Architecture is a pragmatic art. There are many people involved in the building process, many possibilities inherent in the problem itself, many ways to arrange the spaces, to marry the building to its site, and techniques to construct it. Design is really a tool. It is a means of integrating and resolving the inevitable conflicts that range from public/private to socially acceptable/commercially viable in order to reconcile the artistic aspects of making a building with cost, time, and quality control. By trying to optimize all the givens within a consistent framework of values upon which design decisions are based, we hope to arrive at a whole which is more than the sum of its parts.

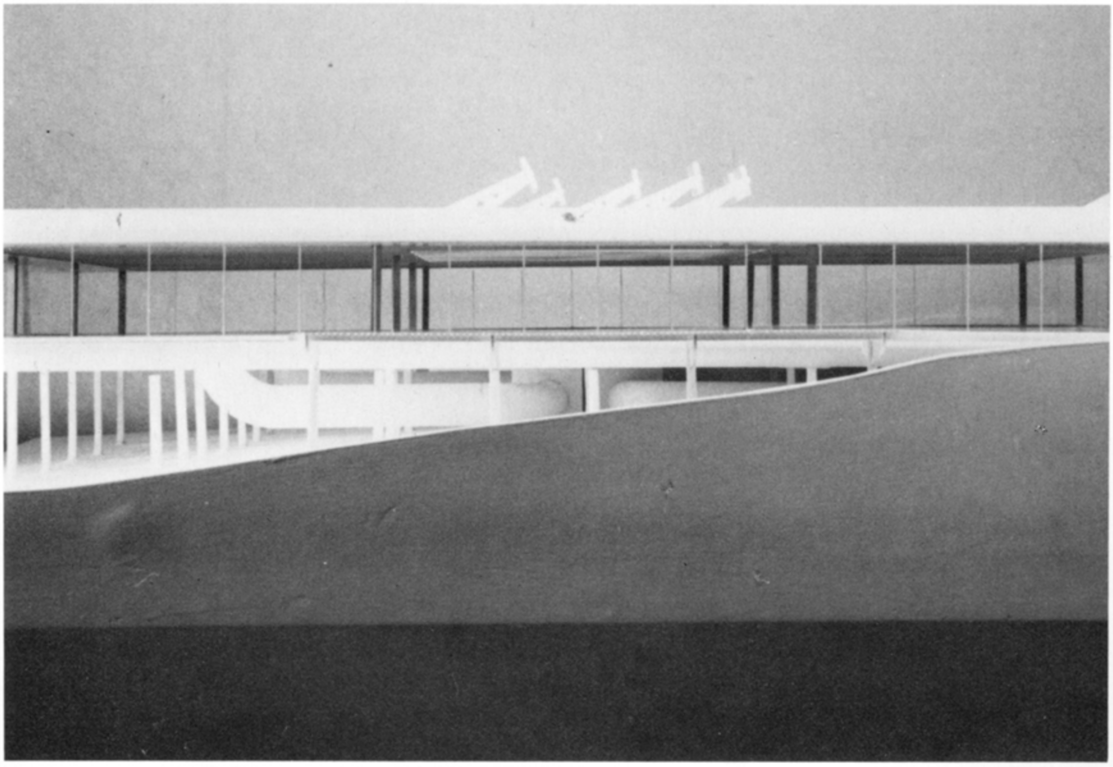
Tantamount among our values is a conviction that we can utilize and develop new technologies for social ends. It translates into a process of probing to determine the requirements of the users, which is both an inseparable part of the design approach and a means to question preconceptions and propose alternatives. For instance, a research project for the Spastics Society was concerned with the special problems posed by severely mentally and physically handicapped children. Research into existing buildings showed traditional toilets, despite extreme incontinency common to such children and the physical and psychological difficulties posed to the staff. In a prototype school pioneered by the Spastics Society with the Inner London Education Authority, toilets were completely reinterpreted as a glazed central area with low screens for the children's privacy, but good views for the staff onto the adjacent teaching areas and the garden court beyond. By pulling all the ventilating air through this space, there were no problems of smells or need for lobbies. (A larger scale version showing the same principle of pressurizing spaces was used in the Willis Faber Building to incorporate the restaurant and pool into a continuous three-story, two-acre volume.) At a detail level the problems of heating and lighting such buildings were quite challenging when we realized that some children could burn themselves on radiators or suffer eye damage when staring up into bright light sources without being able to summon help. The successful resolution of these and other problems enabled better utilization of teachers who were able to make more time available for the real priority: the children's therapy.

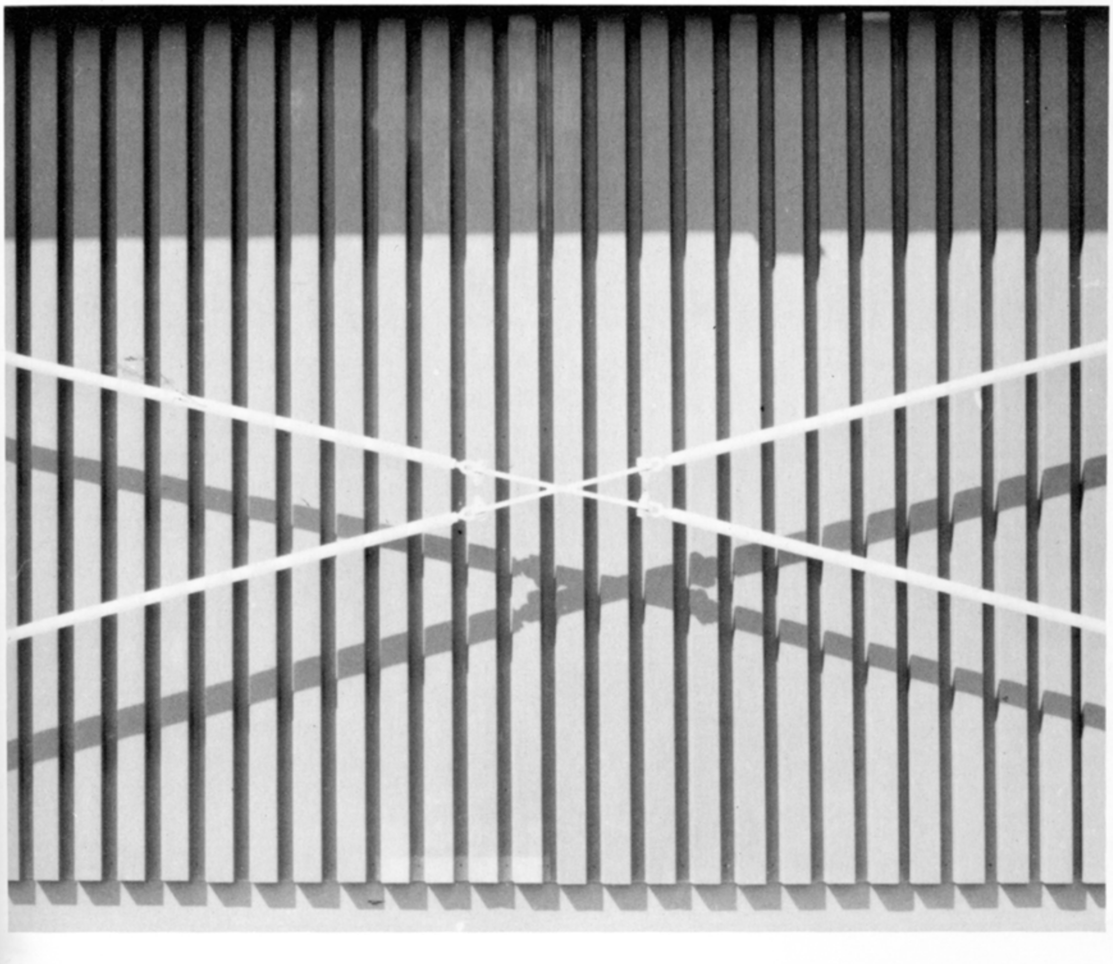
The structure for the Palmerston Special School for Handicapped Children pioneered by the Spastics Society provides generous spans over open-planned flexible space with minimal means.

In addition to an attempt to fit the building optimally to its program, we are concerned with responding positively to the site context. Our early houses have very low profiles dug into their hillside sites to minimize their visual impact on the surroundings and merge with them; one Cornwall house is virtually buried beneath its sodded roof. In contrast the Vestby "offices in a forest" project responds to its context by lifting the building off the ground. It sits on undercarriages of steel stilts in an attempt to conserve the Norwegian forest and protect it from the usual ravages caused by the contractors' activities. Lightweight components, easily transportable through forest trails or moved by helicopter to more remote locations, can be bolted together quickly with the minimum of fuss by small teams. This approach includes concepts of low energy to drive the building. To get the most from the low sunlight, mirrors are to be used to bounce light into the heart of the building in order to burn off the waste snow that would accumulate on the building's north side. Similarly, utilization of the cold water at the bottom of the fjord is a viable alternative to high-energy air conditioning. Furthermore, paper, sewage, and water can be recycled to avoid polluting the fjord with human waste.

