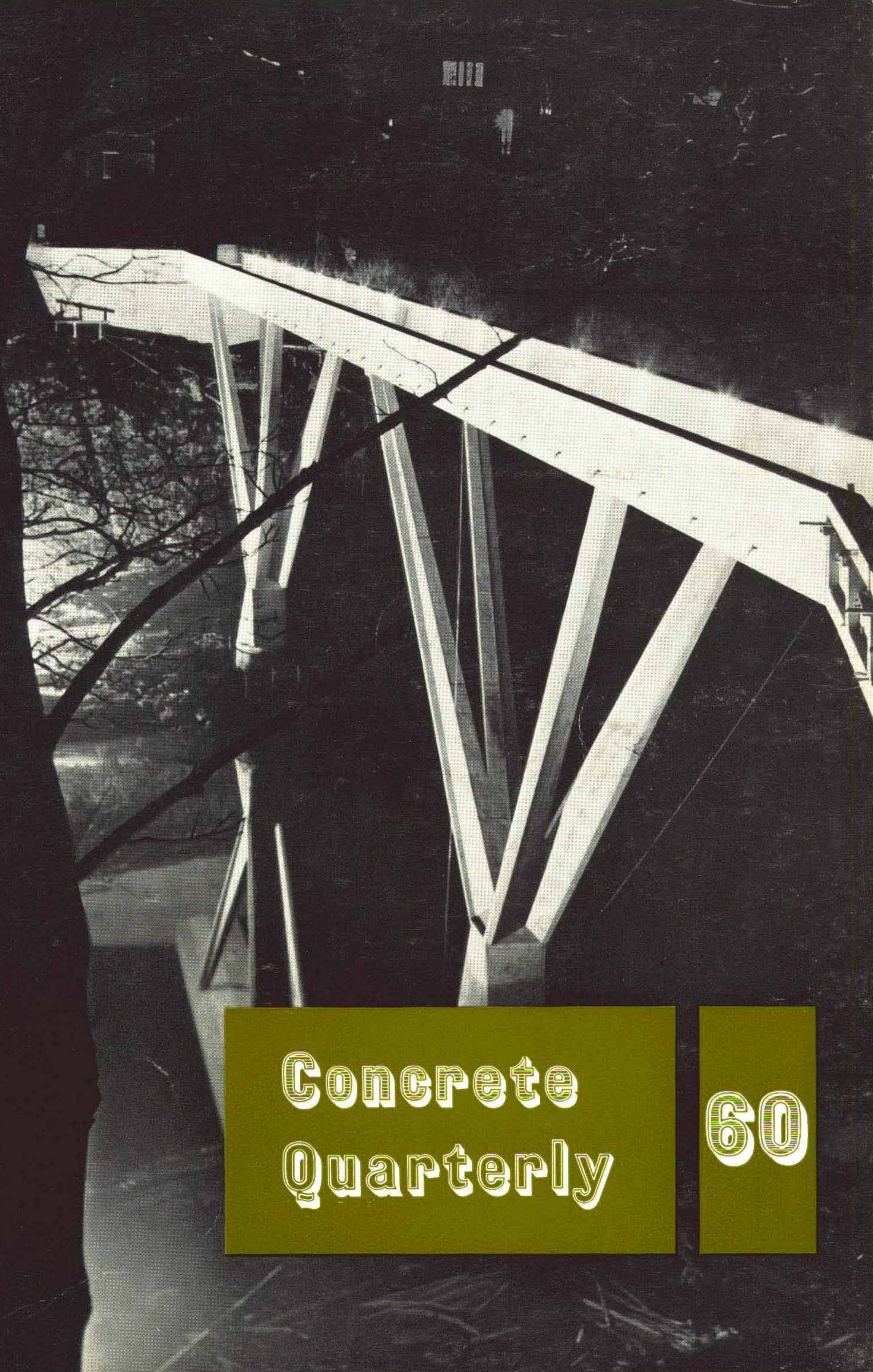
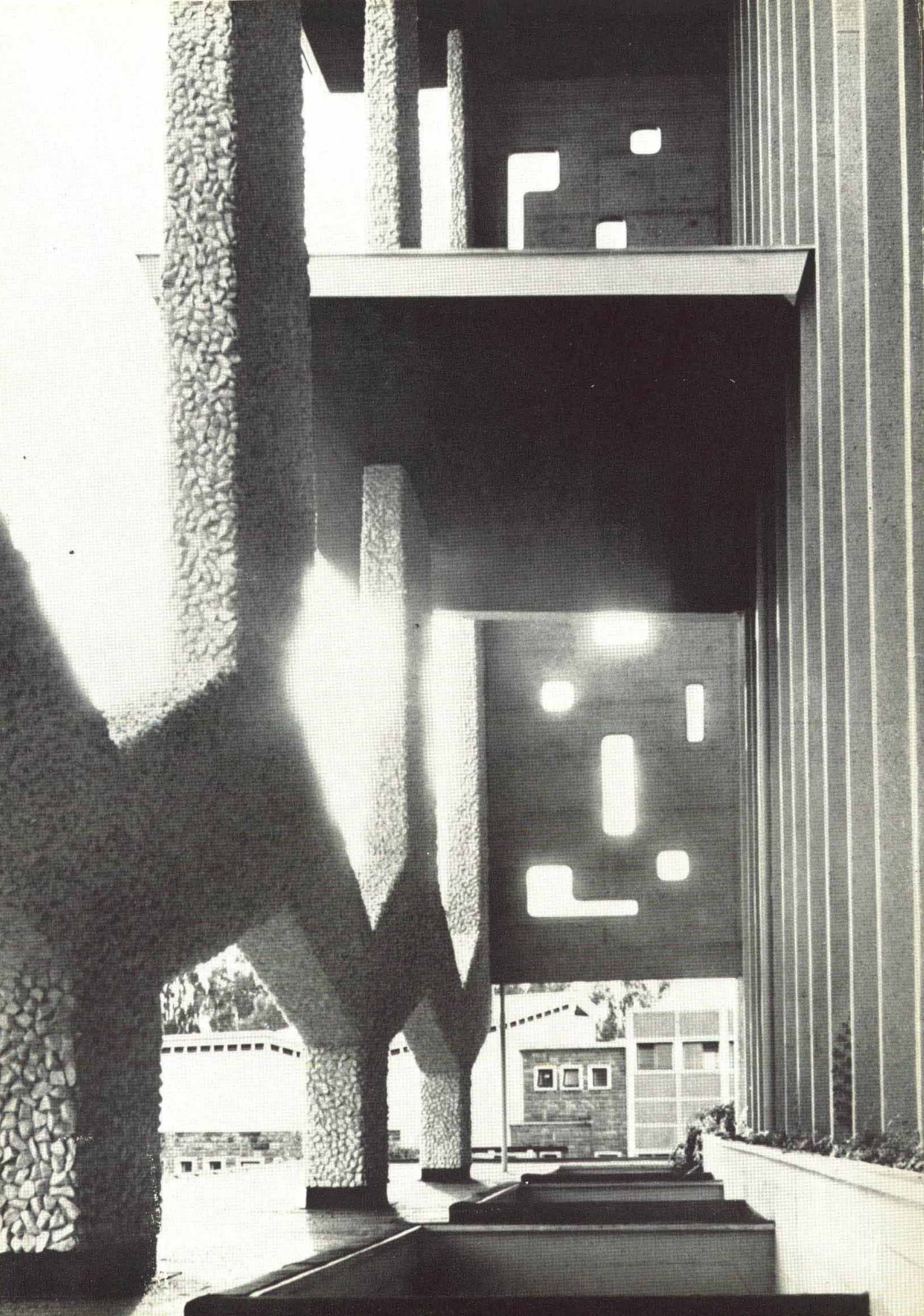
CEMENT AND CONCRETE ASSOCIATION · JANUARY—MARCH 1964 · PRICE FIVE SHILLINGS



Concrete Quarterly

60



Concrete Quarterly

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Contents

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FRONT COVER: *The footbridge over the Wear at Durham, by night.* (*See page* 17)

FRONTISPIECE: *Great Library, Royal College, Nairobi: looking along the façade.* (*See page* 30)

ON 1ST JANUARY this year there occurred an event of considerable importance in the world of concrete construction – the amalgamation of the two organizations concerned with the manufacture of precast concrete: the British Cast Concrete Federation and the Cast Stone and Cast Concrete Federation. This amalgamation has after many years brought together all the important manufacturers in the country – including, of course, such well-established and successful concerns as Marley Tile (Holdings) Co. Ltd., Redland Holdings Ltd., Concrete Limited, Stanton and Staveley Ltd., Trollope and Colls Ltd. of Bradford, and Saunders of Ipswich.

This is a step forward that will be widely welcomed. The amalgamation will enable the industry to intensify its research and exchange its findings in a way not previously possible, and to increase its development activities, and generally, by closer collaboration, considerably to increase its influence.

The precast products industry of Britain already leads the world in a number of fields. Roofing tiles, for example, represent a real success story, production (once almost a German monopoly) growing from a total of not more than 50 million in all up to 1928 to an annual production of 1,020 million by 1958, and 1,600 million last year. Facing slabs, in all their decorative forms, are more widely, and more successfully produced in Britain than anywhere else, and the same is true of prestressed products, and in the more humdrum, but no less valuable, field of pipes.

The increased possibilities of collaboration have come at a time when the products industry is on the brink of a large number of technological advances – such as, for instance, improvements in the factory, including the use of higher strength concrete; automated methods of production; the much more extensive use of lightweight concrete; the continued advances in prestressing in all its forms; architects' ever-growing appreciation of the qualities of precast concrete facing slabs and paving slabs and flags in their ever-widening range; the spectacular progress of the facing block; and, not least, the growing adoption of large slabs for industrialized building and all that this will entail.

The BIBM (Bureau International du Béton Manufacturé) is holding its next triennial meeting in London, in 1966, and it is to be expected that the British precast products industry is looking forward to this event as an opportunity to show greater advances yet, both to Britain and to the world.

The building industry today, with the vast demands upon it, faces a revolution both technically and administratively, and it is clear that precast concrete, in all its aspects, offers a solution – possibly the only practical solution – to the major problems which are arising, and are likely to arise in the future, and the precast concrete industry will have to rise to the demands and the opportunities presented by the situation, with increased production and a much wider range of products.

By amalgamating, the industry has shown its firm intention of taking full advantage of its opportunities. We should like to congratulate the newly formed British Precast Products Federation.

The new Students' Union, University of Keele

– a lively building, with the unifying theme of concrete structure and finishes

GRANTED UNIVERSITY STATUS in 1962, Keele is unique in being the only fully residential university in the country. The new Students' Union, opened by their Chancellor, Princess Margaret, in January 1963, is therefore naturally a very important social centre, a hub for their varied out-of-working hours activities – and especially so since Keele lies five miles outside Stoke-on-Trent, the nearest town. A building that embodies architecturally the spirit of this important social and recreative function must necessarily enliven the whole campus. The new Students' Union at Keele has achieved exactly this positive quality, probably because the architects' avowed aim was to express "the verve of student life". This they have certainly done, in a building that is strong, lively, decidedly "with it".

Perhaps a contributory reason for the freshness of the design was that the students themselves acted as clients, under the guidance of the Registrar, John Hodgkinson, and the University's Architect, J. A. Pickavance, F.R.I.B.A. Their committee assessed requirements for the building and helped also with the choice of furniture and fabrics, giving the architects a first-hand picture of undergraduate interests and relaxations.

These requirements were necessarily complex. Of the forty principal rooms in the building, only the five offices for permanent officials and student officers, the three music practice rooms and the four general purpose rooms have any similarity with one another. The rest, from the ballroom to the barber's shop, all had special needs.

Faced with the problem of giving unity to such varied accommodation, the architects conceived a design that is visually forceful both externally and internally. Externally the three-storey building is a simple rectangle, its reinforced concrete frame powerfully expressed and given added definition by the external staircases to the first and second floors, and by the balconies, particularly the long balcony cantilevered over the entrance. This generous, bold use of exposed concrete makes a decisive contrast with the Staffordshire blue brick infilling and the generally narrow fenestration, with its black-painted divisions. Well-sited in the landscape, the light and dark pattern of the building stands out with distinction against the background of woods and parkland.

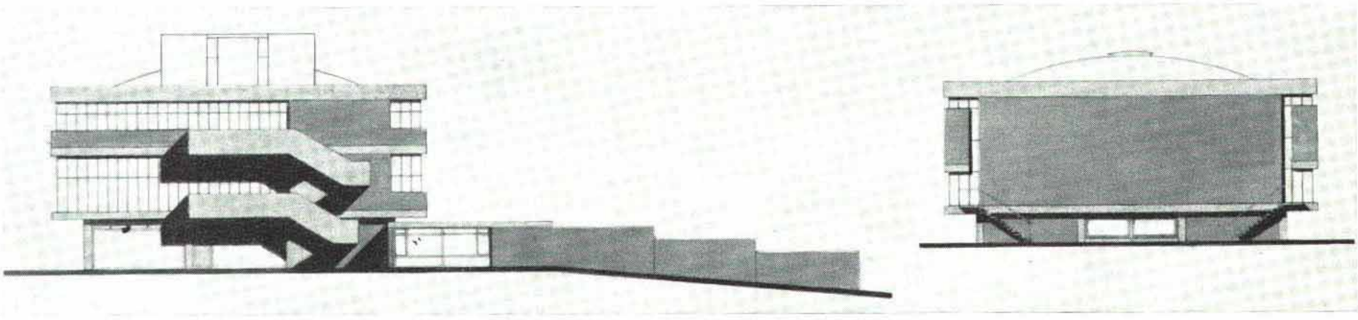
Internally the building is again designed to bring unity out of diversity, and is planned compactly round a central circulation area on all floors, the three straight flights of the main staircase acting as a firm stem. Spanning 24 ft. without side supports, this staircase forms a most important element in the design.

All the main communal rooms are planned en suite on the first floor – the ballroom, lounges, bar, snack bar and kitchen. The ballroom, large enough to hold 300 couples or 600 students seated for debates, is of double storey height. Basically square, it is surmounted by a segmented, saucer-shaped concrete dome, a form suggested by the students' sentimental attachment to the curved roof of the old Nissen hut union. On the ground floor the offices lie under the ballroom, with the general enquiry office next to the concourse; the floor level here is stepped up because of a rise in the ground level at the north-east end of the site. The remaining part of the ground floor is occupied by the shop, bank, and barber, also by cloakrooms, stores and a workshop opening on to a yard where – a nice touch – floats for rag days can be built. The top floor provides games rooms, music rooms and the periodicals room. Wherever possible the internal concrete is again left exposed, and combined with natural materials.

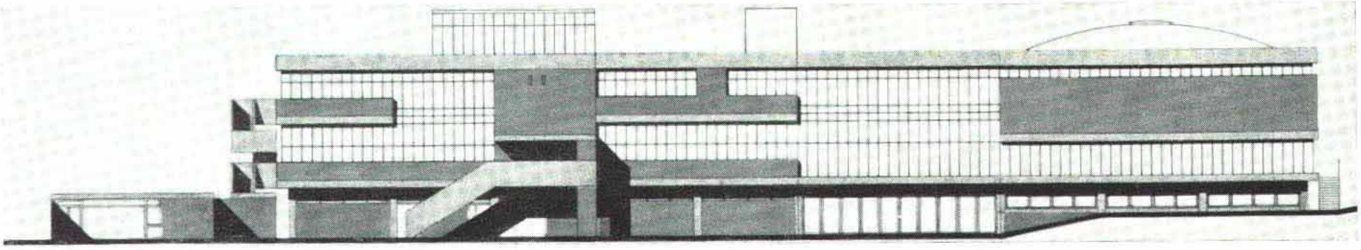
Structurally, the use of reinforced concrete has made possible the features which express the strength and flexibility of the architectural conception – wide floor spans, large cantilevered balcony, boldly defined staircases and unusual ballroom dome. The building is, in fact, divided into four blocks, because of possible mining subsidence, and particular attention has been paid to the foundations. These consist of column bases standing on mass concrete of a minimum depth of 1 ft. 6 in., and connected by heavy stiffened beams designed to allow for differential subsidence.

The general pattern of the structure is of reinforced concrete columns carrying deep floor and roof slabs over wide spans. The first floor is generally 18 in. deep without any projecting beams. The requirement of a clear span of 38 ft. over the ground floor con-

The Students' Union seen from the west, soon after its opening in January 1963.

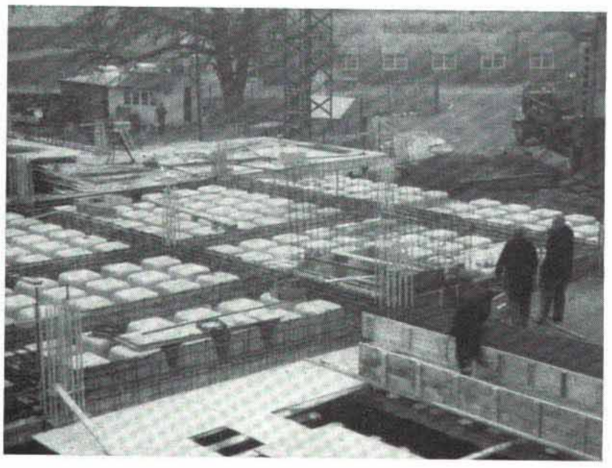


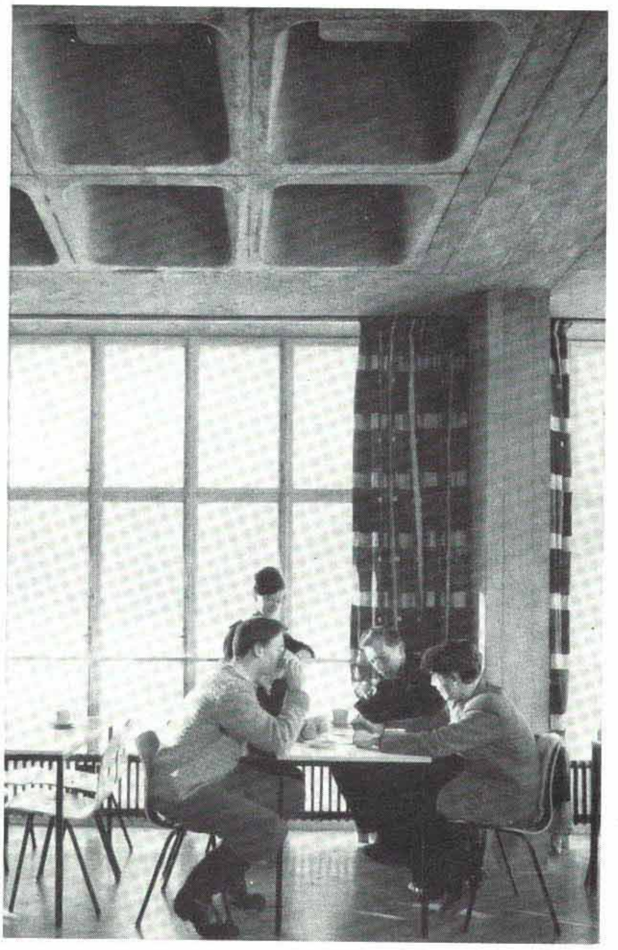
Elevations showing the balconies, stairs, and the dome.



