated or simple as installation warrants or client requires.

Normally controls are housed in a standard floor or wall mounted console, designed to preclude damage from dirt, dust, fumes or

liquids; and to house less robust devices.

Location does not affect the function of the system. The console may be placed, i.e. in the factory foreman's room, gate house or security office.

ADVISORY, INSTALLATION AND MAINTENANCE SERVICES

The Armstrong Hydraulic Control Advisory Service is always at your disposal with no obligation whatsoever

They will find the most efficient way possible through either discussion of your location or through an appraisal of any drawings and supporting documents you may care to submit.

The Armstrong Architectural Division Installation teams are

fully equipped, ready to carry out installations in short order. There is also a close technical liaison with window manufacturers so that necessary, up-to-date modifications can be made on control equipment.

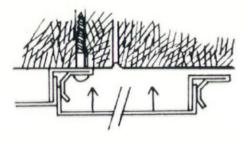
Although small-bore hydraulic systems rarely need servicing, Armstrong service engineers are always available in case of damage by outside influences.

For further information, please contact

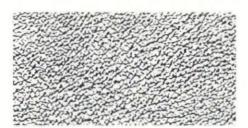
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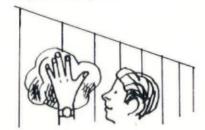
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For rather special wall cladding panels like these you'd expect to pay a rather special price. But not so. At 3/6 a sq. ft. they actually cost *less* than other leading coverings!



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Please supply me with all information on new wall cladding panels.

Name _____

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INTERIOR WALL CLADDING PANELS

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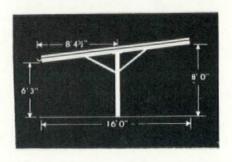


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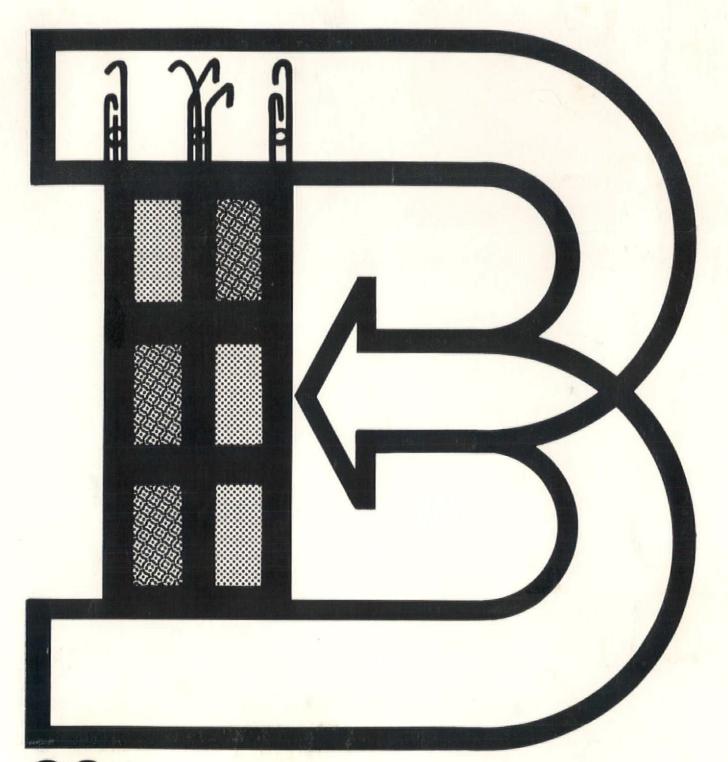
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1100 (00)					194		Tibor Ltd				41
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