We have taken sympathy with the context a step further in our constant preoccupation with interior orientation—particularly natural top light and the liberating qualities of transparency. This idea was transformed in our first houses into open plan spaces, with changing levels and lots of skylights always orienting to the view outside; by the time we got around to the Willis Faber Building it became an office landscape surrounding a skylit winter garden.

We have also been interested in flexibility in buildings as a way of resolving the conflicts between public and private, the community and the individual, and short-term and long-term re-



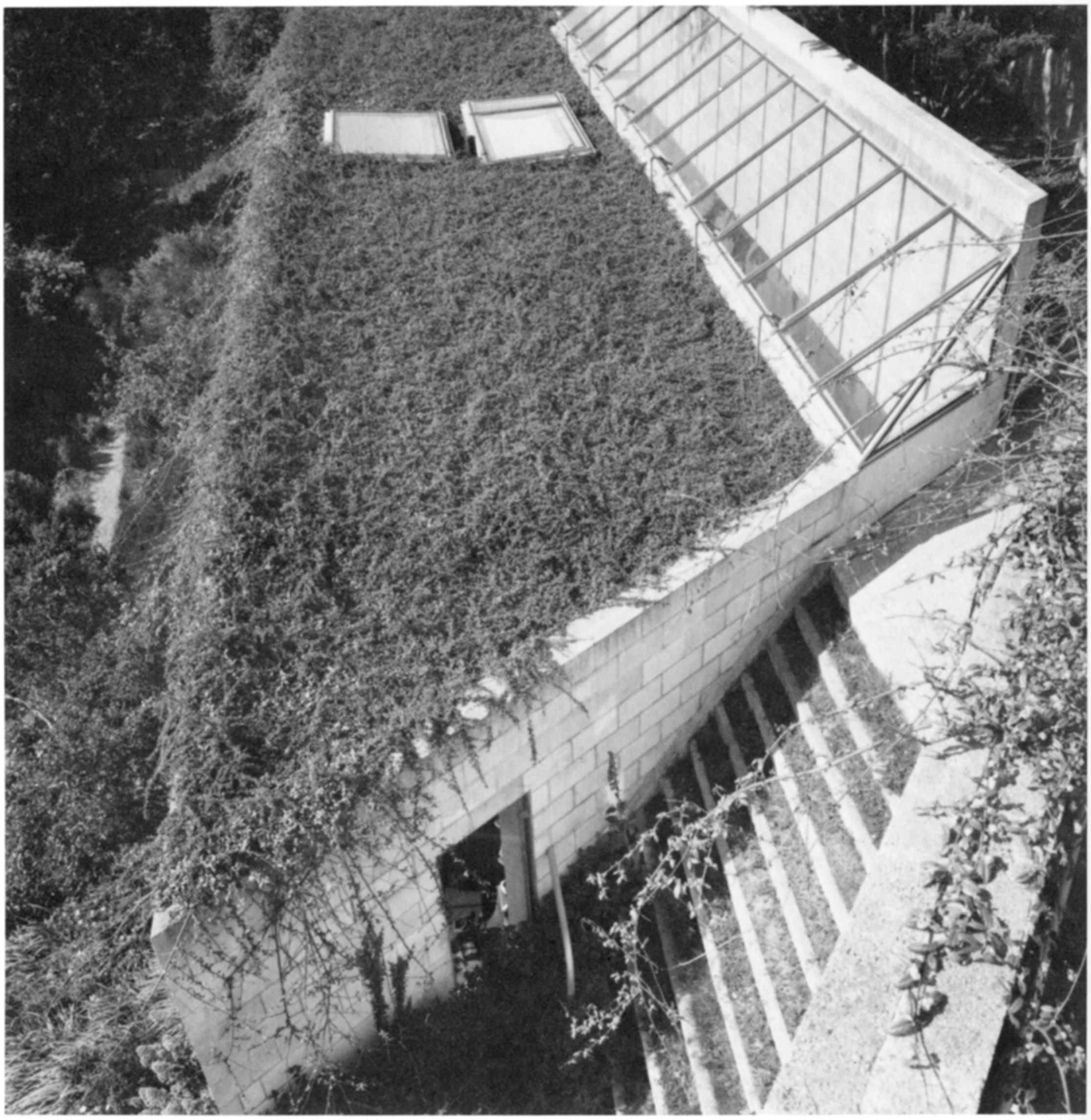


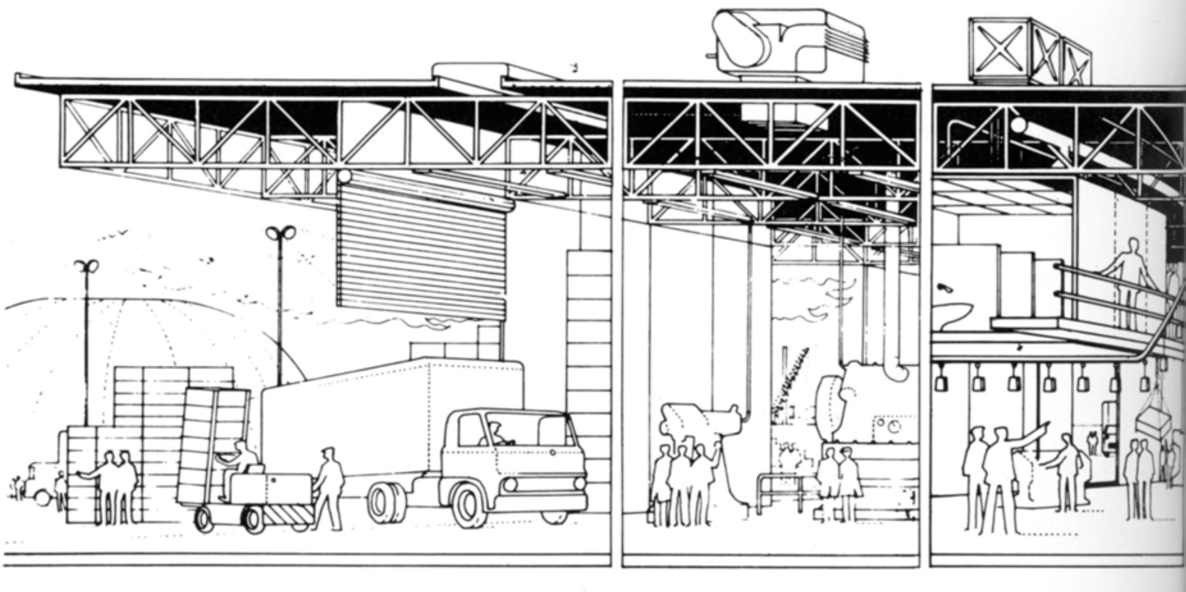
Top: The project for Vestby "offices in a forest" attempts to minimize intrusions on the site, so the building is lifted off the forest floor.

Bottom: Elevation detail of the Reliance Controls Factory; this was the first building where we developed ideas about the integration of services, structure, and skin.

Right: This Cornwall house with its sod roof is dug into its hillside site as a way of blending it with the setting.

Below: This research project shows the potential for multilevel spaces within an umbrella enclosure. It is now being realized in built form as a technical park for IBM at Greenford near London.





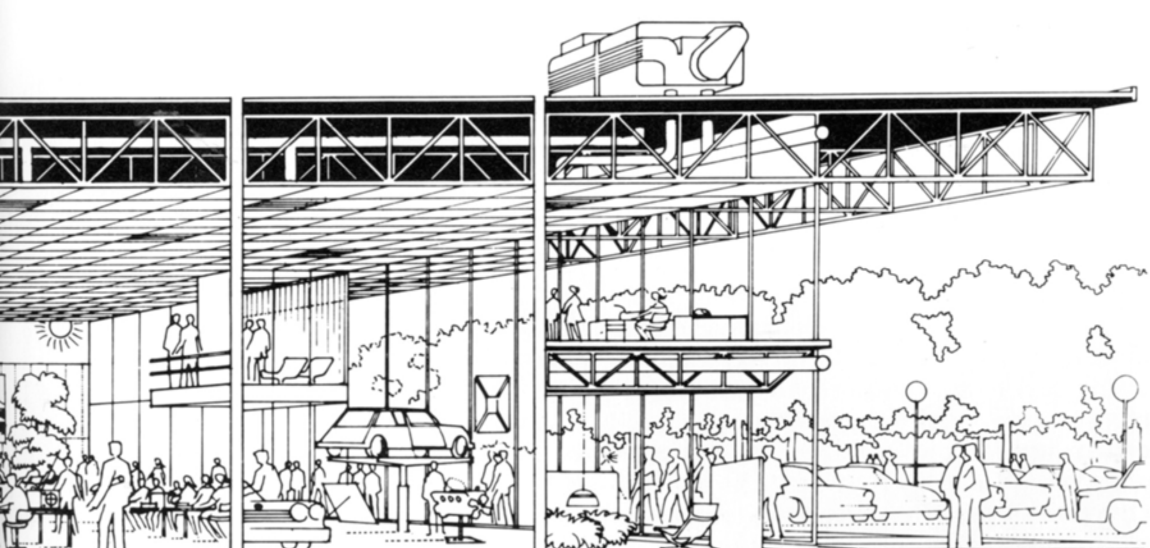
quirements. Flexibility for choice, change, and growth has its problems as well as its bonuses. In the end it means resolving and integrating such conflicting requirements as servicing and structure, heating, lighting, and cooling. It led us to a series of multiuse umbrella buildings such as the Reliance Controls Factory. There a pavilion form was chosen since its inbuilt democratic implications of everybody being on the same plane as everyone else were considered more socially appropriate for a clean, rapid growth electronics industry in the 20th century than the usual workers' shed and management box, with its overtones of "we and they," "clean and dirty," "posh and scruffy," "back and front." Technically, such a form also offered a logic for dealing with limited time and money, as well as provided the potential for quick and easy changes. Whenever possible, elements had to do double or even triple duty; for example, the metal roof profile acted as a lighting reflector for recessed fluorescent tubes in addition to serving structurally as a stiff diaphragm.