Below: The pan formwork in place for the coffered ceiling construction.

Right: The exposed concrete coffered ceiling in the snack bar.





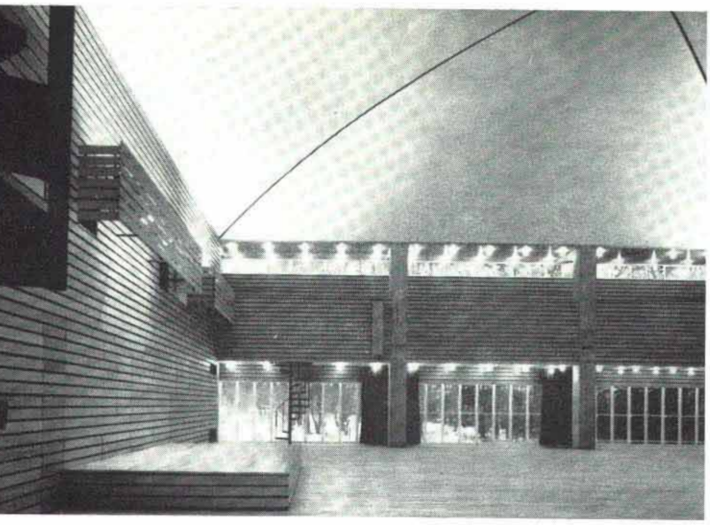
course is achieved by the use of prestressed concrete units, and prestressed units are again used to span this 38 ft. on the second floor and roof. The 21 ft. cantilevered balcony for the first floor lounge is also prestressed, but in situ, with $1\frac{1}{4}$ in. Macalloy bars; cardboard tubes are used to lighten the weight and reduce the amount of prestress required.

The remainder of the first floor, the second floor and the roof largely take the form of a waffle type of structure 18 in. thick, which was constructed with pan formwork. This is concealed by a false ceiling in some areas, but exposed in the snack bar and periodicals rooms. The exposure of these coffered concrete ceilings and of the concrete columns emphasizes the pattern of the structure, making a vigorous setting for the vitality of student communal life.

The shallow concrete dome of the ballroom, which appears in the exterior roof-line, is one of the major features in the design. It is a singly-curved structure, 55 ft. 4 in. in diameter, 20 ft. from the ground at its springing and 28 ft. at the apex, and it is lit by an 8 ft. diameter lantern. Its exterior finish consists of asphalt, with white stone chippings, laid on a lightweight screed. The joints of its four segments are clearly expressed in the interior and the underside has a special finish of fine glass chippings which reflect concealed lighting.

The ballroom interior combines the texture of exposed, board-marked concrete columns with those of natural materials – panelling of Columbian pine and maplewood floor. This combination of concrete textures, generally from the wrought timber formwork, with those of wood and other natural materials of restrained effect, runs throughout much of the building; where walls are plastered, they are generally painted white, to provide a background for the colours of curtains and upholstery. A strong structural colour note, however, is provided by the treads and handrails of the main staircase, which are of paduak, a rare red African hardwood.

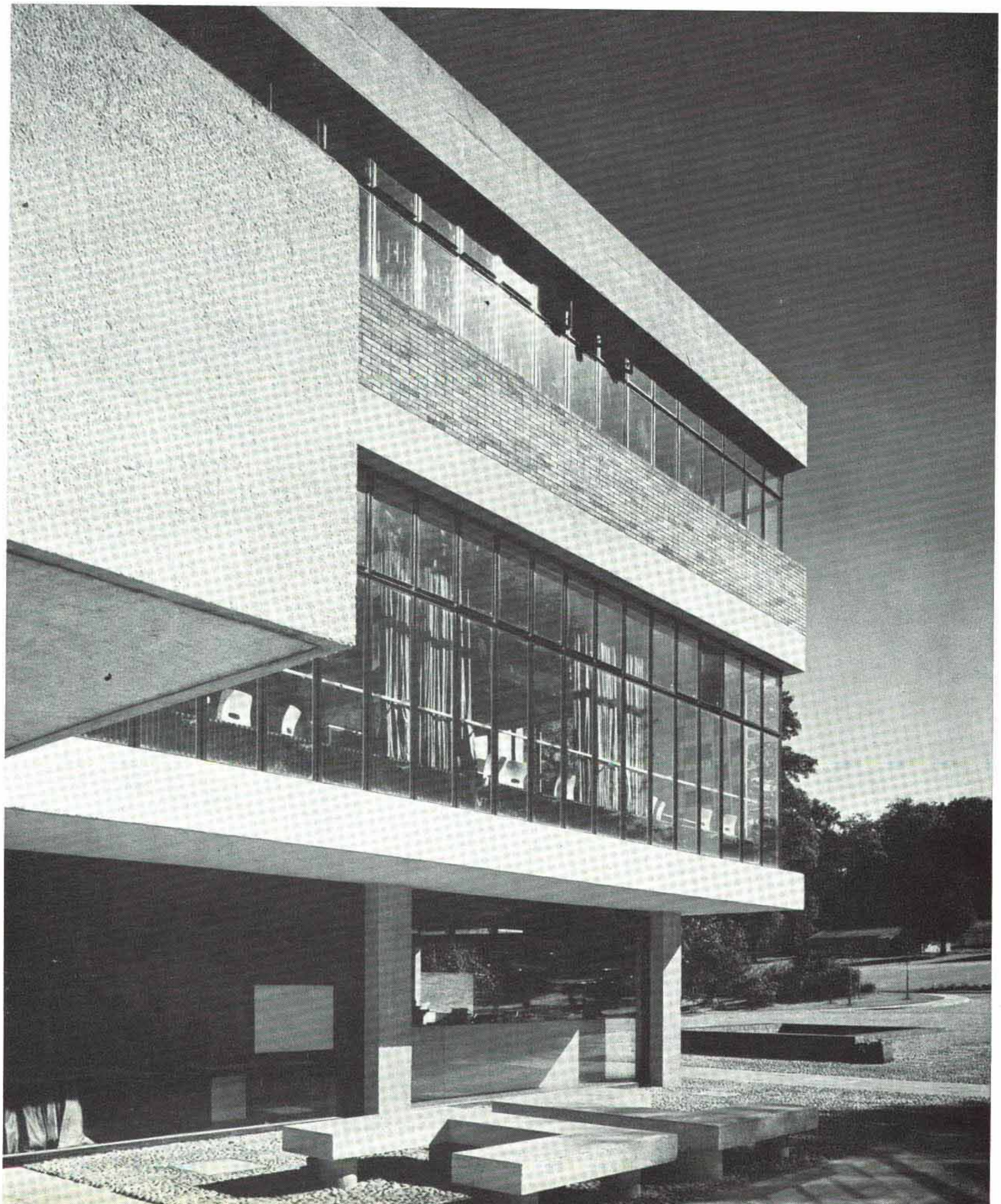
Where the concrete is exposed on the exterior, a specially selected white limestone aggregate has been used, and exposed, to improve weathering qualities. This gives a clarity to the appearance of the concrete which further enhances the strong definition of the most powerful elements in the design. This quality is echoed in the concrete seats situated in the paved and cobbled area surrounding the building. These simple, strong concrete benches, E-shaped without the middle stroke and carried on low cylindrical supports, have exactly the same feeling as the building itself and decidedly enhance its surroundings.



This lively and exciting contribution to University architecture was designed by Stillman and Eastwick-Field, F./F.R.I.B.A., B.A., with Donovan H. Lee and Partners as consulting engineer. The contractors were C. Cornes and Son Limited, of Stoke-on-Trent.

The timber clad walls of the ballroom contrast with the segmented concrete dome.

Below: Concrete seats and paving textures ally pleasantly with the textured concrete building.



EROS HOUSE, CATFORD

a building of glass and 'brut' concrete

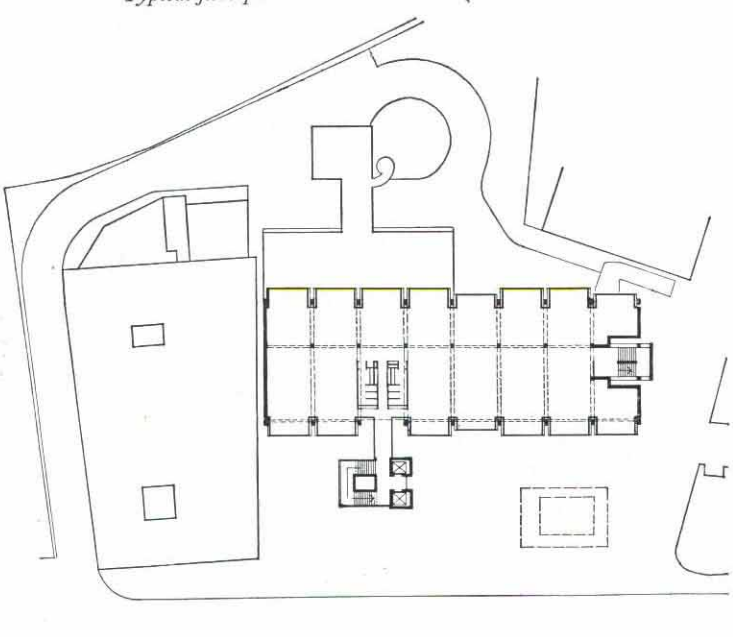
EROS HOUSE, confidently rising over the rooftops of Catford, is a very positive building: sufficiently so, in fact, to spark off very positive, or negative, reactions. Awarded the R.I.B.A. London Bronze Medal last year, this lively 'sculptural' block of offices and shops will do much to banish the glass box monotony which has ruled commercial architecture over the last five years. At the same time, it proves that commercialism need not preclude good design.

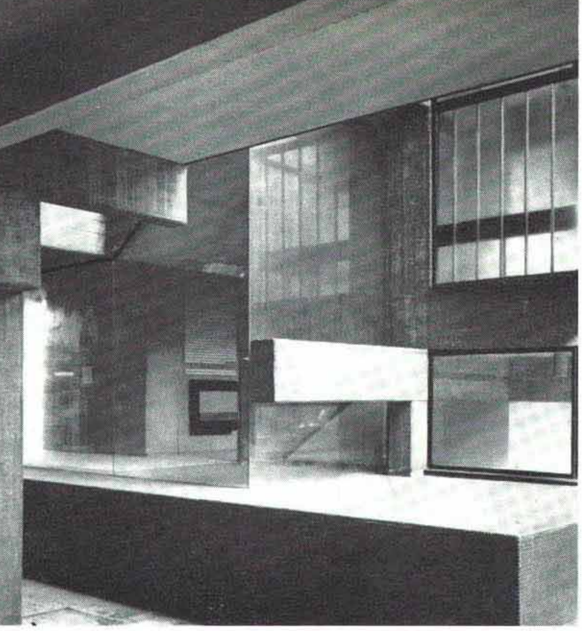
The building, designed for the Bernard Sunley Investment Trust in association with the E. Alec Colman Group of Companies, had to provide the maximum floor area for offices and shops on a minimum budget. The developers were not interested in a prestige building with slick finishes and expensive materials. The architects were therefore fully justified in using the *brut* concrete which is a characteristic of all their work. At the same time, they very sensibly decided that it would be unwise to use this medium in large unbroken surfaces: the concrete elements have therefore been broken up to give deeply modelled façades. On the two main elevations, floor slabs are cantilevered out varying amounts to support the projecting window bays which are very much a feature of the building; concrete beams pierce the walls of the staircase tower to project, at their ends, externally. These aspects, together with the upward-curving concrete eaves over a two-storey block, strongly suggest something of Japan and something of Le Corbusier. Apart from which – it may as well be said – the building is as it is mainly because the designers wanted to build it that way. And what better reason can there be than that?

The planning of the building has several unusual features. The main rectangular block contains seven floors of offices over a car park at first floor level, and a range of shops at ground level. At one end of the site – to attract people to the shops – is a two-storey supermarket, occupied by Sainsbury's, separated from the main building by a narrow passage (for services access and escape from the rear yard). In front of the main block, and divorced from it at ground level, stands the staircase tower which dominates the building, so placed to avoid the usual clutter of lift motor rooms above the main block. At the same time, the placing of the tower causes the main block to be set back from the building line so that a pleasant paved forecourt is created in front of the continuous range of ground floor shops. This serves as a place for merchandise to be displayed in the open. In addition, this aspect of the planning opens up the corner site on which the building stands, and enables the different blocks to 'read' better from the main shopping thoroughfare – Rushey Green – which runs along one end. The projecting window bays, which create a lively rhythm on the two main façades, have – apart from architectural reasons – a logical planning and economic basis as they permit a degree of flexibility in the area of lettable floor space in each storey.

Structurally, the building has a reinforced concrete frame, with some solid external walls also of concrete. Downstand beams project into the divisible office space on each floor. Reinforced concrete floor slabs were cast round fillers of wood-wool which act as insulation to under-floor heating. Another of the great advantages of the window bay treatment is that the glazing is continuous horizontally – returning round the insides of the columns between bays – so that tolerances as regards the concrete structure only had

Typical floor plan.

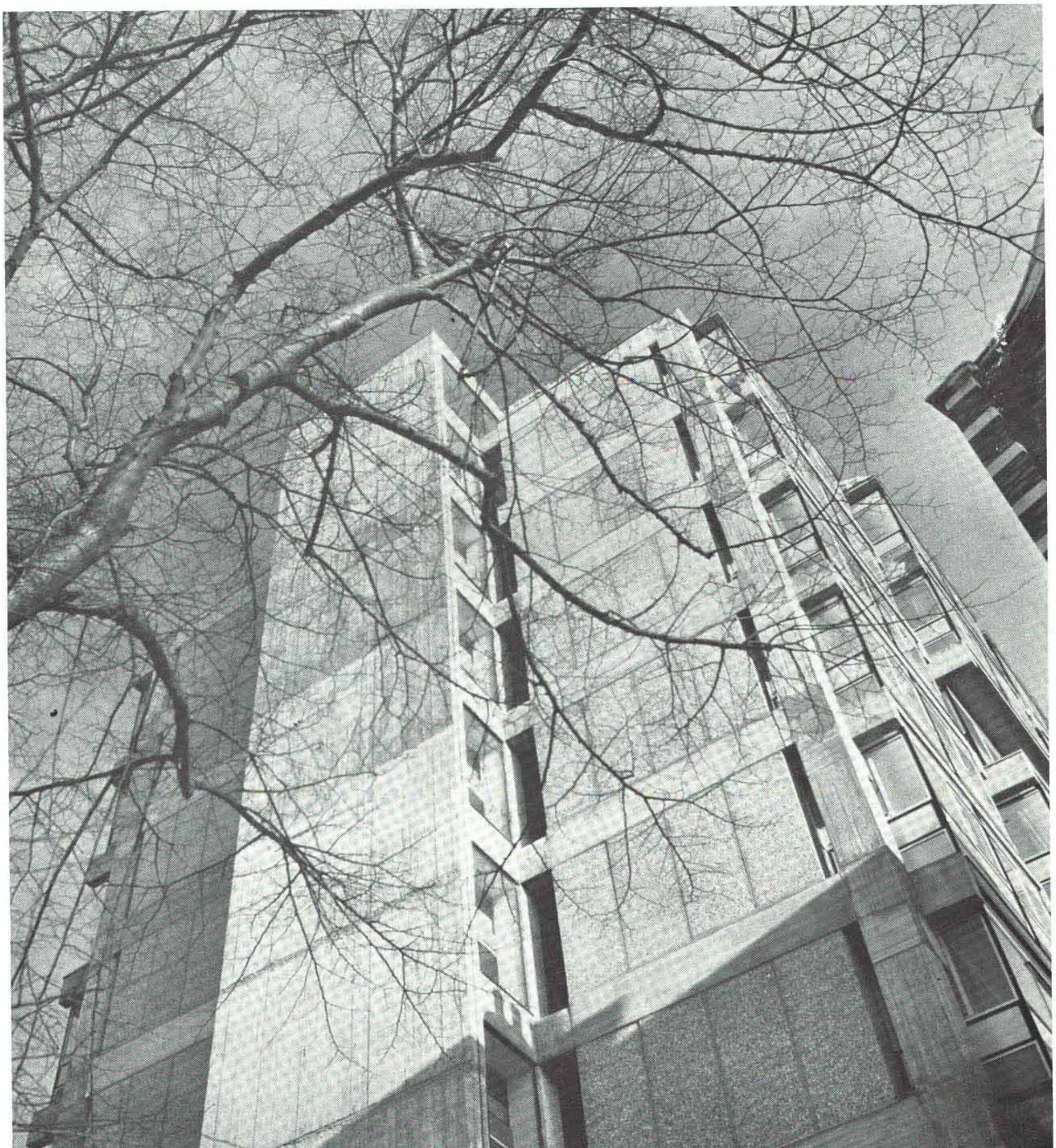




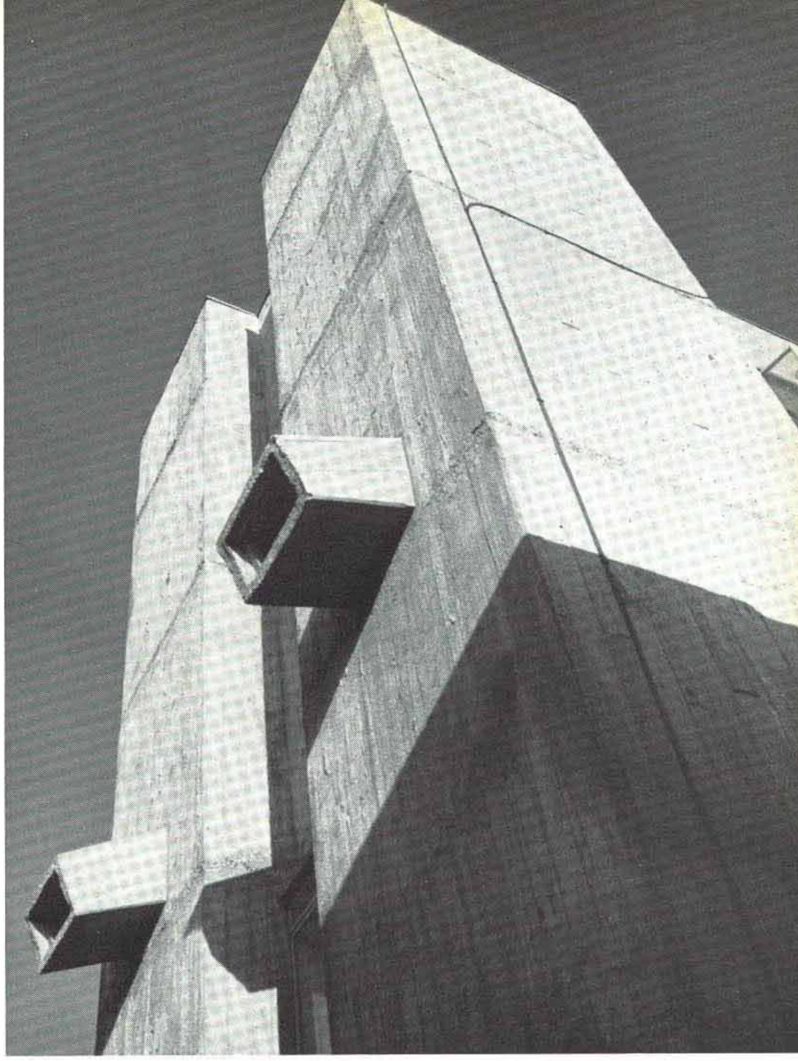
External detail of the entrance hall to Eros House, at the base of the staircase and lift tower.

Below: General view of the building from the south-west.

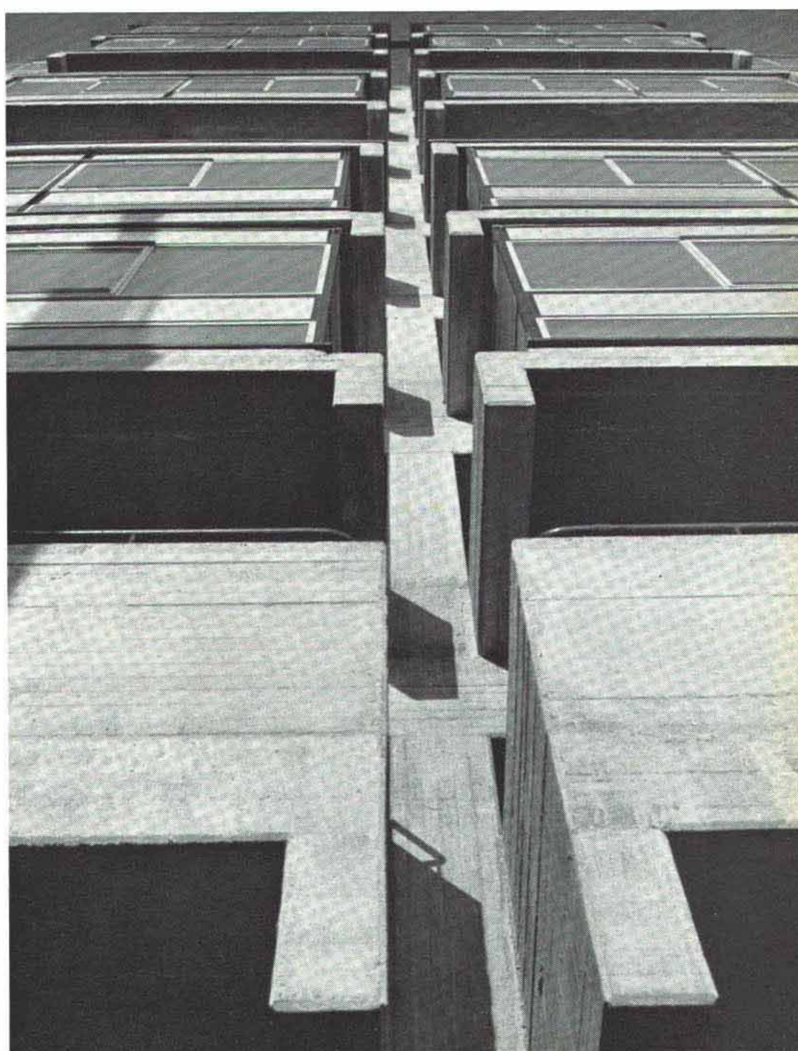
Storey-height precast concrete panels with a buff exposed aggregate finish clad the gable end walls facing on to Rushey Green – the main shopping street.



Board-marked concrete walls encase the two lift shafts in the tower.



Below: Detail of the cantilevered reinforced concrete beams and floor slabs which support the projecting window bays.



to be observed in the vertical direction. This greatly simplified the detailing and erection of the metal-framed windows. At the same time, it was convenient not to have tolerance gaps in the concrete structure as there is, of course, no cladding material to cover them. In the staircase tower, the stairs are cantilevered from a central reinforced concrete box column, with beams projecting beyond the obscure glazing in which the tower is clad.

The roughly-treated exposed concrete which is a particular hallmark of Eros House will not, of course, be to everyone's taste. But then, in modern architecture, designers have for some time fallen into two camps: those for, and those against, the use of natural concrete as a finish – and this is very much reflected in contemporary buildings. However, one wonders to what extent the liking for the rougher kind of *brut* concrete – as sometimes shown by Le Corbusier – is an intellectual rather than a visual exercise. Does it really look nice in this damp, cloudy island? On the other hand, the ideal of natural undisguised concrete, giving structural purity, seems altogether valid. Possibly there is a borderline of roughness and irregularity – in this climate at any rate – beyond which it is not wise to go.

In Eros House, the quality of the concrete finish is variable. In parts – such as the curved eaves to the supermarket – the colour of the concrete is uniform and the board-markings regular. In other parts – sometimes rather vital places – there is staining and honeycombing which one cannot help seeing. On the other hand, care has been devoted to the detailing of the concrete: arrises of beams and columns have been properly chamfered; on the blank parts of the end walls and stair tower, floor levels are marked by 6 in. bands of bush-hammered concrete. Also on the end walls, the natural concrete is varied by the use of storey-height precast concrete panels with a buff exposed aggregate finish – made by Tarmac Vinculum Limited.

The building was designed by Owen Luder, chartered architects (Owen Luder, Dennis Drawbridge and Rodney Gordon). The structural engineer was Gordon M. Rose. The contractors were Bernard Sunley and Sons Limited.

– the old tram tunnel in London forms a new

underpass below the Strand

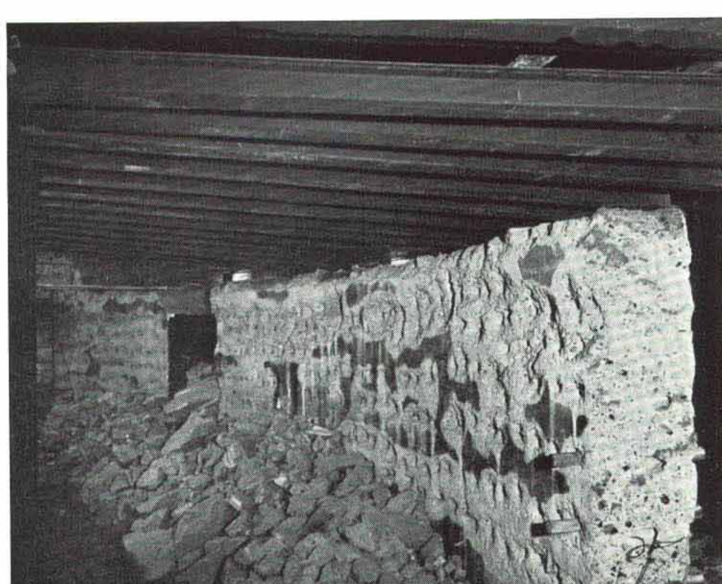
TO RECENT generations of Londoners the old Kingsway tram subway is probably remembered only as the setting of one of radio's funniest Goon Shows, with London's last tramcar lurking under Southampton Row obstinately refusing to surrender. To their parents the subway was the memory of plunging suddenly into the depths at Theobald's Road and of grinding, swaying trams seeming to miss each other by the most perilous of margins.

These memories were revived briefly on January 21st when the new Strand underpass was formally opened to traffic by Lord Morrison of Lambeth. Appropriately enough the opening ceremonies took place at the entrance from Waterloo Bridge – the 'monument' to Lord Morrison's years as the driving force behind the development of the London County Council as it is today. The one-way south-to-north underpass follows the old tram tunnel under the Strand and Aldwych to emerge into Kingsway, using much of the original construction.

Although new construction was necessary to ease the sharp curves under the Strand and Kingsway, and to make a single tunnel of the previously divided one, the sixty-year-old original walls of the original tunnel were found to be in sound condition. These old walls were of mass concrete some 6 ft. thick, with approximately a 4 ft. thickness of 1 : 6 or 1 : 8 cement-to-ballast concrete mix backed up with 1 : 12 concrete to the trench wall. Because of restricted site access the large mixers of the period could not be used and mixing of all the concrete used in the original construction was carried out by hand. So well has the original work endured that removal of thick centre walls at two points was one of the most serious problems during the rebuilding.

At the south end new concrete retaining walls carry a reinforced concrete slab ramp down from Waterloo Bridge to pass under the Strand sewer; at the northern exit the slabs are carried on a new structure between the existing walls. Because of site access problems – rebuilding had to be carried out with minimum interruption of traffic and some concrete work was done in tunnel headings – concrete was delivered ready mixed and pumped into the formwork; some 6,000 cubic yards were used.

Clearance limitations of the tunnel restrict traffic to light vehicles with less than 12 ft. of headroom; photoelectric cells over the southern approach lane control light signals which automatically divert over-height vehicles back into Lancaster Place; the same signals automatically divert all traffic if the tunnel becomes congested or if carbon monoxide or haze concentration passes safe levels. Ventilation is by extraction from the centre of the underpass; either of the two



Aldwych bend, within the underpass, leading to the exit ramp into Kingsway.

exhaust fans can handle the maximum output of 250,000 cu. ft. per minute. Emergency telephones have a direct police connection.

A suspended ceiling of perforated metal panels dampens traffic noise and the walls of the underpass between portals are faced with light panels of aluminium-clad plywood. Both wall and ceiling panels have a light grey plastic finish which is easily cleaned and provides good light reflection. The walls of the open approach ramps are faced with riven Burlington slate panels.

Main internal lighting at 20 lumens per square foot is provided by continuous fluorescent strip lighting and additional transition boost lighting at the portals varies automatically according to the outside light intensity. At night the tunnel lighting is automatically reduced to 5 lumens.

Frederick S. Snow and Partners were consulting engineers to the London County Council for this work; the architect to the L.C.C. is Hubert Bennett, F.R.I.B.A. and the acting chief engineer, P. F. Stott, M.A., M.I.C.E. Main contractors were John Mowlem and Company Limited.

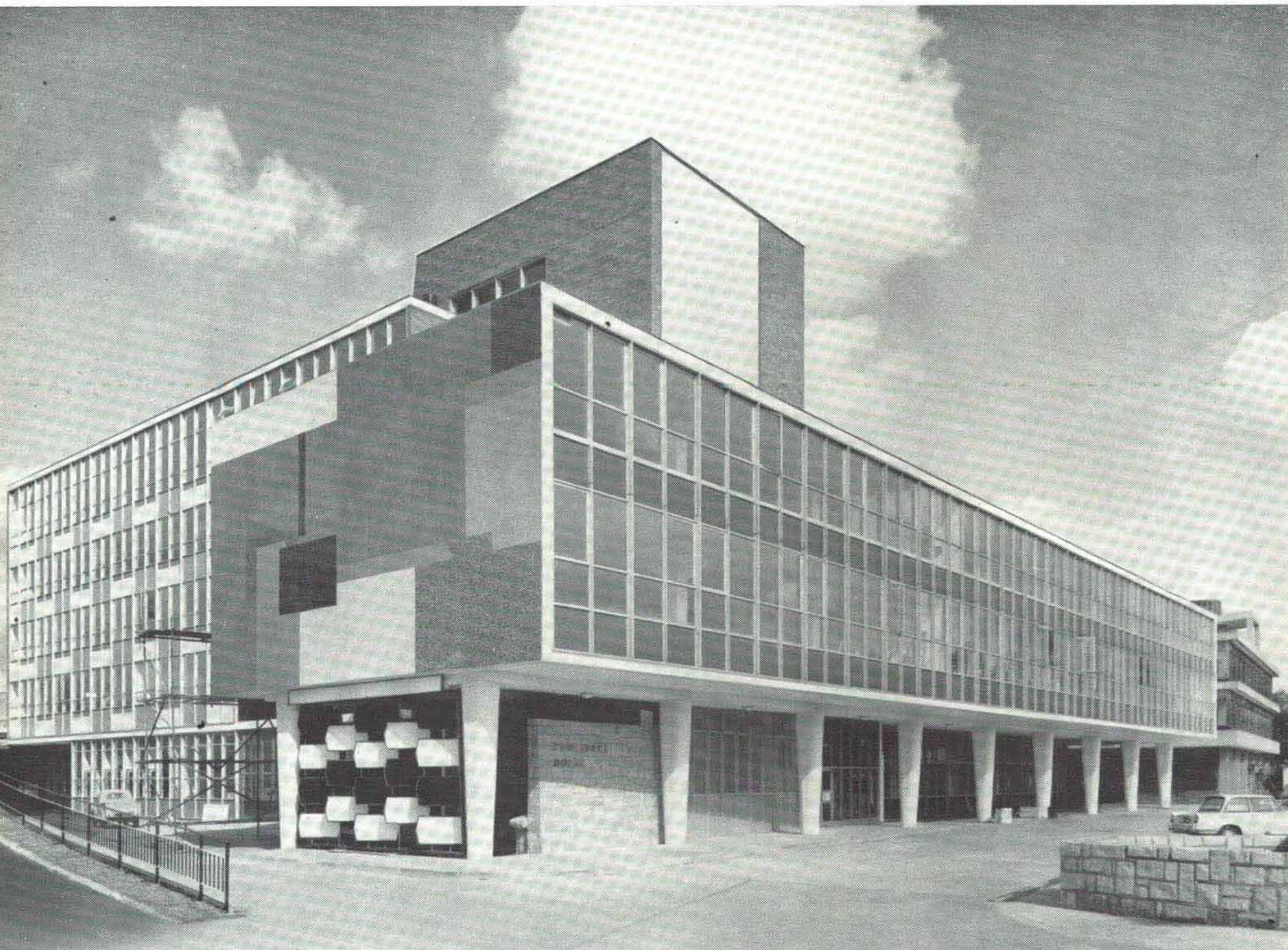
Far left: The Kingsway subway in tramway days.

Left: Demolition of one of the original mass concrete walls; demolition was carried out without explosives by drilling and the use of hydraulic bursters.

The entrance ramp in Lancaster Place, leading down into the tunnel from Waterloo Bridge.

Endeavour House,

a 'flatted' factory at Hendon



The entrance to Endeavour House from the North Circular Road, with the elevated roadway on the left.

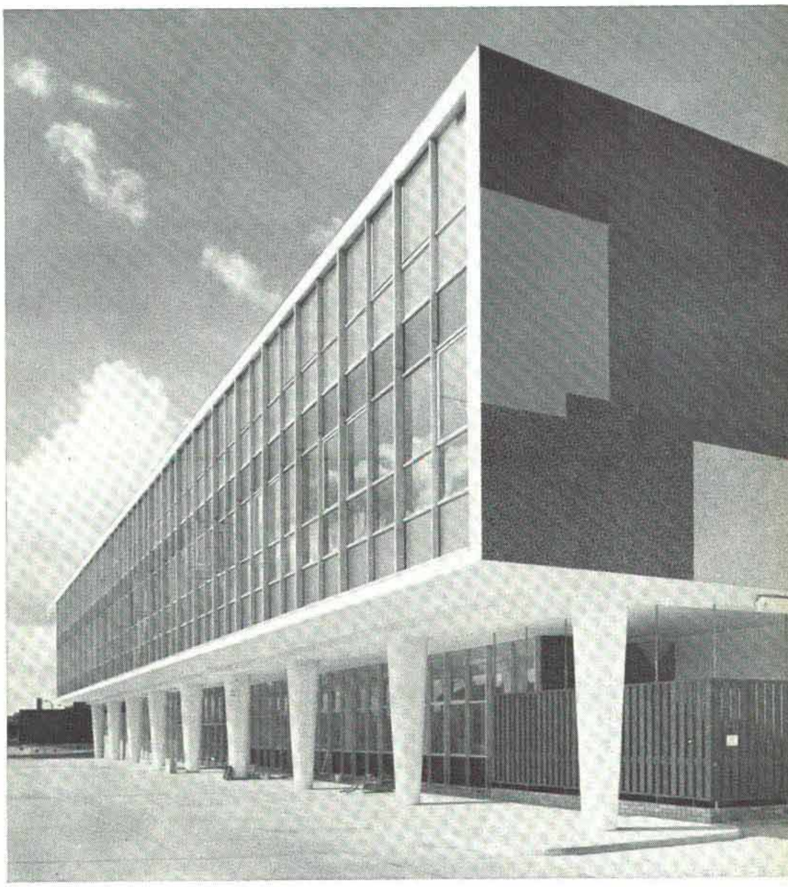
THE 'FLATTED' FACTORY, which has appeared in recent years in this country, may well be on the increase. For the small concern, engaged in light industries, the arrangement has many economic and practical advantages – in much the same way that the residential flat may be said to have advantages over the house. Shared amenities, for instance, are one of the benefits; saving in land is another. Also there are many industrial concerns that have had to move because of redevelopment plans, and alternative accommodation has been hard to find – particularly as land gets scarcer: the flatted factory has, in these instances, proved invaluable. The first of the flatted factories in this country were built over five years ago by the London County Council in Shoreditch and parts of the east end of London. Also about this time, a large eight-storey flatted factory appeared in Birmingham. Two years ago, a similar-sized factory of this type went up in Brighton (with prestressed concrete beams), and more recently, another – Endeavour House – has been completed at Hendon, Middlesex, on the North Circular Road. This was built expressly to accommodate those firms which have been 'redeveloped' and also those which have been unable to conform to existing plot-ratio requirements (1:1).