Towards an Appropriate Technology

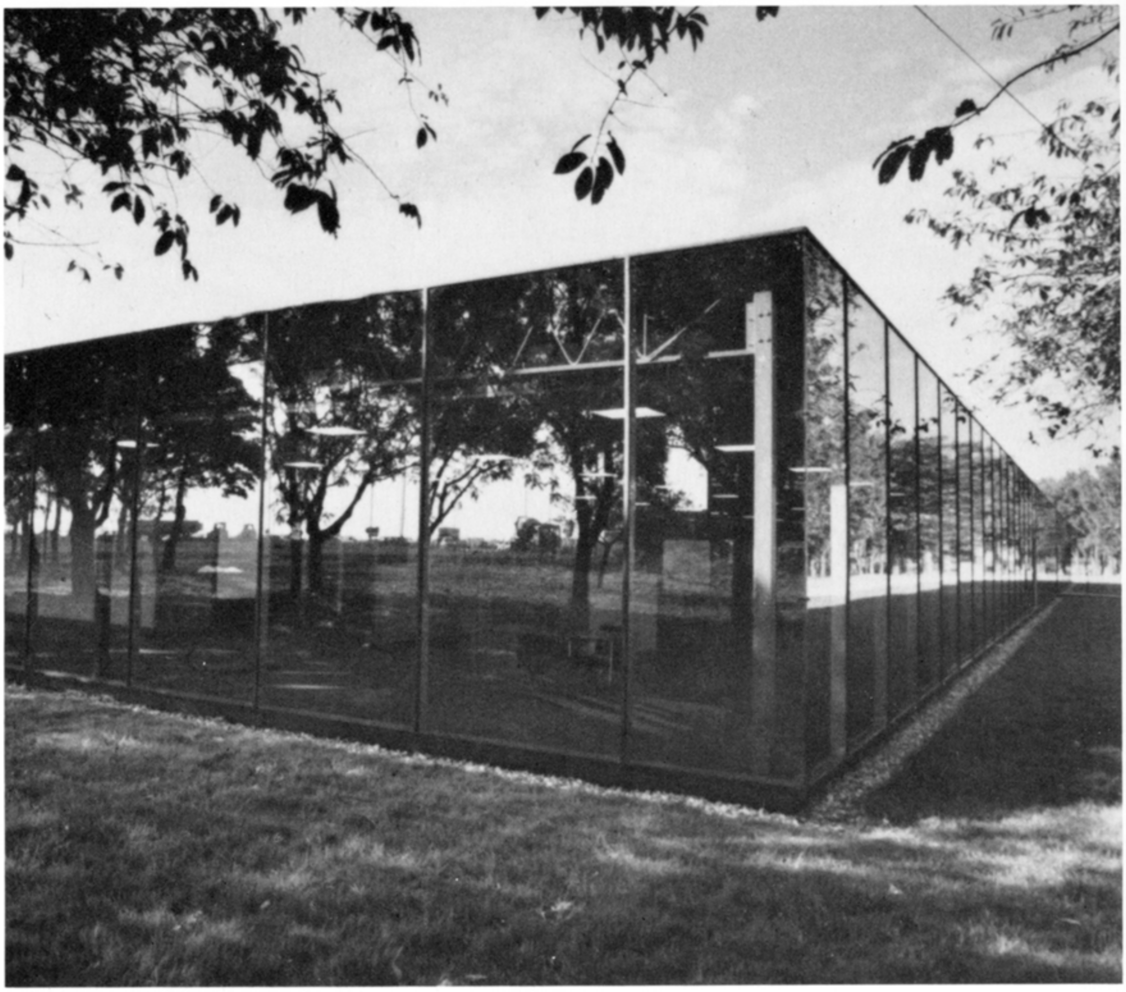
The Reliance Controls Factory marked a turning point in our attitudes toward materials. While the early houses were all built partially out of traditional materials and partially out of industrial components, we were becoming increasingly disenchanted with so-called traditional materials, their anachronisms, and the problems of quality control posed by the breakdown of craft traditions. In one early house, the Creek Vean Waterfront House built in Cornwall, we attempted to combine blockwork with structural gaskets. Quality control usually consisted of condemning areas of blockwork to be slavishly rebuilt. Even the "locally matching" blocks were a charade as they had to be freighted from Liverpool, some three hundred miles away. Trying to build this way left us in no doubt about the shortfalls and labor-intensive indulgencies involved in so-called craft trades. Which left us searching for a way of making buildings exclusively out of dry components.

We did some research into a kit-of-parts approach for educational systems that produced interior layouts which would be responsive to dynamic change within an infinite variety of plan forms. Essentially, these were highly integrated, lightweight service umbrellas, developed with a strong awareness of the performance specification design approach and integrated umbrellas of the concurrent California Schools Construction Systems Development.

Later, this approach was incorporated into a project for IBM in which a wide variety of functions were grouped under one roof, rather than the traditional collection of diverse buildings, in order to maximize flexibility and optimize the use of space. Initially, the building housed pilot main office functions such as computers, offices, amenities, and a communications center, but has since been in a constant state of flux. Since the program was never fixed, things are still being moved around eight years later; the canteen has changed its location several times, the entrances have been shifted three. The schedule was so tight (less than a year for design and build) that IBM assumed that an "off-the-shelf" timber building would be the only answer. The budget had been set accordingly at around half the price of a tradi-



The pilot main office for IBM unites all the separate functions into one umbrella, similar in spirit to the Reliance Factory.



tional permanent building. IBM had about half of its British operation in such temporary structures and the remainder in permanent buildings (its statistics are similar to those of the Los Angeles school system), which tells a great deal about the constant of change. Within such constraints, the only solution was an integration of essential dry systems, which could be likened to an erector set. Ironically, this has produced a permanent building, as now defined by the owners' and city building authority's terms of reference.

Perhaps our most minimal exercise in serviced space was the air-supported office for Computer Technology. The structure was environmentally engineered to enable 80 people to work throughout the year in conditions more comfortable than the standard factory shed to which it was attached. This was the first application of an ultrathin membrane enclosure for sedentary activities. The erection time was under an hour, and the kit-of-parts approach enabled interior systems to be installed in less than a week. The structure was eventually removed to provide a parking lot for a new multiuse permanent building, which utilized gasketed aluminum and foam sandwich panels derived from the automotive and insulated container industries. This and the later Modern Art Glass project with its wrap-around cladding were related to component developments for the Sainsbury Center.

With the kit-of-parts approach, the building becomes an integration of systems rooted in social and technical research. In its traditional sense, this includes the structural, mechanical, and electrical. In its broadest it includes the filigree of interior systems involved with the flux and change of movement and activities. The links between research and practice are close and aided by continuous model studies at varying scales, from full size mockups of rooms to testing programs for prototypical components.

In 1968 Buckminster Fuller approached us to collaborate with him on his first English project, the Samuel Beckett Theater, which eventually took the form of what could be best described as a submarine under an Oxford quadrangle. This collaboration expanded into a wider partnership which continues to pose radical alternatives to

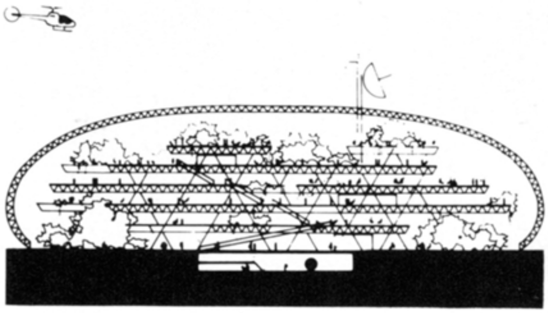
Top: The erection of the bubble of this air-supported structure for Computer Technology took about an hour and the entire construction sequence a few weeks.

Bottom: This pneumatic structure, later resold, provided virtually rent-free accommodation for a year.

Right: During the development of the Willis Faber scheme, we were collaborating with Buckminster Fuller and discussed some of the Willis Faber design problems; he suggested radical alternatives which led to this research project since called Climatroffice.

Far right, top: The challenge with the Willis Faber + Dumas Building was to find a form which was appropriate for both the company's activities and its market town setting. During the day the glazed facade reflects the surrounding buildings.

Far right, bottom: The section shows how the skylit wintergarden opens up the inside of the building.