The Hendon factory is in parts three storeys high and, in others, five. The gross area of the site is 73,930 sq. ft. and the actual workshop area is 59,510 sq. ft. In all, there are seventeen separate factory units with variable floor space, as well as ample car parking space and facilities for lorry delivery. The building has one goods lift, capable of taking 4,000 lb., with its own loading dock; there is also a primary loading dock which serves the ground floor factories only. An elevated roadway, built to Ministry of Transport specifications, permits access by any weight of vehicle from the main road to the first floor at the rear; below it, there is car parking space for about seventy vehicles. The roadway incorporates heating below the surface to prevent ice formation.

The River Brent runs immediately behind the factory and was to some extent diverted to make way for a paved space at the rear. The canteen, with a caretaker's flat above, is built actually on the bank of the river, and to support this and the elevated roadway, the river bed was sheet-piled along the appropriate length. Buildings on the perimeter of the site rest on reinforced concrete bored piles which also assist in underpinning adjacent properties. The remainder of the factory rests on 'Franki' piles grouped in fours and driven to a depth of 38 ft.; over 430 piles were driven, in all. On top of these, a 10 in. reinforced concrete slab foundation was laid. Above, the main superstructure of the factory is of in situ reinforced concrete, with flat plate floors supported by columns spaced fairly widely apart. The floors are of 10 in. reinforced concrete to permit heavy loading.

The front of the building is faced with glass curtain walling, flanked by walls treated with large abstract murals done in rectangles of coloured glass mosaic; these are clearly visible from some distance along the North Circular Road. Parts of the side and rear elevation are treated with 'Mineralite' rendering with an exposed-aggregate finish.

The factory was designed by the Borough Engineer and Surveyor's Department of Hendon Borough Council (Borough Engineer and Surveyor F. J. Cave). The Chief Architect was B. Bancroft. W. V. Zinn and Associates were the structural engineers. The contractors were Tersons Limited.



Abstract murals on the flank walls to the front elevation, plainly visible from some distance away.

Extensions to a hall of residence, University of Southampton

include a fine 17-storey tower

SOME VERY FINE EXTENSIONS have recently been built to students' residential accommodation at Southampton University. The new buildings have been added to South Stoneham House – a Queen Anne mansion of some architectural merit, set in mature grounds overlooking the Itchen valley. The mansion has been used as a students' hall of residence for about thirty years.

The focal point of the new layout is a 17-storey tower block of study-bedrooms, at the base of which a group of low buildings – communal rooms and kitchens – form a link with the original mansion. The architects decided on a tower block so that the maximum amount of site would remain untouched as gardens. The low blocks are of traditional brick construction to serve as a 'continuation' of the mansion. The tower, on the other hand, is concrete built and finished – a strikingly simple design of cross walls and facing panels which, in structural and elevational treatment, strongly suggests an industrialized building system: so much so, in fact, that it serves as a pointer to what system building can mean in terms of good architecture.

On plan, the tower block is nearly square – 49 ft. by 56 ft. Each of the upper floors has ten study-bedrooms, two larger rooms linked by a lobby (for students or for staff 'flatlets'), a kitchen, a laundry and the usual wash rooms; all the study rooms have wash-basins and fitted wardrobe units. The tower is served by two lifts and a staircase open to the outer air.

At foundation level, the whole structure rests on a 2 ft. 6 in. thick reinforced concrete raft based on a subsoil of stiff clay. From here, a central reinforced concrete core rises the height of the building, housing the lifts and services and giving stability to the structure. Below first floor level, the tower is mainly supported on slender columns, which allow free circulation areas around the central core. Above this level, the tower is built as an egg-crate structure with 6 in. thick reinforced concrete cross walls, which suited the regular layout of the study-bedrooms. These walls were cast in situ, as also were the 5 in. reinforced concrete floor slabs. The formwork for these was in the form of tables – each one room unit in size. After the 'tables' had served one floor, they were moved out of the rooms and lifted by tower crane to the next level. No scaffolding was used in the building at all: all lifting was done by a climbing tower crane supported within the central core.

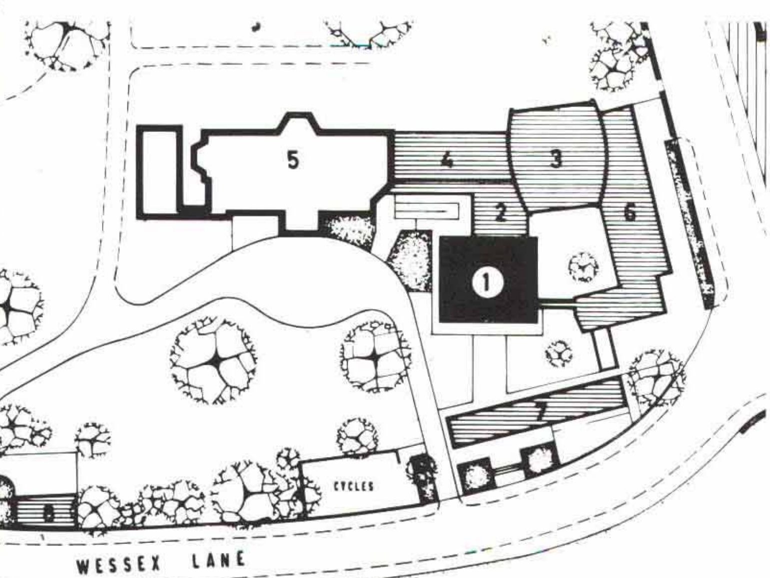
A particularly interesting aspect of the building is the cladding, which consists of room-sized precast concrete panels with an exposed aggregate finish, each weighing up to two tons. The panels were handled by crane and fixed, weather-stripped and glazed from within the building so that no scaffolding was necessary. The majority of the panels were simply infill panels, but others – of special sandwich construction with an insulating layer of foamed concrete – were used as permanent formwork for the in situ flank walls. The outer edges of cross walls and floor slabs are also faced with narrow precast slabs – marking externally the division of room units. These and the permanent formwork panels have an exposed aggregate of grey Cornish granite. Infill panels are in two colours, with an exposed aggregate finish of green Criggion granite chippings set either in a white or a black matrix to form a regular pattern on the façades. Columns at ground floor level are faced with slabs with an exposed aggregate finish of Derbyshire spar.

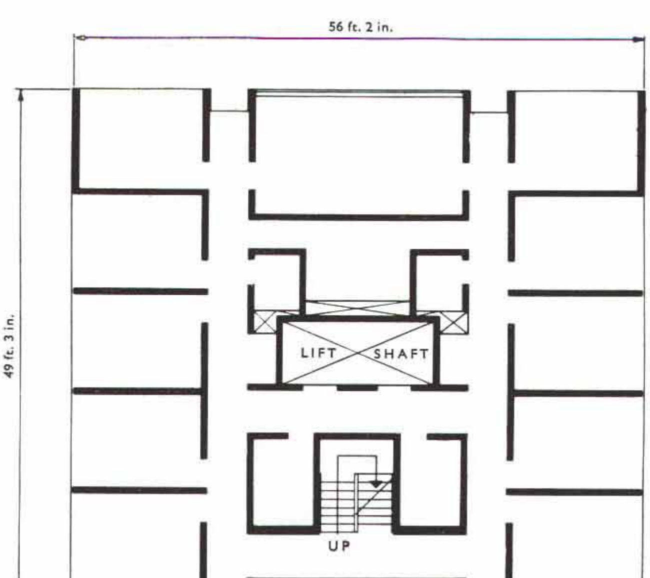
Internally, the greater part of the concrete has a fair-faced finish obtained by using plastic-faced plywood formwork. The traditional plastering could therefore be entirely omitted, and because of the high quality of the concrete finish, decoration was applied direct to walls and ceilings with the minimum amount of preparation. Windows – designed for cleaning from inside – are in hardwood frames.

The new extensions were designed for the University of Southampton by Robert Potter and Richard Hare; the associate architect in charge was J. J. A. Caunt. The structural engineers were E. W. H. Gifford and Partners. Trollope and Colls Limited were the general contractors. The exposed aggregate facing panels were made by Portcrete Limited.

Opposite: ▶
Site plan, and typical floor plan showing the layout of cross walls.

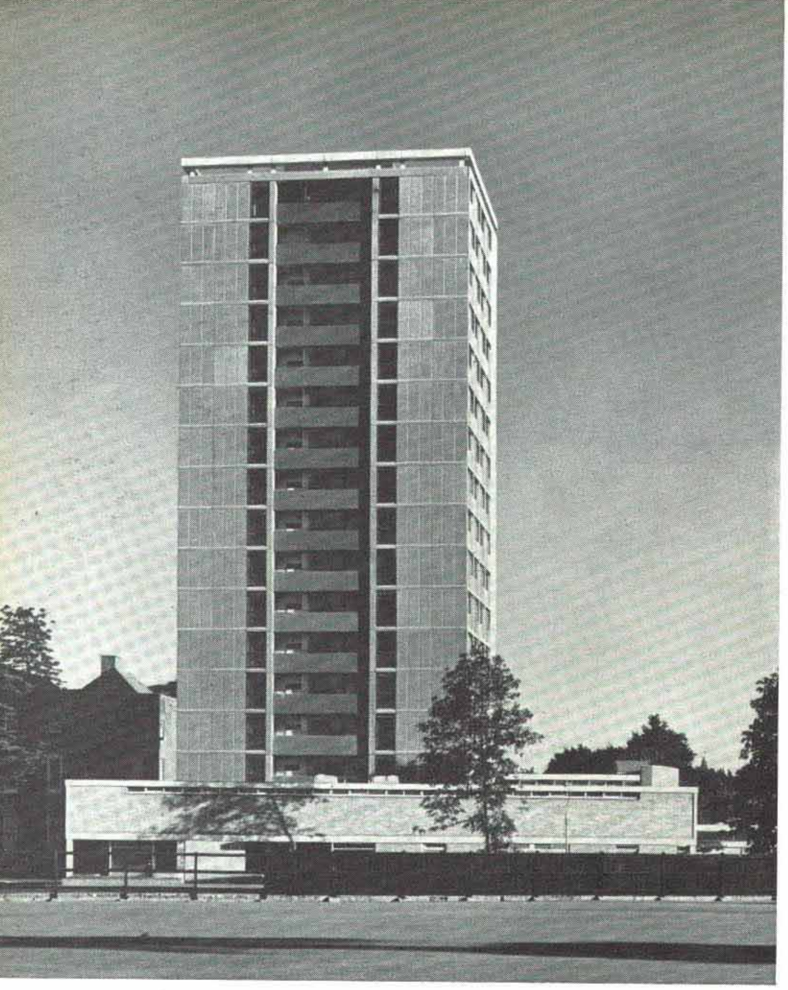
The tower block viewed from the lawns in front of the original Queen Anne mansion.



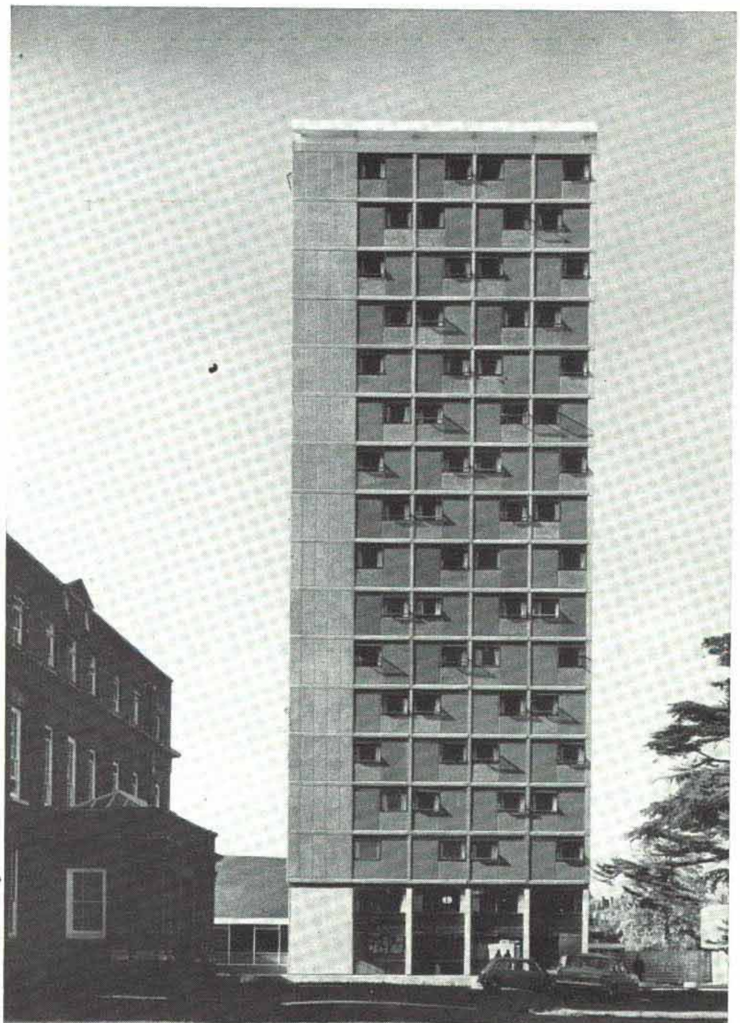


UNIVERSITY OF SOUTHAMPTON:

continued

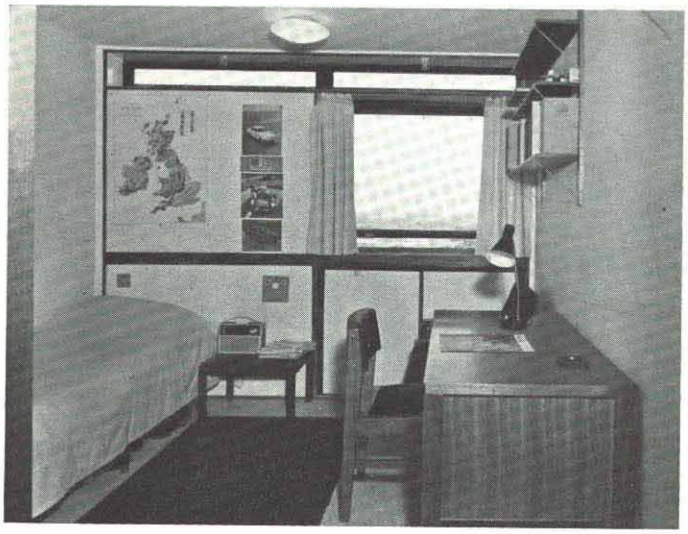


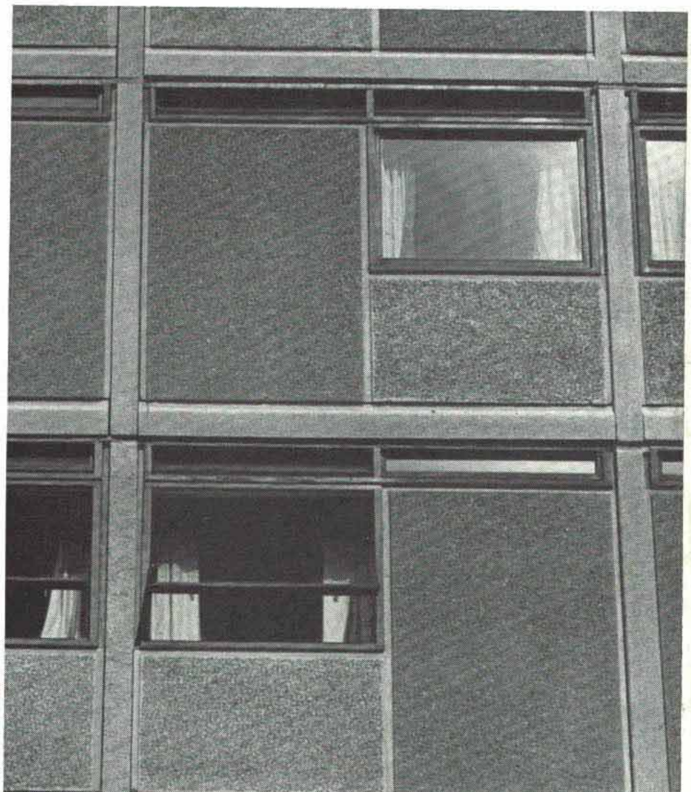
Above: The staircase elevation of the students' residential tower block. The precast concrete facing slabs have an exposed aggregate finish of grey Cornish granite. Below: The tower from the entrance drive. Each study-bedroom unit is clearly expressed on the façades.



Below: One of the study-bedrooms.

Bottom: Two kinds of precast infill panels are used on the tower: each has an exposed aggregate finish of green Criggion granite set in a white or black matrix. The narrow precast strips have an exposed aggregate finish of grey Cornish granite.

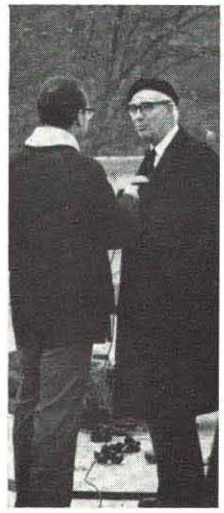




An elegant

footbridge at Durham

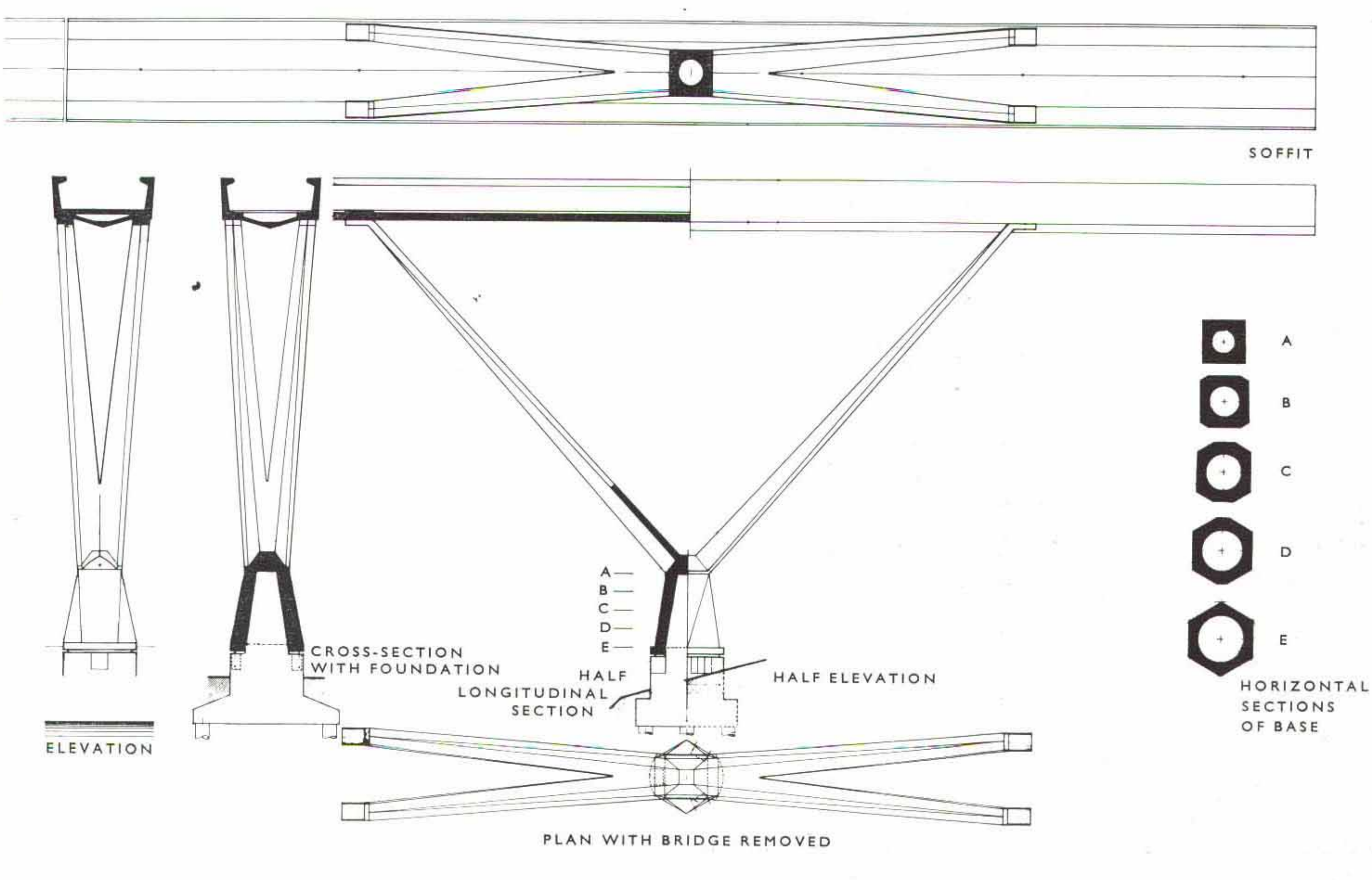
with an original method of construction



THE RIVER AT DURHAM lies, dramatically beautiful, at the foot of its deep wooded valley that is topped, on the City bank, by the magnificently sturdy Norman cathedral and the University buildings – not old, but pleasantly mellow. A new group, on the opposite bank, is soon to be added to these – Durham University is growing fast, as are all our Universities today – and it had to be linked with the major buildings and the City across the river. A footbridge was needed, inexpensive, elegant to equal its splendid setting, yet of a sturdy simplicity that would be in key with the Norman simplicities of the cathedral. Ove Arup and Partners designed it.

The University Council, who put the bridge in hand, started with the assumption that they had only £35,000 to spend, and had originally thought that this would only run to a short bridge, spanning the 120 ft. width of the river itself, at the foot of the valley, with steps and walks leading up on either side. The designers, however, realized that with a high bridge, spanning the 350 ft. width of the top of the valley, 56 ft. above the river level, the height itself could make for economy, enabling as it did each support to be spread and two supports only to carry the whole span. This, then, was the solution adopted, and bridge conceived, in the words of the designers "as a thin, taut, white band stretching horizontally across the valley, resting on a pair of slender tapered fingers, in a V shape, rising from each side of the river". The plain description covers it, but leaves out the subtlety with which the shapes are handled, a subtlety without chi-chi or softness, but keeping in its fineness a certain

Top: Ove Arup interviewed for television after the closing of the bridge.
Below: Plans, elevations, and sections of a support.



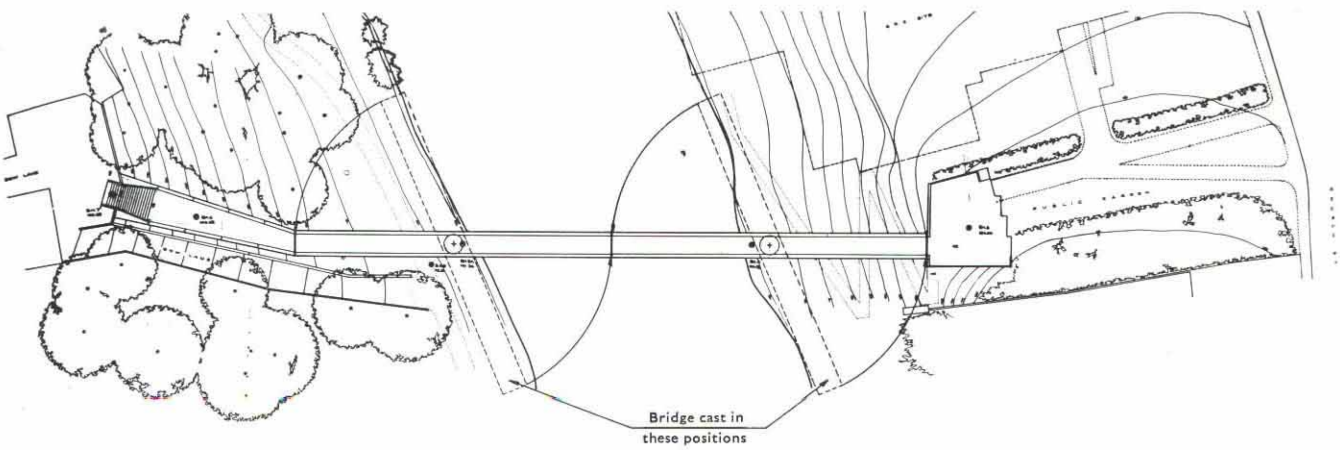
strength of plane, which can truly be said to be in keeping with the strong and simple lines of the cathedral above.

A contributory economy was, of course, the highly original method of construction. This, indeed, brought about a real saving to the University, but was undoubtedly the outcome of a considerable expenditure of thought on the part of the designers. The effect was the total elimination of all falsework and scaffolding in the river – where traffic had to continue unobstructed in any case – and this was done by casting the bridge in two complete and separate halves, one on each bank, with all falsework founded on dry land, and then swivelling each half in a right angle, to meet in the middle.

The two supports, therefore, are each founded on the foot of the river bank; the footing consists of a double cone rising from a cylindrical base, itself founded on 18 in. bored piles. The inner and outer shells of the cone revolve one on the other, enabling the two halves of the bridge to be pivotted from their position parallel with the river to that at right angles to it. A temporary bearing at the top of the cone is used in the swivelling process.

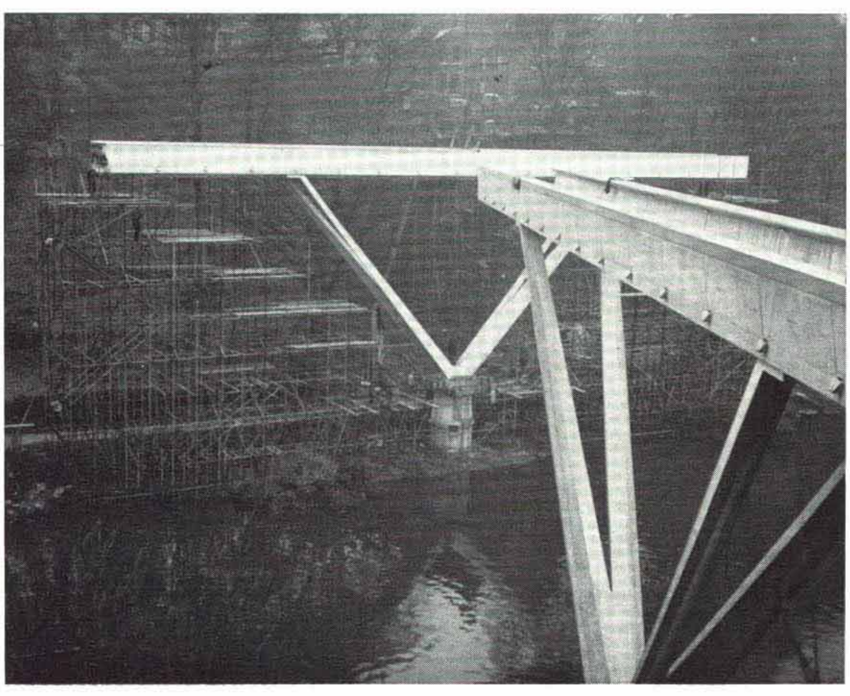
From each pair of V-shaped supports the bridge deck spans across the river, while the outer ends cantilever towards the shore. At the end where the bank is higher than the deck level, an approach extension is provided, with a short flight of steps leading down to it.

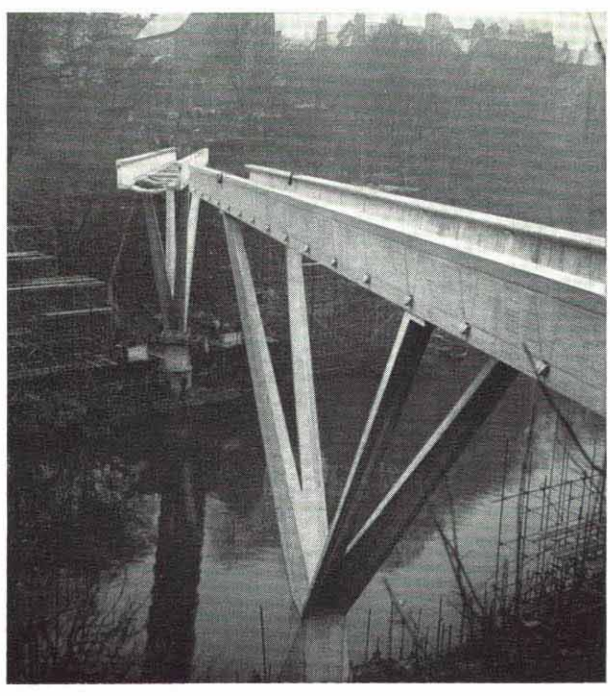
The V supports consist in fact of four fingers, each arm of the V dividing and tapering to the underside of the deck. The arms are beautifully shaped, changing in cross section continuously from base to top. At the base, where the concrete section is only about 5 in., the struts are approximately 5 ft. wide, curved on the inside and forming straight planes on the outside. As they divide into two and taper upwards to a width of only 1 ft. 9 in. each, the thickness of the concrete

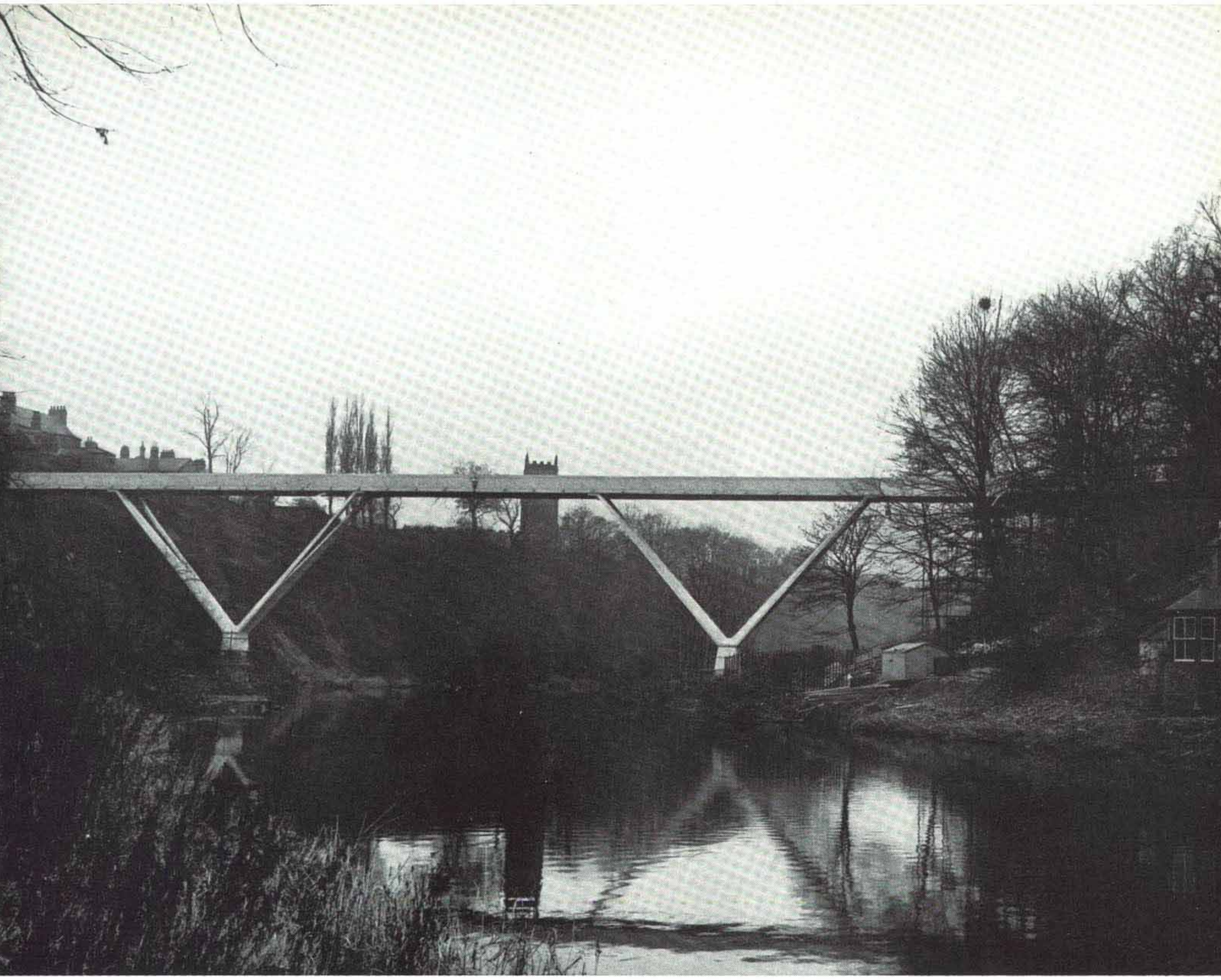


Above: Site plan, showing the casting position of the half-bridges and their line of rotation.

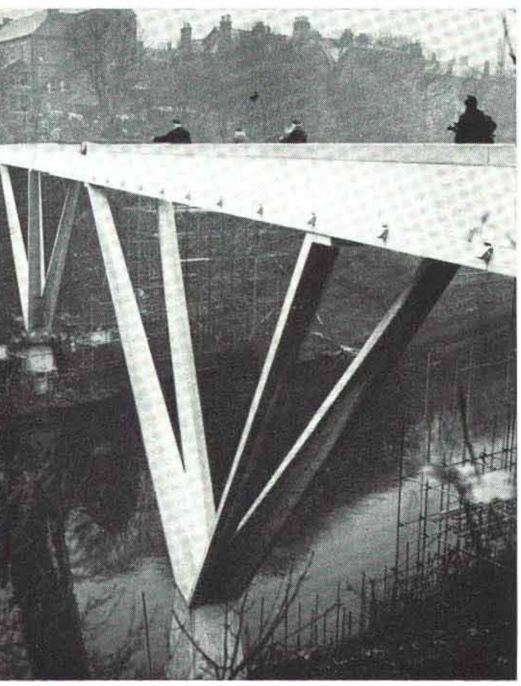
Below, left to right: Three stages in the rotation of a bridge half, from parallel with the shore to final joining.



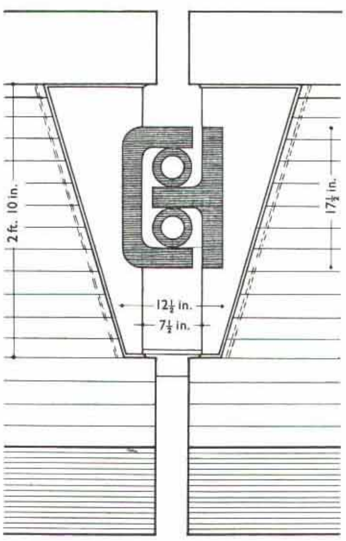


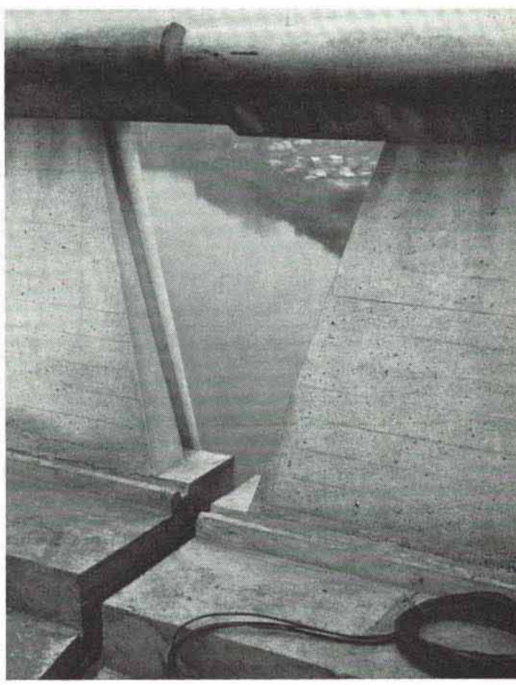


The finished bridge, elegantly spanning the deep valley of the Wear.