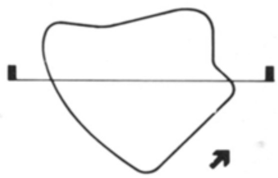


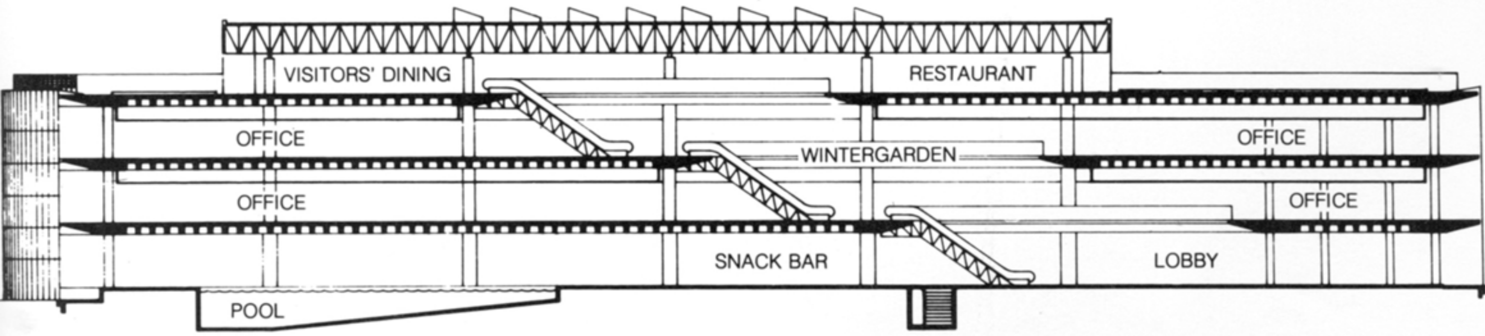
conventional built form. For example, the Climatroffice project was projected at the time of the Willis Faber scheme and shows the potential for grouping a mix of existing buildings and new activities under an all-embracing structural skin to create a total microclimate.

Both the Willis Faber and the Sainsbury Center are interesting as recent examples of our design philosophy and as culminations of the last 15 years of work. Both are made completely out of industrial components. Both are umbrella structures taken beyond the ordinary factory-plus-office combination in a way that maximizes the social amenities and the standards offered to the people who have to use the building. More than anything else, technology is only a means. While in no way underestimating the importance of such means, they are, after all, means and not ends in themselves. The ends are social, generated by people rather than building hardware.

Willis Faber + Dumas

Willis Faber + Dumas, a large international firm of insurance brokers whose coverage has run the gamut from the Titanic to the NASA moon buggy, wanted a typical office, a paper factory. The challenge was to produce something better than the kind of Dickensian squalor in which they seemed to exist. In a fundamental sense, the building is really about the concept of people and their workplace. Our preoccupation with standards in industry and commerce was rooted as much in research into the work process as in an interest in social change and a sensitivity to the proportion of time spent in the workplace. We placed an emphasis on raising standards and providing amenities to attract the most talented, competent people and to keep them happy enough with their working conditions so that they would be highly productive in their jobs. Consequently, the two office floors were sandwiched between a host of amenity facilities: swimming pool and coffee bar, gymnasium and restaurant. The roof is virtually a glass restaurant pavilion set in a landscaped garden. All




VISITORS' DINING
RESTAURANT
OFFICE
OFFICE
WINTERGARDEN
OFFICE
OFFICE
SNACK BAR
LOBBY
POOL

At Willis Faber all floors are connected and penetrated by a vertical movement space. This center of gravity in the building is important both functionally and symbolically.

floors are connected and penetrated by a vertical space containing banks of escalators, palm trees, and daylight from generously glazed skylights. The proportion of amenity area to work area is high, especially if the near acre of roof garden is included in the equation.

Emphasis on the workplace and related standards is best expressed by a virtual about-face from the traditional office building. There, typically, standards are highest for the visitor and gradually lowered until you reach the user—for example, entrance lobby areas have finishes and fittings that gobble up the top slice of the funds and reflect a total disparity with the working floors.

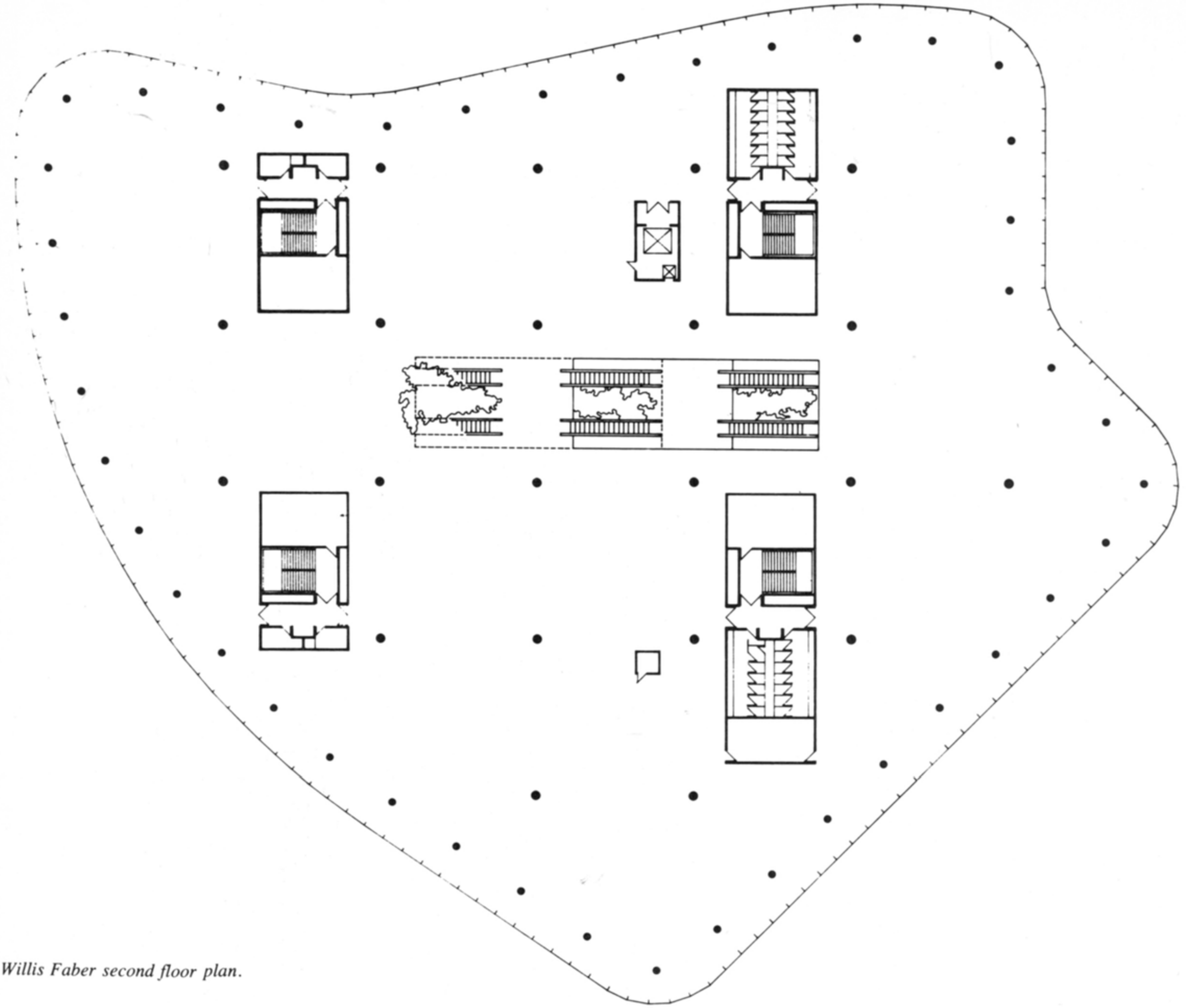
The reverse is true at Willis Faber. The entrance is an exposed concrete structure (enlivened with emulsion paint), studded rubber (the same as in the boiler room and lavatories), and demountable metal partitions (like everywhere else). This compares with carpet, custom-designed ceilings, and glare-free light fixtures throughout the two office floors. There is no question of a reaction against fine finishes; it's merely how you define priorities and reflect them in the allocation of fixed resources (i.e., money). Usually, the workspace is ''out of sight and out of mind,'' bypassed by the grim anonymity of elevator cars and the drab monotony of corridors—orientation is the elevator floor, the button you push, the number on the door. Here the reverse is everywhere apparent. Movement is open, literally in the sun, and social contact is natural and relaxed across the spectrum of the company. Orientation is immediate; you always know where you are. The barriers are few and seldom visual.

Management, establishing an ''open door'' approach in their original quarters, is here reflected by a virtual absence of doors. The planned cellular office for the deputy chairman was lost en route in the design process, and the ''Directors' Dining Room'' became a piece of furniture design to separate a part of the main restaurant. Even that has now become a visitors' dining room. The kind of spaces described are in no manner fixed for the future. Indeed, the acoustic and lighting technology which enables them to work at present also provides the flexibility for them to be adapted to quite different patterns.

The plan form and cross section are a response to the need to weave a large new building into the edge fabric of an historic town. The key factor was to adopt a very low, deep building, which enabled us to equate an economically feasible content with a low profile. There were other spinoffs as well: fewer larger floors provided more efficient space utilization, greater flexibility, and far lower energy consumption. Further, by pushing the building to the limit of the site boundaries, the original street pattern was reinforced.

The building is the outcome of a team approach in which the key was to shift the traditional roles of those concerned with designing and fabrication. For example, many activities were streamed in parallel during the early stages of the project. Research into the program and the inner workings of the company proceeded concurrently with studies into energy optimization, preliminary planning, and construction possibilities. This was essential on a crash program: two years of feverish design and building activity with a minimum construction period. During the complexities of demolitions and utilities diversions, the architects were more involved as management consultants than as practitioners of any normal design-based skill. A briefing guide was specifically developed to provide insight into the client's organization. In collaboration with the client, a joint management structure was established, which was in direct communication with the board at regular intervals and briefed other consultants as necessary.

Collaboration began so early that it actually preceded the definition and purchase of the site itself. The acquisition pattern proved to be one of the most difficult things to come to grips with. We would be given a site and we would be designing away for it while there would be negotiations for another parcel of land across the street. We would receive a phone call saying that it was almost purchased and could we do a scheme to show how the building would be if we had that part as well, which meant closing the road. So we would do a scheme for that, which would no sooner be finished than the client would be negotiating on the other side of the site altogether and we would be designing for that. We had scheme on scheme on scheme, which lasted a few months until it became apparent that the real estate process was so volatile that it was impossible to reflex quickly enough with traditional one-of-a-kind design responses. Careful analysis of the work study which generated the built form, as well as the ground conditions under the building (which included a high water table and all the continental telephone cable from that part of the country), together with insight into the process of site acquisition, provided the main clues. A uniform 44-foot (13.5-meter) square column grid provided an acceptable cost threshold, related well to office planning constraints, and could straddle such fixed elements as the swimming pool, roads, and loading docks. (In a building which has no front or back, the docks have to be brought inside to respect



Willis Faber second floor plan.

good street manners.) Furthermore, an edge necklace of columns tuned the perimeter to closely follow the lines of existing street boundaries. Once we had the system, the client could play real estate games to his heart's content and even buy up all of Ipswich. It didn't matter.

In addition to anticipating the mechanics of building swiftly and economically on a very tight urban site, the detail development of the structure was strongly influenced by the constraints of the servicing systems. The waffle slab eliminated downturned beams throughout and provided a structure handsome enough to stand in its own right—good for the budget (no need to paste over it) and good for the schedule (fewer trades). In its final form the structure was boiled down to remarkably few elements: a set of interior columns and slab, another set of edge columns, and a cantilever strip.

The structure was the only site-based wet trade. Everything else was shop fabricated for quality control, cost, speed of erection, a belief and delight in the materials of the age, and economy of means. This also meant a shift in roles; if the product was not available ready made (and hardly anything was, in the integrated sense of the word), then we designed one and collaborated with manufacturers to produce it. This meant encouragement to industry where appropriate and frequent use of full-scale tests and mockups. A summary of the history of the glazed facade provides insight into the relationship of the design and the management techniques, which, in our view, made creative aims technically feasible.

The suspended glass wall was a response to the notion that most people are happier being able to see the outside, provided they do not suffer some discomfort as a consequence. In a deep building the effect of large glazed perimeters defining circulation routes is relatively insignificant on energy loads (unlike shallow plans where it makes quite a drastic difference). Also, in deep buildings the proportion of glass has to be generous to ensure that everybody, and not just those sitting closest to the windows, has contact with the exterior. This led to the consideration of several alternate systems that would combine such qualities as transparency with acoustic and solar control. An awareness that glass is at its strongest in tension prompted the concept of a curtain suspended from the top edge of the building. Unfortunately we were unable to convince anyone outside the office that it was technically feasible. For this reason all the interior perspectives of that period show a steel mullion system designed for the project and tested out on a smaller installation in Thamesmead. Eventually, enough calculations and technical details emerged to convince the manufacturers that the idea was not only viable but very attractive on a cost basis, which was hardly surprising since it reduced elements to just glass and glue.

We were more than happy to trade our design know-how for design warranties backed by the manufacturers. This seemed more appropriate to our role as architects attempting a progression of ideas rather than getting locked into the marketing of one specific system. We had always viewed the design process as a vehicle for generating systems that were usable beyond an immediate one-of-a-kind solution. That is why we have put so much effort into researching integrated umbrella systems and kits-of-parts. As for the suspended glass wall, the manufacturers now market it as a freely available system. Through a similar process the studded green flooring, lighting, and escalators have also found their way into the catalogs and trade literature of their manufacturers.

The office floor and ceiling systems had a similar development, attempted in the spirit of integrating normally separate systems. For example, the parabolic light fittings were designed to link with the ceiling and also provide the air supply and return for office areas as well as sprinkler runs and a separate emergency lighting system. This compares with the more usual proliferation and redundancy in separate suspended elements brought together in a kind of on-site shotgun marriage. Likewise the electrical power and telephone lines on the office floors telegraph through the lighting grid above and below. Aware that flexibility is always thwarted by fixed trunking runs and that wet screeds take forever (like plastering, the bottom seems to have dropped out of that particular trade), we searched for viable alternatives. The result is a platform floor system (which is conceptually similar to a suspended ceiling) developed by manufacturers for this project, with continuous lines of easily removable access panels. The goals were speed, cost, appearance, and maximum flexibility in random order; it would be extremely difficult to define a hierarchy at that time or in retrospect.

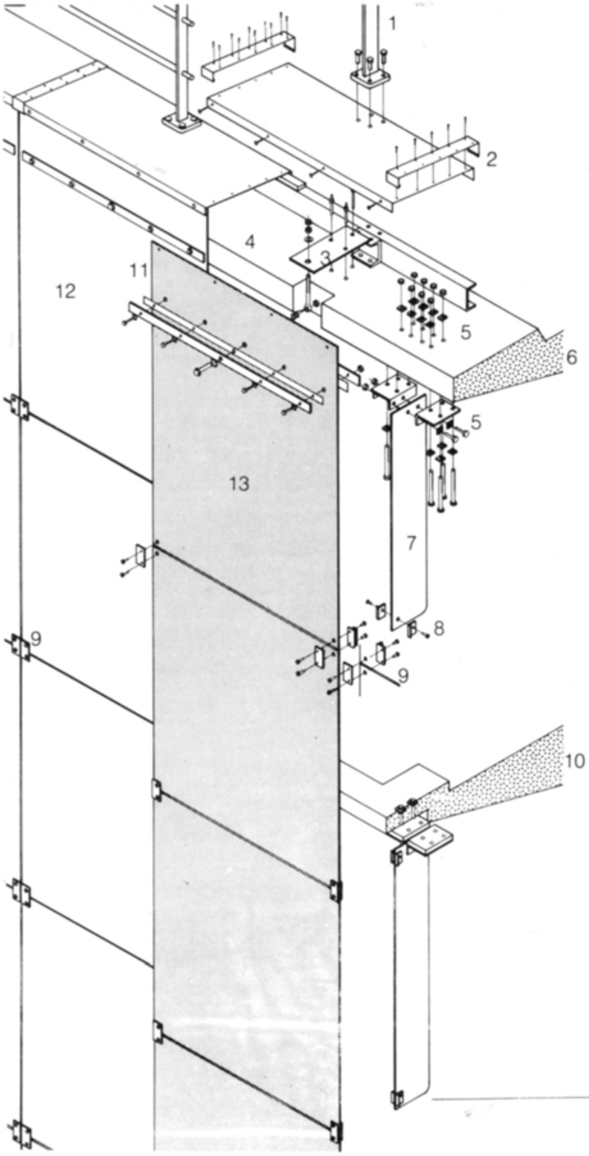
The design development and final definition of facilities and standards were inextricably linked with continuous financial appraisals—quite the opposite of a static program and cost response. A wide variety of options were examined and always related back to a basic yardstick of minimum shell cost. Alternatives were evaluated with particular sensitivity to cost-in-use. The exterior, for example, is virtually maintenance-free: the glass wall almost wipes its own face, and apart from an occasional haircut, the turf roof looks after itself.

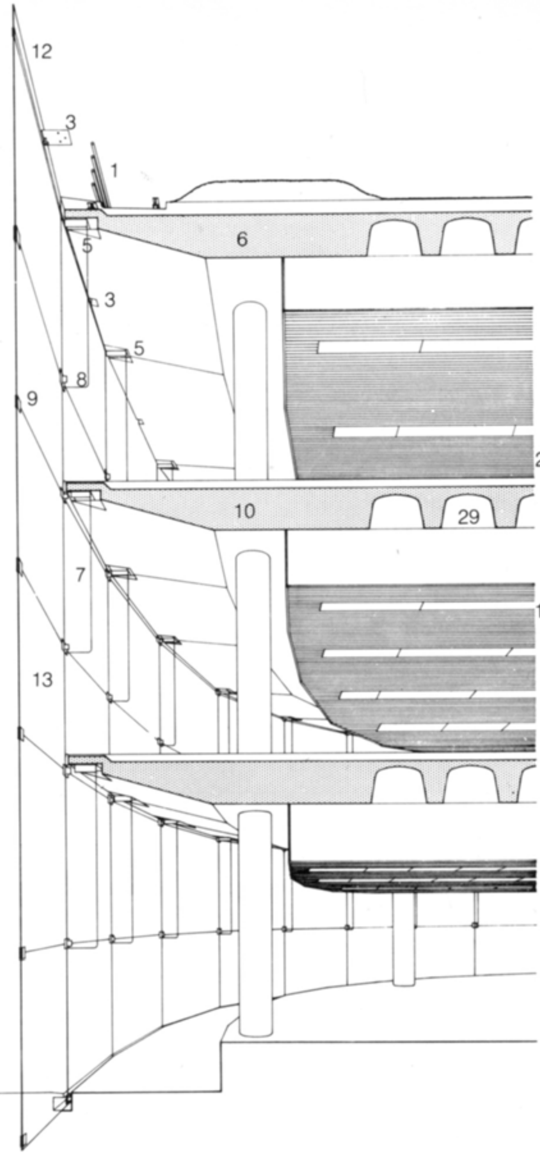
Right: Exploded drawing shows typical Willis Faber glass wall assembly details.