Right: The two halves of the bridge draw together, prior to final levelling.
Below: The bronze expansion joint at the centre of the bridge.





Misty weather in the Wear valley blurs the outlines of the new bridge among the trees.

FOOTBRIDGE AT DURHAM: *continued*

section increases to 10 in., with a 7 in. thickness running a little way along under the deck. Thus the volume of concrete in the struts, though differently disposed, remains approximately the same throughout.

The deck is a trough-shaped structure with solid parapets forming an integral part of the spanning beam (structural design) while at the same time their solidity echoes that of the Norman cathedral (aesthetic design). To obviate large plain concrete surfaces, triangular grooves were formed in the parapets to coincide with the construction joints, and precast water spouts at these points further bring simple functional modelling to the surface. The curved base of the trough for service pipes and cables is covered over by precast concrete planks which enhance the 'footbridge' feeling.

Structurally, the bridge is two self-contained units, and could have been left as such, were it not that safety against wind action was felt to require more rigidity than this permitted. The short cantilevered abutment span was therefore joined to the bridge span by means of surface slabs – thereby denying the structure the complete 'purity' it would otherwise have had, but fully justifying itself in effect.

When the 150 ton half-bridges had been pivoted into position jacks were inserted in the pier bases, by which the two spans could be precisely levelled. After completion of the turning process the bearings were grouted, and one shoreward cantilevered end locked to the abutment. The joining at the centre is effected by specially designed bronze expansion joints which permit horizontal movement due to temperature change to take place, but transmit the vertical forces from one half of the bridge to the other.

This unusual bridge was completed within the specified figure, and with no disruption to river traffic. Its attractive appearance lies not only in its elegant lines, but in its warm white colouring, obtained by using white cement and pink Shap granite aggregate, exposed by sand blasting. The abutments are differentiated visually from the bridge proper by being constructed of ordinary grey concrete with a strong board-marked texture; their parapets are formed of precast concrete units.

The construction was carried out by Holst and Company Limited, contractors.

'Point Royal'

a hexagonal block of flats brings height to

Bracknell New Town

THE FIRST WORD that comes to mind in describing Point Royal is "conspicuous". As the inevitable silver-painted water tower announces each American prairie town, or the church campanile an Italian village, long before the town itself emerges from the landscape, so the 17-storey block of flats is the traveller's first sight of Bracknell New Town.

Its hexagonal shape would draw attention to Point Royal in any setting, but even the most uninteresting tower would stand out against the spread-out, low-height 'basic brick' of Bracknell. In the context of an unfinished and slightly raw-looking town-in-transition, and situated well away from the town centre in the Easthampstead section, the flats seem almost out of place. Almost, but not quite, for in a sense Point Royal is a preview of Bracknell-to-be – not the market town of 5,000 it was a few years ago or the light industrial town of 23,000 it is today, but a town of 60,000 with modern roads, a completely re-developed town centre with separated pedestrian and road traffic, and more tall blocks providing a visual balance to the one that is now so prominent.

Seen at close hand Point Royal loses its out-of-character feeling; instead it dominates and serves as a focal point for the neighbourhood. The tree-dotted rise on which it stands masks the ground-floor deck and parking area; cantilevered outward from its supporting columns the six-sided building seems to rest suspended a few feet above the earth.

The illusion of a building floating in space grows rather than diminishes as one approaches. The upward, outward sweep of the cantilevered first-floor slab, emphasized by the board-marked finish, is repeated in the edge and soffit of the saucer-like gravelled pedestrian deck at ground-floor level and again in the bowl of the sunken parking area; the ring of space between the edge of the deck and the retaining walls seems to pass completely under the building.

The shape of the building that seems so plainly hexagonal from a distance turns out, on closer viewing, to be irregular, as if a giant wedge had been driven into the centre of one of the flat sides and the two halves swung slightly apart – and viewed on plan it becomes clear that the architect has done exactly that, leaving space for a stairwell down the "split".

The structural system springs from the first-floor level and consists of 6 in. thick in situ concrete floor slabs supported by an inner core of 7 in. in situ walls and an outer periphery of precast edge beams and two-storey columns. Within the inner core of structural walls is a rectangular lift shaft of in situ concrete which, together with the inner core walls, takes up wind loads. Precast stairway units carry the loads from the ends of the floor slabs and the landing slabs.

Loads from the inner core and outside columns are gathered within an in situ combination ring beam and slab at the first floor. The ring-beam portion is triangular in section, 5 ft. 6 in. deep at the apex, and transmits loads to a pile-cap ring beam below the garage floor level through seven in situ concrete walls 14 in. thick. The lift shaft is supported on an independent piled foundation within this ring beam.

The outer ground-floor deck, serving as a pedestrian area and a roof for the garage area, is of radial and ring beams carrying a 4 in. slab, all cast in situ on 12 in. diameter round columns supported on individual column footings independent of the main foundations. A flexible sliding joint between the deck and the ground-floor slab takes up any movement due to expansion or shrinkage of the deck.

At roof level are two 2,500-gallon in situ concrete water tanks carried directly on the lift shaft, which also carries loads from the lift motor plant.

The curtain walling is largely glass. Glazing in the kitchens and sitting rooms runs from floor to ceiling and is carried by precast concrete mullions; where solid infill occurs it is of rendered concrete blocks.

In finish Point Royal is a powerful, almost uncompromising, example of exposed concrete. In general in situ concrete finishes have been left as struck from either rough board or wrought formwork. Within the internal lift halls on upper floors the vertically board-marked finish has been bush-hammered, muting the effect to a degree and providing a hard wearing surface less liable to defacement. All precast concrete elements were cast in wrought formwork.

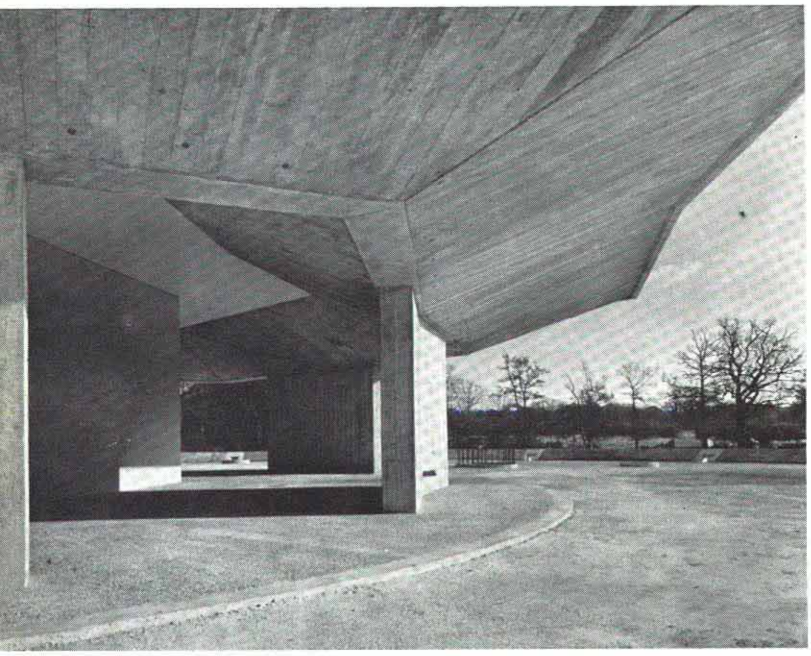
Detailing of the external precast concrete – columns in particular – is carried out in such a way that long unbroken vertical surfaces are avoided and rainwater gathered every two storeys in order to control weather-staining to a degree; the sockets of the two-storey columns are designed to act also as catchments, diverting rainwater to the perimeter balconies where it runs through drop-holes from floor to floor before being caught at the first-floor level.

The choice of the hexagonal shape was a practical one, as being the most economical way of doing the job. In this it achieves something of the structural economy found in cylindrical point blocks like Chicago's Marina City, but without the complications presented by the circular layout and with the bonus of a visually more interesting form. Use of the hexagonal layout, too, has made it possible for all rooms requiring standard furnishings – the bathroom, kitchen and bedrooms – to be made rectangular on plan. In each of the 102 flats only the corner sitting room is wedge-shaped. The floor plan is the same on each storey: four one-bedroom flats, one bed-sitting room and a double-bedroom flat achieved simply by taking what would have been the bedroom in the adjacent bed-sitting room flat.

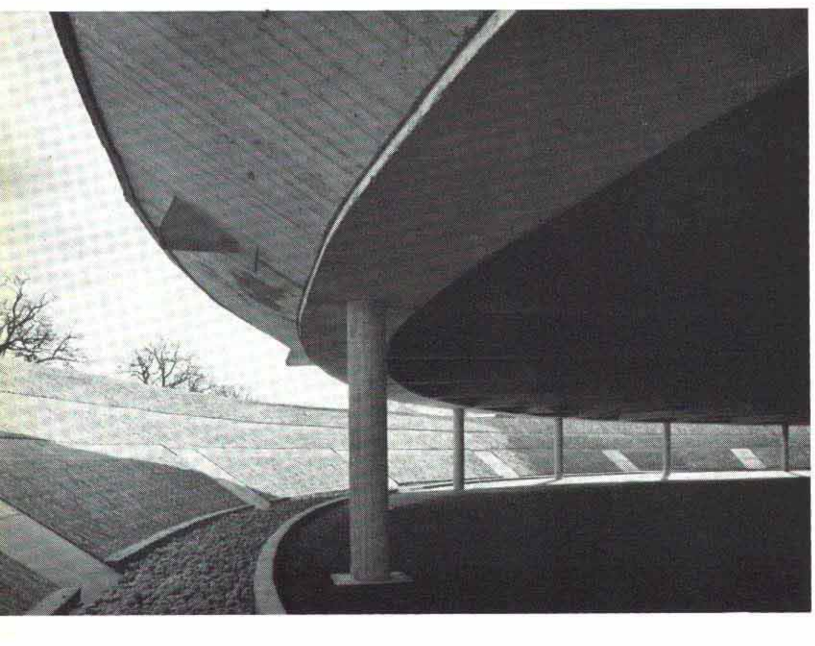
Unusual in a point block is the fact that the floor plan of individual flats extends inside the structural core; the bathroom and hallway are within the load-bearing core walls. Around the perimeter of each floor is a narrow fire-escape balcony with access to the stairwell by doors with single-side latches. Two passenger-operated lifts are provided, each serving alternate floors for economy, and services are carried in three vertical ducts, each serving two adjacent flats on each floor.

Point Royal has been specifically designed for single tenants and childless couples – basically the young executives and scientists drawn by the town's industry which leans heavily toward electronics and precision light engineering, and by the Meteorological Office. Partly with them in mind covered car parking is provided for one car per flat. Rents vary with the size, exposure and height of the flats, ranging from £181 for a first-floor bed-sitter to £363 for a top-floor flat with two bedrooms, inclusive of rates and garage space.

Arup Associates were the architects, structural and service engineers and quantity surveyors for the scheme, with Philip Dowson, A.R.I.B.A., as architect in charge. The chief architect for the Bracknell Development Corporation is E. A. Ferriby, A.R.I.B.A., A.M.T.P.I. The main contractors were Pauling Construction Limited.



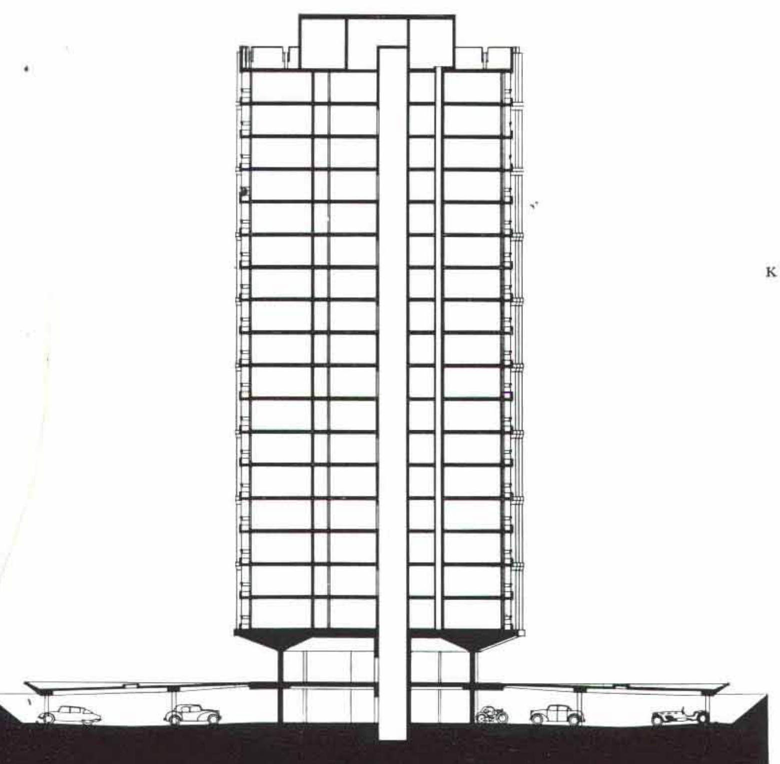
Left, above: The massive triangular-section ring beam at first-floor level carries core and peripheral loads down to 14-in. slab columns.



Left: The flare of the ring beam is repeated in the parking area walls and the board-marked lip of the ground-floor deck.

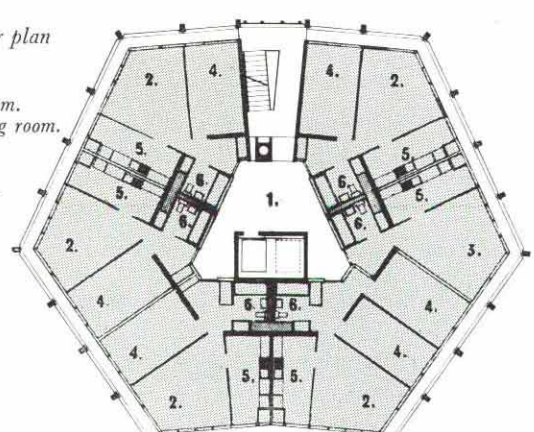
Cross-section showing main triangular ring beam and sunken parking area. ▶

The hexagonal block stands apart on a tree-dotted rise.



Typical floor plan

KEY: *1. Lift hall.*
2. Living room.
3. Bed-sitting room.
4. Bedroom.
5. Kitchen.
6. Bathroom.



A prestressed concrete bridge

over the Seine at Choisy-le-Roi,

near Paris

A BRIDGE of precast concrete with *glued* joints? Ridiculous! – or so it might seem if such a bridge had not just been built. The use of 'glue' – high-strength epoxy resin adhesive – as a jointing material between precast sections of the hollow box deck girders is the most interesting feature of the new highway bridge at Choisy-le-Roi, close by Paris's Orly airport. Even apart from that the bridge is an outstanding example of current bridge design and construction in precast concrete. Last September members of the Prestressed Concrete Development Group visited the site and had a chance to see for themselves.

The bridge, which replaces an existing bridge carrying National Highway 186 (now being improved as part of the future Paris outer belt system) over the Seine, has been built on the free-span method, in which successive sections of the concrete deck beam are built and progressively prestressed symmetrically outward as cantilevers from the bridge piers without the use of centering. Many other examples, with spans up to 400 ft., have been built in situ; one of the most impressive is the Bouguen bridge at Brest, 145 ft. high and 684 ft. long. The bridge at Choisy-le-Roi is unusual in having been built from precast components on the same system.

The bridge will carry two 23 ft. carriageways and a pair of 13 ft. 6 in. pedestrian and cycle paths, as well as a median strip.

The bridge is being built as two parallel structures. The first phase of construction includes only the downstream half, adjacent to the existing bridge; the second half will be built only when traffic from the existing bridge has been diverted to the downstream portion and the old bridge demolished. The two parallel structures are quite independent with respect to vertical deflections and possible differential settlement, and rest on separate piers. A centre connecting slab 4 ft. wide, however, joins the two halves and is prestressed to them along a pair of continuous longitudinal hinges. As a result the decks behave under horizontal load as a very stiff beam 93 ft. wide – particularly important in the event of accidental collision with a breakaway river barge or floating débris during flood season.

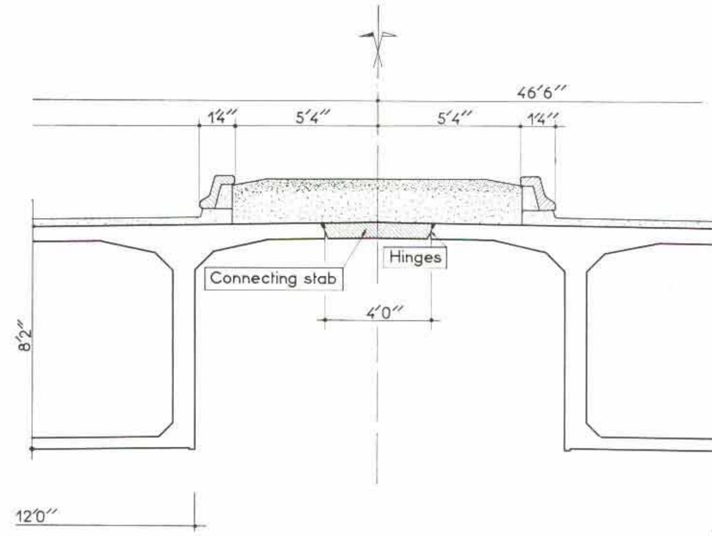
Each of the four piers consists of four slender inclined concrete slabs, two to each beam. The four slabs are prestressed to a rectangular column with its top three feet below normal water level and supported on tubular steel piles filled with concrete.