Far right: Wall section.

Opposite page, top: Section perspective through the floor-ceiling sandwich.

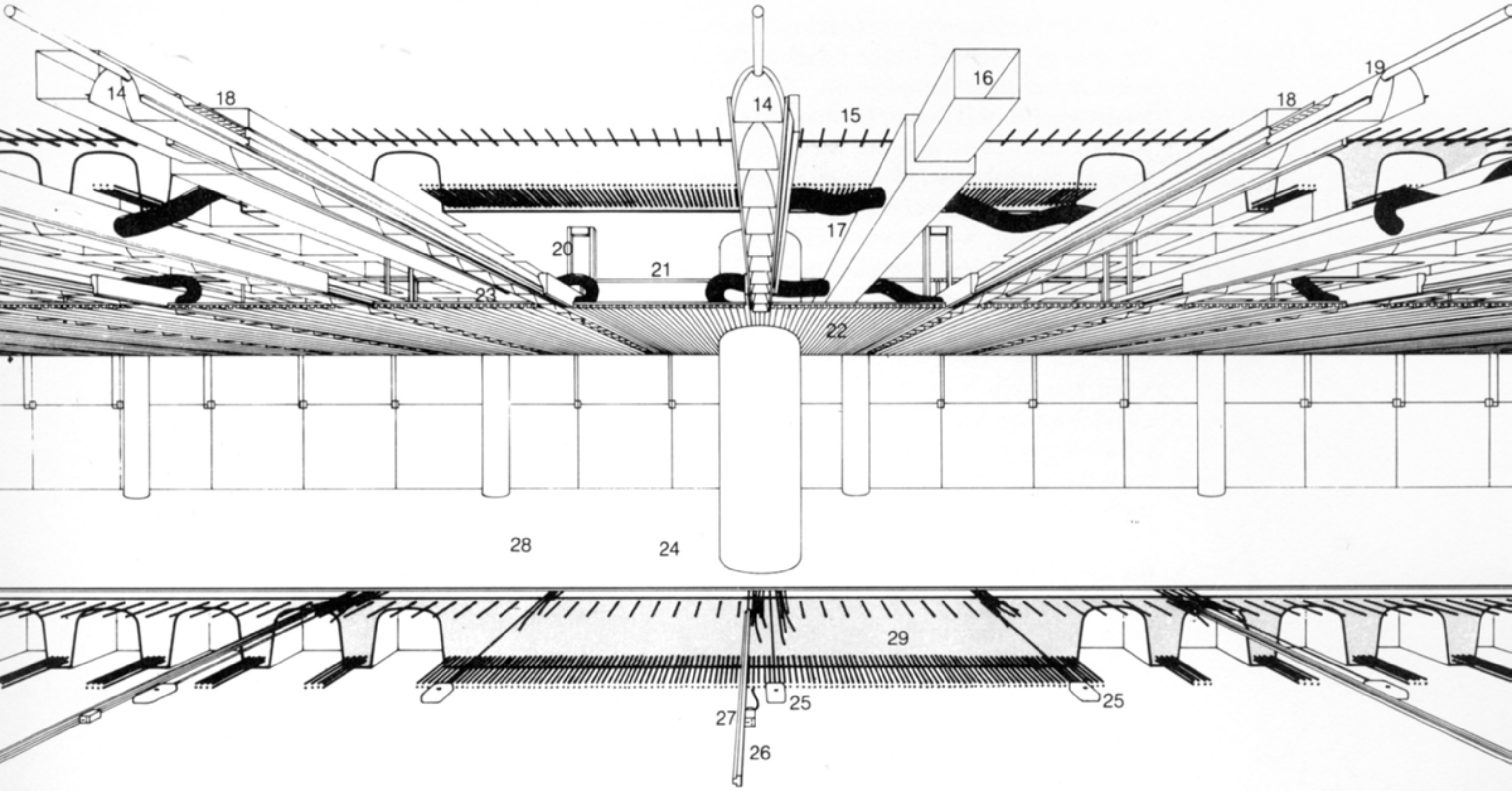
Opposite page, bottom: Typical Willis Faber office space.





Key:

1. *Aluminum handrail support*
2. *Top flashing: folded aluminum sheet*
3. *Suspension bolt supporting plate*
4. *Suspension bolt*
5. *Roof supports for fins bolted through slabs*
6. *Roof slab*
7. *Reinforced clear glass fin*
8. *Patch fitting fin component restrains horizontal movement only*
9. *Patch fitting plate component split vertically to allow differential movement between facets*
10. *Typical floor slab*
11. *Fiber gasket*
12. *Top clamping strip bolted through glass*
13. *Tempered bronze-tinted glass*
14. *Fluorescent light fixture*
15. *Air diffuser*
16. *Main supply air duct*
17. *Flexible air duct connector*
18. *Air return plenum*
19. *Lighting cable track*
20. *Integrated ceiling and light fixture support*
21. *Sprinkler pipe*
22. *Sprinkler head*
23. *Aluminum ceiling channels (acoustic mat above)*
24. *Platform floor*
25. *Telephone distribution box*
26. *Electrical supply track*
27. *Socket outlet connector*
28. *Electrical and telephone access panels in carpet*
29. *Concrete waffle slab*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3

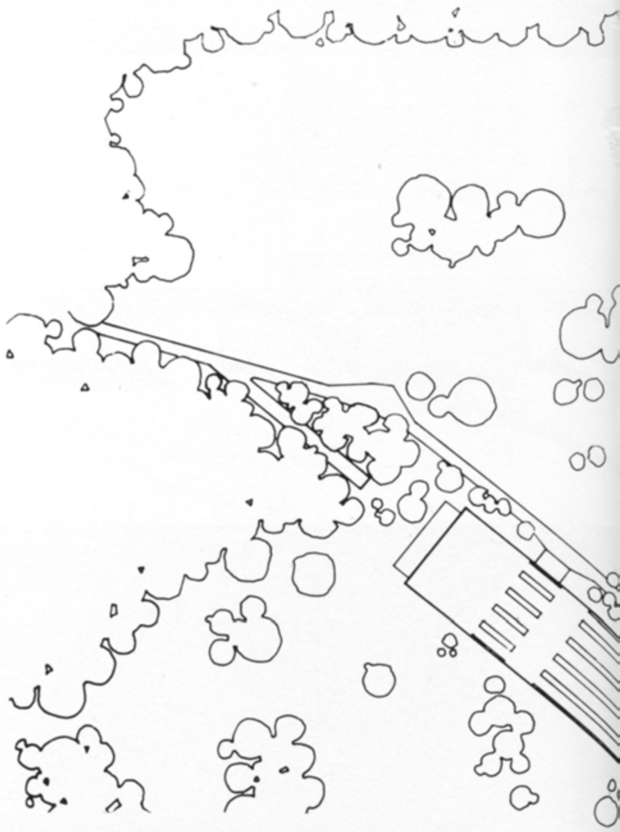
Considerable ingenuity was deployed to minimize the cost of potential fringe benefits and thereby encouraged their introduction. For instance, a landscaped roof is certainly more expensive than asphalt. However, because we made it stronger than we needed, it acted as such a good insulating quilt that the traditional expansion joint across the entire building, with its attendant double rows of columns and piles, was eliminated. This led to increased energy savings. Similarly, we decided to expose the innards of the escalators so that you could see the whole thing working. In the same spirit and as a reaction to an innate dislike of swimming in a washbasin with a rim, we designed a swimming pool where the water level is flush with the surrounding floor. Then there was the problem of what to put in the show window of the insurance company: we decided on a display of all the mechanical equipment.

For financial justification the building had to have sublet potential. The change could be straightforward: the wintergarden could function as a semipublic space used by all office tenants; each floor has four cores enclosing escape stairs and utilities allowing up to four major subdivisions accessed from the interior court; and the mechanical systems allow total subdivision into cellular offices if required.

The Sainsbury Center for the Visual Arts

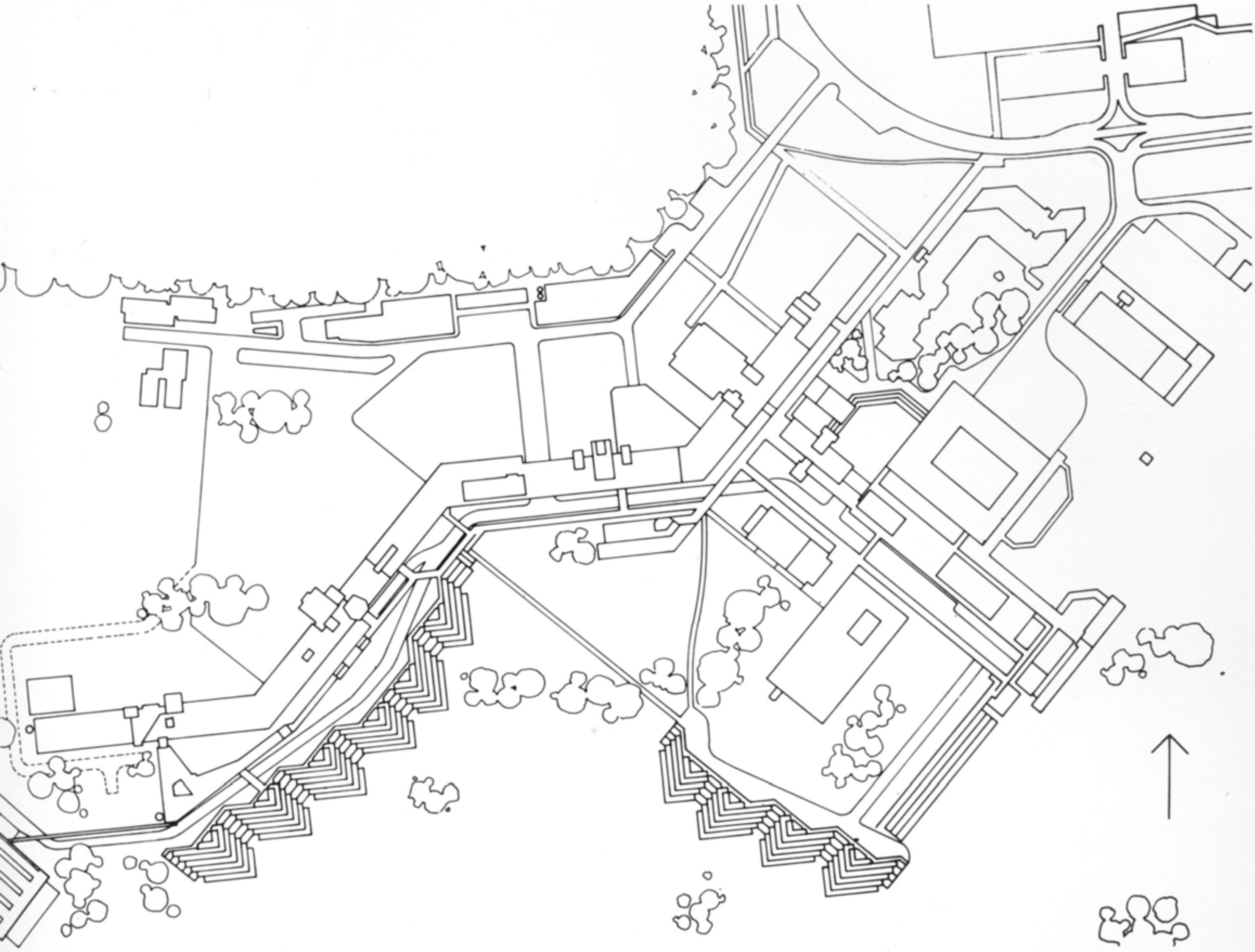
The first meeting with Sir Robert and Lady Sainsbury left no doubt about their attitudes to art galleries. They had an obvious distaste for monuments, a belief that works of art should be enjoyed as a pleasurable aesthetic experience, and the desire that there should be maximum opportunity in a university setting for contact by scientist and art student alike. If such a building could be a meeting place and the gallery could provide a shortcut to academic areas, then so much the better. Beyond these guidelines, the program itself did not exist, and the first joint design exercise was to develop a schedule appropriate to such a project, which, as far as we were aware, did not have a social precedent elsewhere.

The site location was determined by the philosophy behind the project and by research into the university background. The latter was traced from its original green fields through and beyond the masterplan and buildings designed by Sir Denys Lasdun. Future growth was indicated along the lines of the Yare valley, and in anticipation of this, a network of roads, drainage, and utilities had already been provided. Respecting



the valley and setting the stage for the next increment of university growth, it was both logical and economical to literally plug into these existing routes with an overhead bridge to link the existing pedestrian spine directly with the new complex. In the spirit of opening up new opportunities for the enjoyment of art on a broader front and opposed to developing an arts ghetto at the opposite end of the campus, the location next to the scientists was ideal. Another important factor in favor of this area was the potential to relate sculpture to a landscape with fine uninterrupted views to the south and west.

During the initial period a wide variety of existing galleries were researched from the viewpoint of visitors and curators alike, providing a number of broad conclusions which strongly influenced the design of the building. These could be summarized as an awareness of the positive qualities of adjustable natural top lighting, the importance

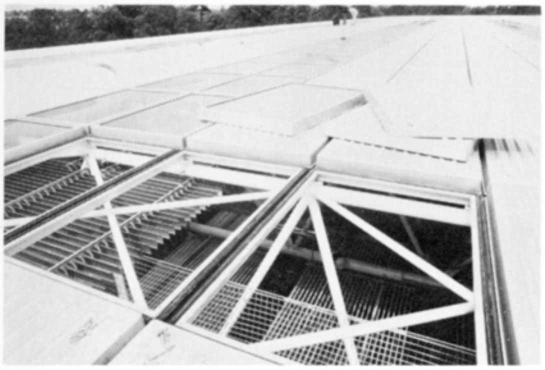


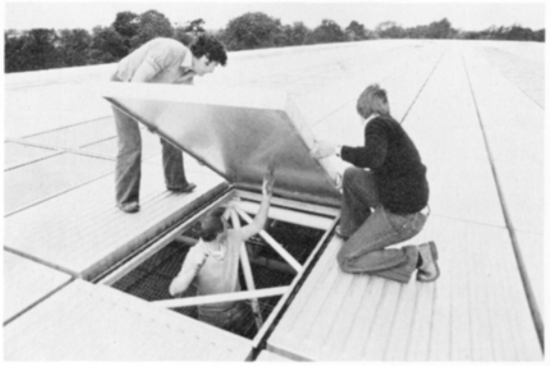
of flexibility for change and growth, the need for good security which was not labor intensive, the value of usable storage space (most museums seemed to have as many works of art inaccessibly closeted away as on display), the need to service a gallery without disturbing either exhibits or users (when changing and adjusting lamps and air filters, for example), a desire to respect and integrate social elements, and a need to see the display and furniture as totally coordinated elements of the overall design.

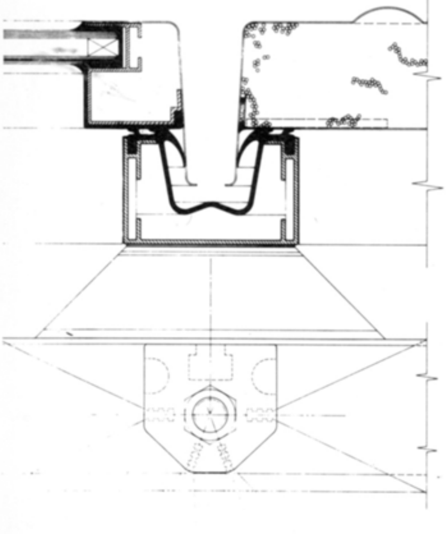
A wide range of building forms were explored to house the activities—the gallery, senior common room, restaurant, and school—culminating in a design which grouped all the functions under one roof, or umbrella, rather than creating a complex of separate buildings for disparate activities. The result is a linear strip which responds to the line of the valley contours and the geometry of Denys Lasdun's original master plan. The close physical proximity of normally quite separate activities (galleries are usually confined to viewing and schools to teaching) offers the benefit of cross-fertilization in the spirit of the original program. A system of internal screens, mezzanines, and conservatory courts provides security, privacy, and social focus as appropriate. In such a plan the gallery also becomes the interior route or shortcut to the school, restaurant, and senior common room.

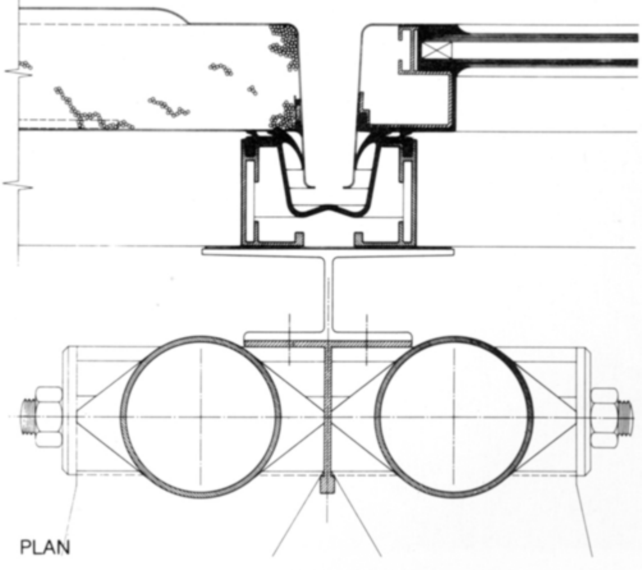
The system of supporting structure and related panels enclosing the roof and walls was developed especially for the project. There are three types of panels: glass, solid aluminum, and grilled aluminum, which are interchangeable by merely undoing six bolts. Here for the first time in a building any part of the roof or walls can be changed easily in about five minutes from solid to glass or vice-versa. This permits a nearly infinite variety of permutations for whatever displays

The university masterplan and the Yare Valley were important considerations in the choice of the site for the Sainsbury Center (lower left).