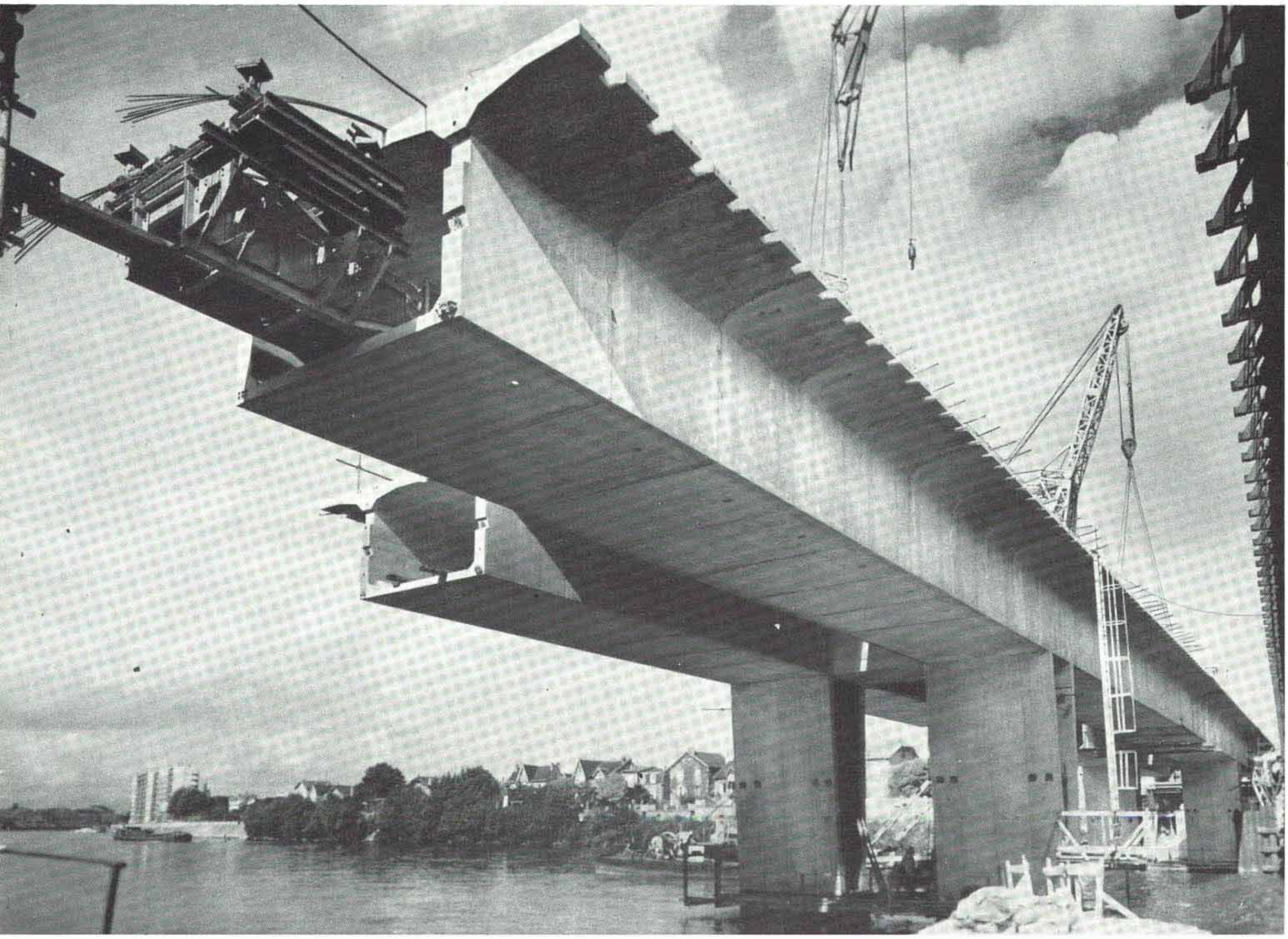
The pier slabs were precast and prestressed vertically to the foundation. Temporary bracing of the slabs to resist horizontal moments during erection of the deck was provided by a steel framework which was subsequently embedded in a massive concrete block projecting beyond the piers to provide protection against collision. The piers were erected in a sheet-piling cofferdam designed to be re-usable for each of the four piers.

Each half of the bridge deck consists of two identical hollow box beams 8 ft. 2 in. deep and 12 ft. wide over the webs, the top flange cantilevering outward to a total deck width of 20 ft.

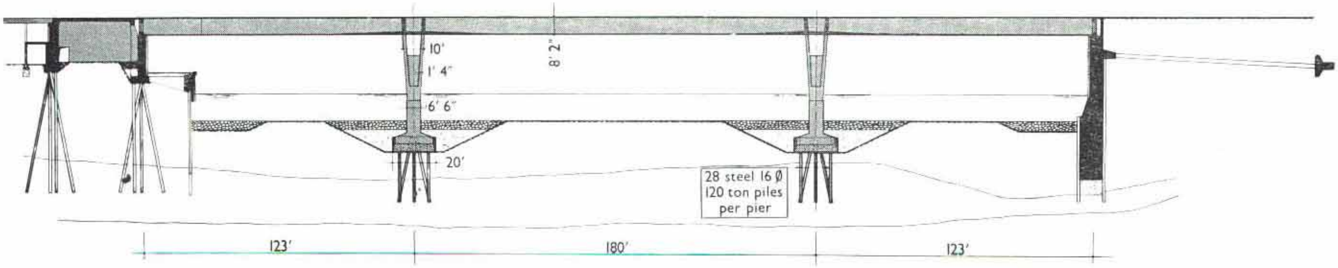
Construction was based on the use of precast voussoirs fabricated in a yard on the bank of the Seine a mile upstream from the site. A special 16 ft. section weighing 52 tons, with transverse diaphragms for prestressed connection to the piers, was first placed on the inclined slabs and adjusted to exact height and

Detail showing the hinged slab connecting the two parallel structures.



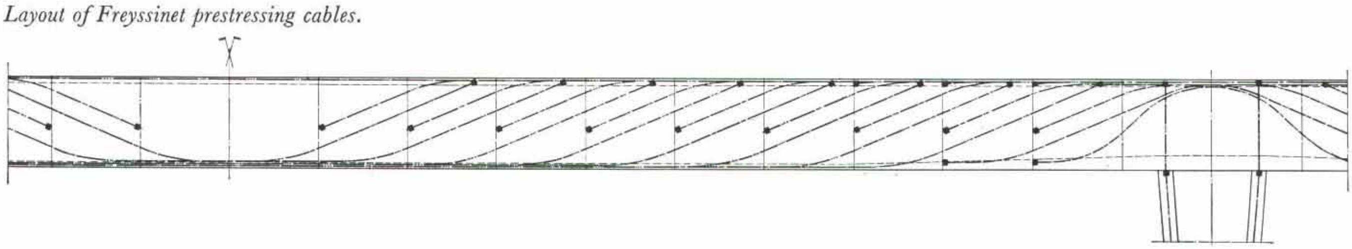


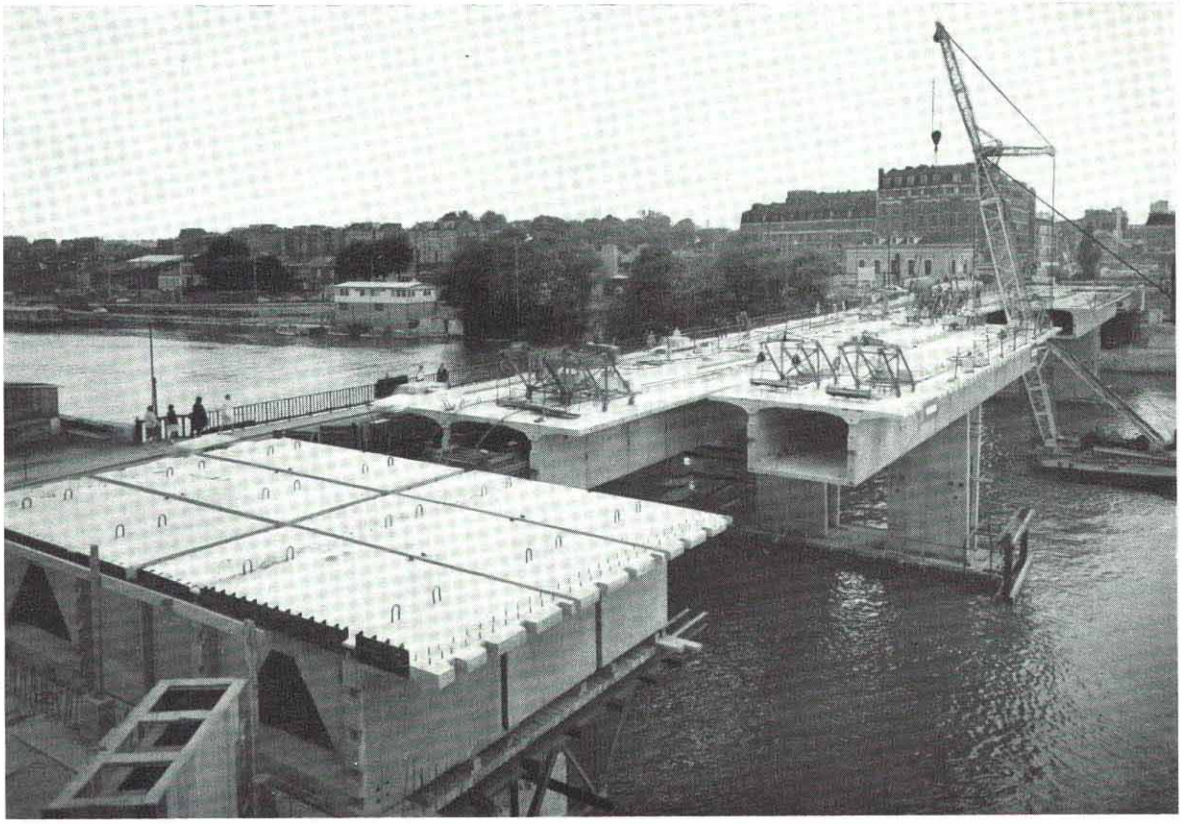
Precast 20-ton deck sections are held by a retractable jig during epoxy jointing and prestressing operations.



Longitudinal section showing details of the piers and pile foundations.

Layout of Freyssinet prestressing cables.





The downstream half of the bridge under construction; the existing bridge in the background will be demolished when this first half is opened to traffic and will be replaced by an identical structure.

A PRESTRESSED CONCRETE BRIDGE: *continued*

angular position. A floating crane was used to load the 8-ft., 20-ton voussoirs on to barges, and also in erection.

A special travelling jig rolling inside the box beam was used to position the voussoirs. With the voussoir placed by the crane and adjusted to position, the jig was rolled back into the completed structure to hold the new section in place for the application of resin and then retracted to complete the joint. As each pair of voussoirs was placed the sections were prestressed to those already in place.

Use of an epoxy resin bond only about 1/32 in. thick called for extreme accuracy, and to achieve it each voussoir was cast against the previous one over a continuous soffit adjusted to the intrados profile, a peel-off resin film being applied to allow for separation. This resulted, in effect, in the casting of 'continuous' beams which were then dismantled along cold joints and re-assembled on site.

The original decision to use epoxy resin for the joints between precast elements was the result of a desire to reduce both site work and erection time to a minimum.

The engineers and contractors, Entreprises Campénon Bernard, carried out beforehand an extensive programme of research on the behaviour and properties of epoxy resin joints between concrete components. Compressive and torsional shear tests were carried out on test cylinders of pure resin to determine the limiting capacities of epoxy proper.

Shear tests on actual joints between concrete prisms were also made to determine the influence of the type of resin, the temperature of application, the preparation of joint surfaces (rough or smooth), moisture on the joint surfaces, age of the joint, and transverse compression perpendicular to the shear plane (to simulate the effect of prestress in the actual structure).

The resin finally selected appears to be suitable under all site conditions. Application can be made without special precautions at temperatures above 40°F. and the resin develops an appreciable strength only 10 to 12 hours after application. Transverse compression was found to improve the quality of the joint and as a result voussoirs were prestressed together immediately after application of epoxy to the joint. Prestressing is by the Freyssinet system, using cables of twelve .315-in. wires prestressed to 52 tons; prestress was applied step by step as the cantilever arms were extended.

Tests showed that at the maximum shear stress probable joint movement would not exceed .005 in., and the completed bridge is expected to behave like a conventional cast-in-situ structure.

A NEW, WHITE, GUARDS' CHAPEL

has risen from the ruins at Wellington Barracks

BY 1944 raids on Britain by piloted aircraft were pretty well a thing of the past: the flying bomb was the weapon of the year, screaming through the air until it cut out into the more sinister silence that preceded its fall. And on a Sunday morning that summer, in the middle of a service, a flying bomb landed directly on a full church, wrecking the building and killing 121 worshippers and their priest. So the Royal Military Chapel at Wellington Barracks, London, was destroyed, with only the apse left standing in the ruins.

There is now another chapel on the site, incorporating the old apse, but in all else entirely new. It is an austerely simple building – a white catafalque touched lightly with black – grave memorial to the tragedy of twenty years ago.

Wide shallow steps from the Parade Ground lead to the portico across the west end of the chapel, which is entered by three fine double doors of simple bronze strips enclosing glass. The doors lead directly into the narthex of the basilican church, separated from the nave by a three-tiered open-arched screen of Portland stone, beyond which stretches the austerely white rectilinear chapel. Narrow vertical slit windows of clear glass, striping the whole lower half of the north side, light the interior. The south side is punctuated by a series of embrasures, each a small chapel for an individual regiment of Guards, with a simple slab altar set before a wall engraved with the regimental badge and battle honours, and lit by angled, clear glass slit windows to ground level.

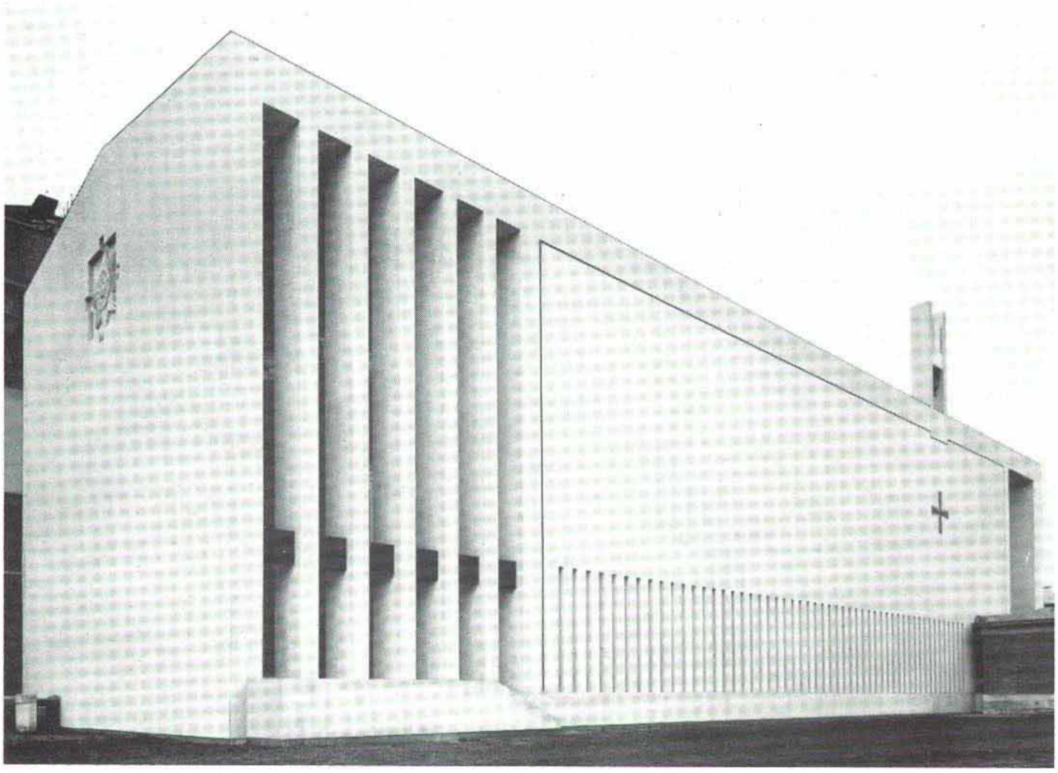
The plain white walls lead the eye forward to the two high-placed side screens of black aluminium – abstract sculpture of horizontal bars overlaid by curiously menacing forms – and at the end there blazes the unexpected gold mosaic of the old curvilinear apse, lit and shining.

The new chapel stands, substantially, on the foundations of the old. It is constructed with a reinforced concrete frame, infilled with brick. A reinforced concrete portal frame at the east end of the nave stabilizes the surviving chancel arch and relieves it of all additional load, while providing transverse strength to the eastern end of the building; the massive outer wall of the west portico provides the transverse strength to the eastern end; bronze flying stays between it and the chapel's west wall provide transverse strength to the latter. Transverse wind forces are transmitted by the steel roof trusses to these two stabilizing members.

The building is rendered externally with 'Granitex', a beautiful white 'scraped texture' rendering incorporating white cement, mica and white marble aggregate. A plinth of Portland stone encircles the base. Internally the walls are generally covered with a roughly applied white plaster, except where Portland stone is used, as a plinth, and in the regimental chapels. White marble frames the arch of the apse and, allied with black marble, forms the beautiful pulpit (the gift of H.M. the Queen and members of the Royal family), the lectern and the low chancel wall. The roof of the chapel, and the choir walls and stalls, are formed of warm-toned Columbian pine; the simple pews are afrormosia, cushioned in blue.

Externally, one is conscious of the slim vertical lines of the fenestration – the narrow glass side windows down the north wall, and the tall, full height slits at the apse end and the west portico. The nave windows are filled with clear glass, and inside contribute to the simple rectilinear impression of the whole chapel, unbroken until one reaches the shining intricacies of the apse. The only colour in the building, apart from this apse mosaic, is the late Victorian glass which also survived (it had been removed before the bombing) and is incorporated in the window which forms the greater part of the west wall – glass without great richness of colour, and small-scale in pattern but, in

The scene after the bomb fell, in June 1944.



The austerely simple form of the new chapel, faced with gleaming white exposed-aggregate rendering.

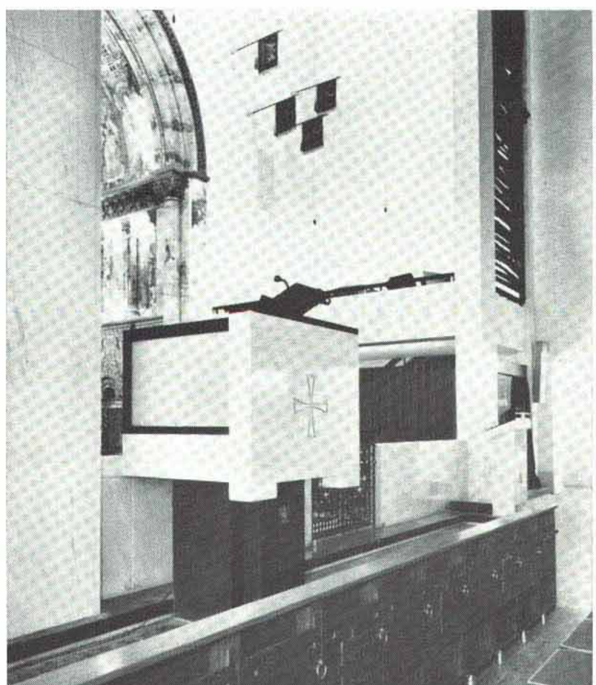
Opposite: The interior, with the original colourful apse incorporated in the new chancel.

Opposite, below: The white and black marble pulpit and lectern, with the musicians' gallery above.

Looking towards the narthex and the entrance. Original glass has been incorporated between the concrete mullions of the west window.

the context, the better for that.

These two reminders of Victorianism have a certain incongruity in the setting of the entirely modern chapel, but their inclusion is justified on sentimental grounds and, in the case of the apse, by the consummation which its colour and brilliance bring to the memorial quality of the rest of the work. In the body of the church contrast comes from the regimental colours set high on the north wall – frail pre-Waterloo colours, colours which had been carried at Waterloo, and others newer, but no less glorious, all blackened, and many tattered with age.



The new chapel was dedicated by the Archbishop of Canterbury in November 1963, in the presence of the Duke of Edinburgh. The architect for the work was Bruce George, A.R.I.B.A., of George:Trew:Dunn; the consulting engineers were Scott and Wilson, Kirkpatrick and Partners, and the contractors Dove Brothers Limited. The artist responsible for the two aluminium grilles was Geoffrey Clarke, A.R.C.A. – perhaps best known for his 'Crown of Thorns' at Coventry Cathedral.

The independent Memorial Cloister at right angles to the chapel was built in 1955 to the design of the late H. S. Goodhart-Rendel.

Great Library, Royal College, Nairobi —

folded plate roof, striding brises-soleil and exposed aggregate finishes

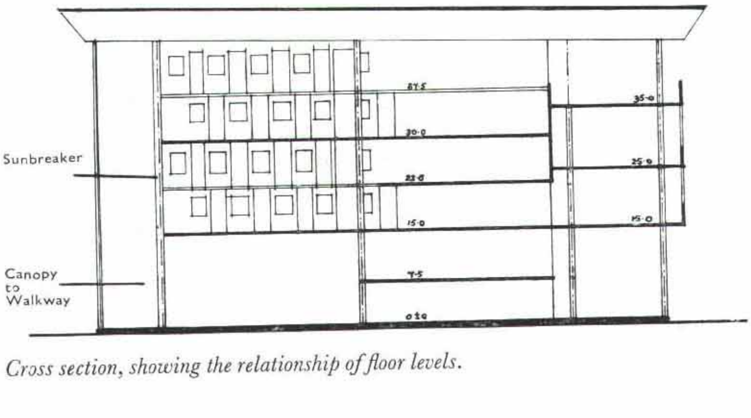
THE MULTI-RACIAL University of East Africa comprises three colleges: Makerere (Uganda), the new University College, Tanganyika, and the Royal College, at Nairobi in Kenya.

The Royal College, Nairobi, is being developed from the 200 students of the old Technical College to the present 500 of both sexes; later the numbers may reach 2,000. It comprises a series of buildings set in pleasant, attractively landscaped grounds enlivened by forest trees and sculpture, the planning of which is in the hands of the English architect Anthony M. Chitty, F.R.I.B.A. In view of its having grown out of the old technical college, the bias of the studies at Royal College is at present distinctly practical: buildings so far completed include science blocks, a hydraulics laboratory, engineering departments, buildings for architecture, surveying and domestic science, as well as residential accommodation and dining halls for staff and students; eventually they will also include a Faculty of Arts block, veterinary schools and special institutes. The heart of this linked group of buildings, set on one side of a large grassed quadrangle, is the new library block, designed by Hening and Chitty, architects, with Ove Arup and Partners as the structural engineers; they were associated with a team of local architects, engineers and quantity surveyors.

Great Library, a "multi-purpose shell", is intended ultimately to become a national library, housing 508,000 books – a number that it is planned to reach in several years time. Meanwhile there is a good deal of space to spare which is wisely being used for a variety of other purposes and this multiple use has made necessary a high degree of flexibility in the design. The upper floors are already in use as examination halls, seminar rooms and other accommodation; the section which will ultimately become a school of librarians at present houses the Faculty of Arts, whose building will not be started until later this year.

The library is rectangular on plan, with an internal well up to the third floor level. It has been designed to provide not only the usual bookstack and readers' areas, accession room, offices, etc., but also a fully equipped bindery. Of the 50,000 sq. ft. of floor space, 21,000 sq. ft. is allocated to the bookstack, 15,000 sq. ft. to readers' rooms, and 14,000 sq. ft. to offices and other accommodation. In general, the bookstack and offices occupy one side of the building's long rectangle, and reading rooms and the open well the other. At the north end of the building a series of 'carrels' – small post-graduate lock-up study rooms – is provided; these are cantilevered from the main structure, staggered on four levels. Within the building, students' circulation is by the staircases, which are placed at each end of the block, and staff and book movement by the two 6-person lifts.

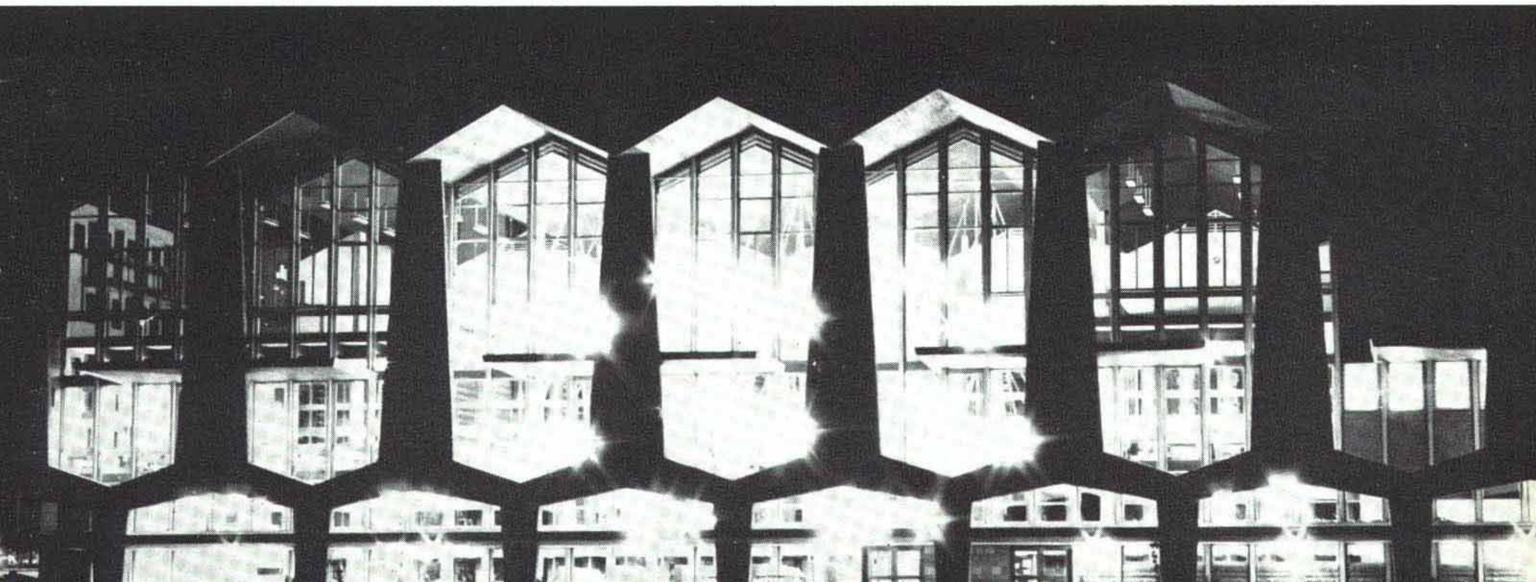
The building is constructed with a reinforced concrete column and beam frame, solid reinforced concrete slab floors and a concrete folded slab roof. On the west side the standard columns are replaced by a series of 9 in. by 6 in. cruciform concrete mullions. On this side, too, special attention had to be given to shading from the glare of the sun, and to this end the folded roof slab projects 15 ft. beyond the façade line of the building, and a system of sun breakers is provided. These are both horizontal and vertical: horizontally, they are 12 ft. shelf-like projections mid-way up the height of the building, and vertically, a screen of in situ concrete wall-column brises-soleil, standing forward from the main façade and linked, at first floor level, by a deep zig-zag beam that echoes the line of the folded roof. Structurally these members provide support for the roof overhang and the horizontal brises-soleil.



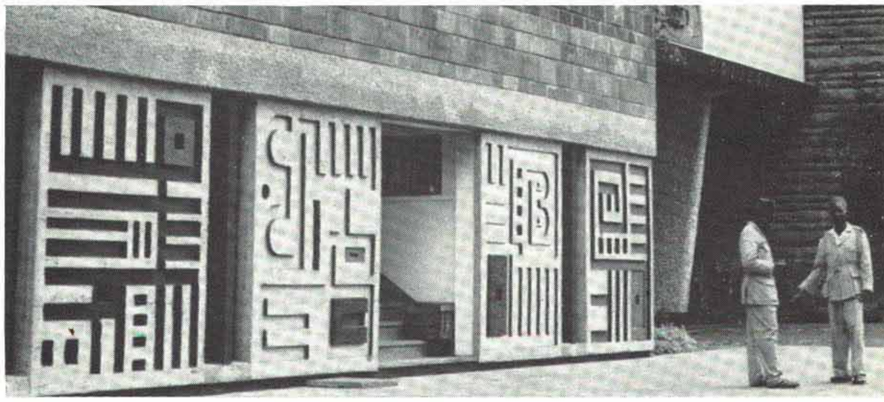
Cross section, showing the relationship of floor levels.

The façade of the library block, showing the folded plate roof, and the vertical and horizontal brises-soleil.

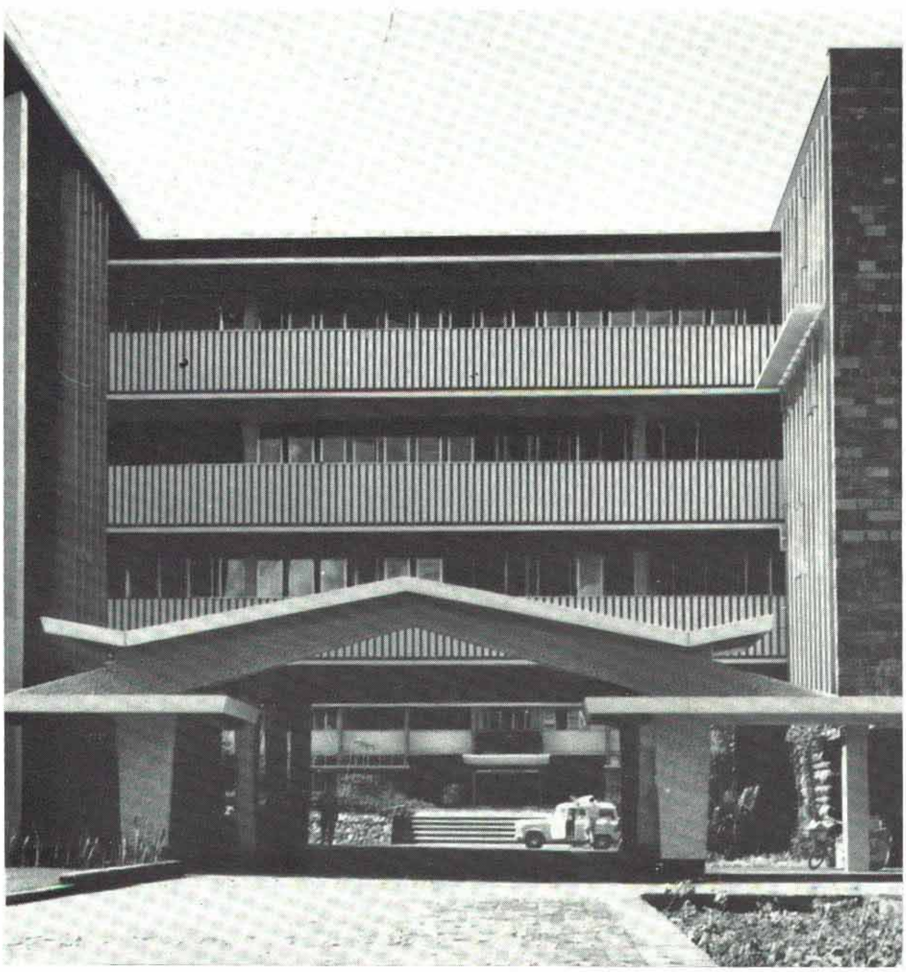
Lights shine out from the library by night.



Below the entrance canopy; the supporting piers are faced with large Kenya marble aggregate. Paving textures have been given particular attention.



Large panels of profiled concrete, subsequently painted, form simple murals at the rear of the building.



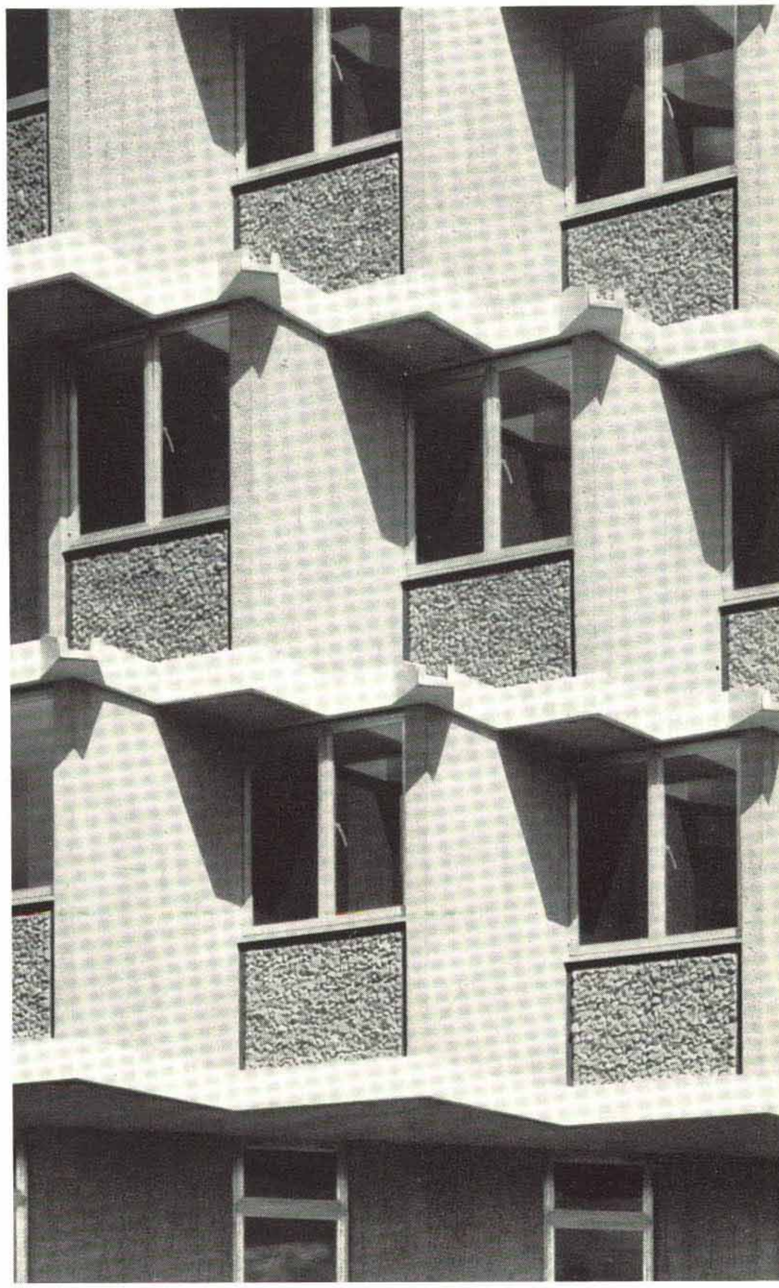
The entrance, with the canopy supported on large concrete piers. The façade behind is faced with narrow close-spaced precast T-units in natural concrete.

In view of the suddenness and intensity of tropical rainstorms in Kenya, gutters and enclosed down pipes have been avoided as far as possible. The folded roof itself acts as its own gutter, falling slightly to one end where the water is thrown off by projecting precast gargoyles. Similar gargoyles placed at the head of the open down pipes on the east side of the building supplement these should extra outfall become necesary (five inches of rain can fall in an hour).

Surface finishes throughout were chosen for maximum economy and absence of maintenance, but are nevertheless extremely effective. The large vertical brises-soleil have a facing of applied chunks of Kenya marble – a white, sparkling, quartz-like stone – set in white cement. Elsewhere another local stone, the dark grey 'black trap', is used as large exposed aggregate; precast panels below the windows of the carrels make use of this finish, as do the projecting two-storey-high vertical panels that face the east side of the building, contrasting, in both these cases, with the pale grey of the natural lightly board-marked concrete. Elsewhere, narrow precast T-section panels of natural concrete are used as facings – the stem of the T faces inwards and the flanges, not quite touching, have the recess behind painted black to provide contrast. Another external material used as an infill to the reinforced concrete frame is the red-grey local stone, langata.

Internal finishes are equally carefully studied and equally simple and economical. The structural columns are all exposed concrete, bush hammered and painted with clear cellulose; ceiling soffits are similarly concrete as left by the forms, which were lined with hessian to soften the line of the joints. The metal bookstack units, made with a beautiful precision of finish, were obtained from Copenhagen.

The building was started in January 1961 and completed in May 1962, including College offices over the gateway and stage improvements to the adjoining assembly hall.



The 'carrels' which form a zig-zag pattern on the end of the building, have exposed aggregate panels below the windows, and interesting gargoyle rain spouts at each floor level.

Photographs pages 31-33 by Nicholas Chitty

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