Opposite page: All the panels that clad the Sainsbury Center are interchangeable.

Top, left: This is the first time interchangeable roof panels derived from the automotive and container industries were used in a building.

Top, right: It takes but six bolts to install a panel.

Middle: The three types of panels can be changed in about five minutes.

Bottom: The panels are sealed with neoprene gaskets which do double duty as rainwater channels. They eliminate the need for traditional gutters and downspouts, as can be seen in these cladding panel-to-panel joint details.

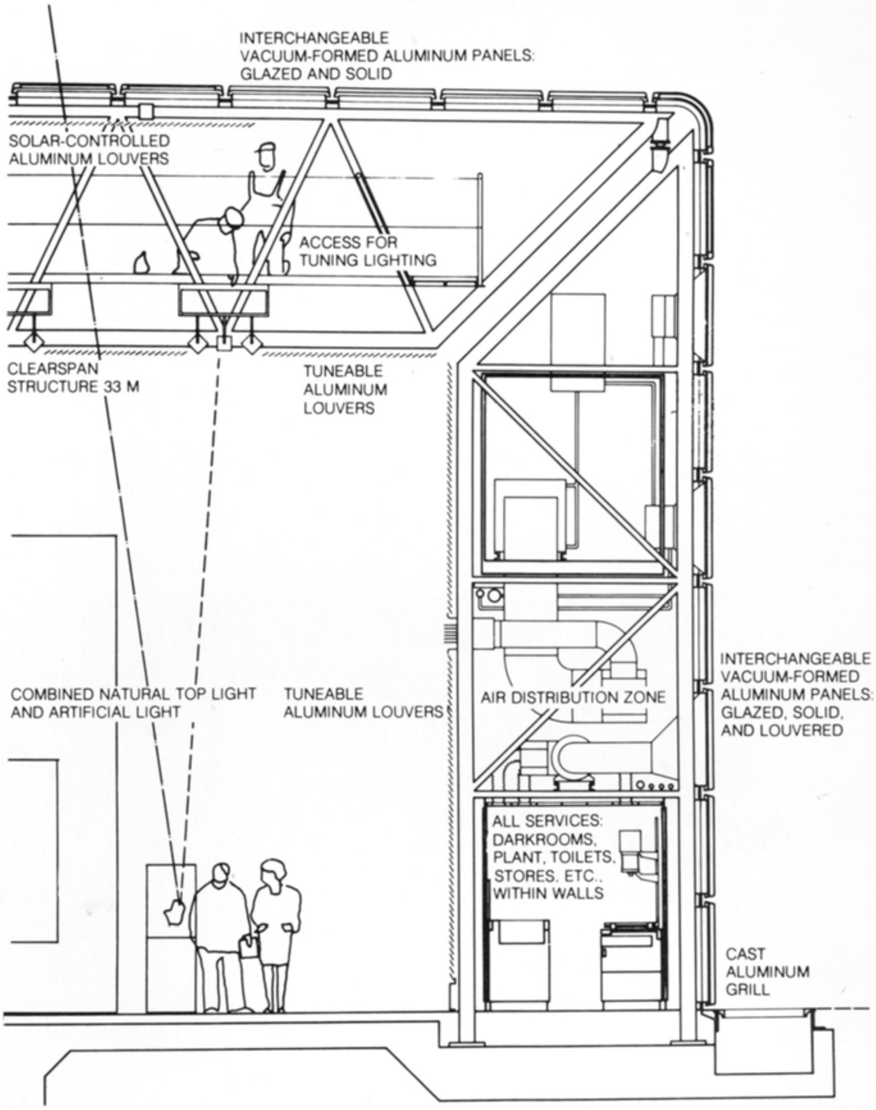
might be required in the future. In a similar manner the exterior entrances can be popped out and shuffled to new locations if desired.

The panels themselves are also interesting technically: they are a sandwich construction with a molded outer skin of anodised aluminum. This is the first application in the building industry of superplastic aluminum. The process by which it was manufactured enables the metal to be molded in a manner normally associated with the plastics industry. In addition the foam-filled sandwich panel has an exceptionally high insulation value, which is an important part of the scheme's low-energy concept. Its highly reflective exterior finish also deflects heat and helps keep the interior cool. The individual panels are sealed with neoprene gaskets, which also double up as rainwater channels, thus eliminating the use of traditional gutters and downspouts. Instead, the entire roof drainage is handled by the grillage in the ground at the base of the building.

The structure of welded steel tubing, freely expressed at the ends, spans 110 feet (33 meters) to form a column-free, unencumbered space for all activities. The clear height of 25 feet (7.5 meters) was determined by the maximum size of works of art, scope for additional levels, and environmental control. The open-ended form allows views through the length of the building to the lake at one end and the woods at the other. The end glass walls were designed for minimum visual interruption, with full-height panels of glass joined only by clear adhesive, as a next step beyond the Willis Faber glass curtain.

The structural members are contained between an inner skin of wall and roof lining and the outer panels, creating a uniform 8-foot (2.4-meter) zone in the wall and roof plane to accommodate a wide variety of functions (such as toilets, darkroom, storage, and mechanical facilities) more fixed than the flexible main areas which they enclose and serve. All circulation spaces and access to them, whether for public and academic use or maintenance, can take place in isolation from the main gallery and university areas. The space in the roof zone enables the lighting to be maintained and focused without disturbing the display below. The inner skin or lining consists of adjustable perforated aluminum louvers with additional motorized banks under the glazed areas. These, combined with the interchangeable exterior panels and a highly flexible system of electric display lighting, produce almost infinitely adjustable light control.

The building was essentially factory produced; the work on site was virtually confined to the process of assembling prefabricated elements.



Opposite page, top: Some functions in the Sainsbury Center like the air-handling units here are more fixed in nature than the main spaces they serve, which prompted us to generate a servant zone to wrap around the tube.

Opposite page, bottom: The Sainsburys wanted the gallery to be rather like their living room where people could sit in easy chairs and read books and magazines. Since their living room was neither air conditioned nor windowless and the collection had been there 40 years in perfectly good condition, they didn't want the gallery to be a hermetically sealed air conditioned environment. Furthermore, the paintings were all conceived in rooms with side or top lighting and the primitive sculptures were created outdoors; our approach would allow the work to be viewed in conditions similar to those of its creation.

Above: Because of the service band, the catwalk system permits workmen to adjust the lighting without closing the gallery or significantly disturbing viewers.

The unbroken 24-foot (7.3-meter) high single sheets of glass in the Sainsbury Center are a further refinement of the glass technology in the Willis Faber curtain wall.

This is in the mainstream of previous projects and is rooted as much in a sense of appropriateness to the age as in cost control, time available, and present-day realities of quality control.

Technology is viewed not as an end in itself, but rather as the means to achieve social goals and open up wider design possibilities. The concept that high technology can be equated with low energy is particularly relevant at this time. In this instance the design of the spaces (their height and shape) and the nature of the enclosing wall (its double thickness, reflectivity, insulation value) combine with the engineering of air movements to attempt an alternative to air conditioning, with its high installation and running costs. The absence of air conditioning is also in the spirit of a living room environment rather than a climate-controlled vault for art works. Despite an extremely hot summer, this has worked well, with the temperature remaining in the 70s.

The idea with technology is to use it appropriately. There are situations where it is best to build in a highly labor-intensive manner (in the Third World, for instance): other times, like here, the reverse is true.

We are currently engaged in projects ranging from large-scale urban planning to experimental housing systems. The technologies that we now consider most relevant stem from the aerospace industries, and it seems no coincidence that events such as the Farnborough Air Show, with its vast array of subcontractors and exhibits, provide more hard-edged clues and inspiration than this year's *Sweet's Catalog*. The technology for our own house project, for instance, is totally rooted in the alloys, glues, and high-strength fixings of the aircraft industry.

Other influences and acknowledgments range from Victorian engineering (where is today's equivalent of the Crystal Palace?) to such apparently misunderstood pioneers as Fuller, Wachsmann, and Eames. Surely there were more roots to 20th-century architecture than some present cul-de-sacs with Disney-like versions of the so-called vernacular, which are as much an affront to any true vernacular as they are to Disneyland.

Our design philosophy could thus be expressed as a process which resolves and integrates those views and polarities which might otherwise be in conflict. Another part of the approach is and always has been a conscious and deliberate attempt to put all those dry objective pieces of the jigsaw (research, statistics, cost schedule, site analysis, structural options—the checklist is endless) together with some very subjective joy—a kind of celebration! That is what architecture should be about.