HOSPITAL RESEARCH & BRIEFING PROBLEMS

KING EDWARD'S HOSPITAL FUND FOR LONDON

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Hospital Research and Briefing Problems

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A report on the research and briefing methods used in the Department of Health and Social Security's Greenwich District Hospital development project. The material is based on a series of papers given at a conference held at the King's Fund Hospital Centre.

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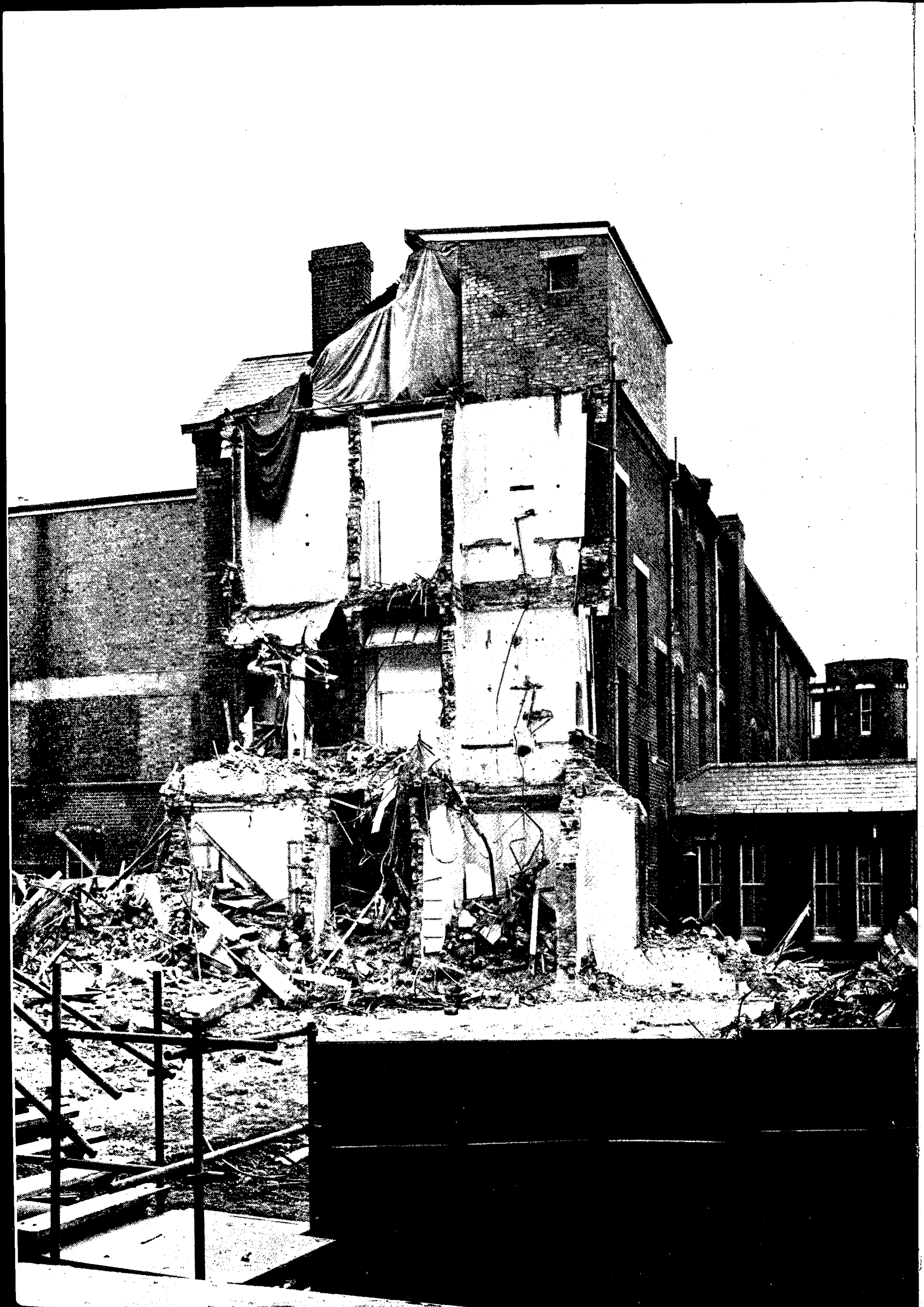

Foreword

In June 1962 the South East Metropolitan Regional Hospital Board agreed to cooperate in the Ministry of Health's third research and development project for which St Alfege's Hospital, Greenwich was selected. The aims of the project were to redevelop a whole hospital on an existing and restricted hospital site while maintaining a full service from the old buildings, to have modular planning so as to make use of repetitive and standardised items, and to provide an efficient and reliable service for patients and visitors in a safe environment.

Continuous building was adopted, thus enabling the phasing of the project to be arranged to suit the functional, structural and architectural needs. The building was designed so as to make the best possible use of mechanical devices and with complete flexibility to meet changes in medical, nursing and administrative methods without disturbing the hospital. It was proposed further that the mass of research data collected should be collated and produced as a basis for guidance material for national use.

The first phase of the building is now in use and the next phases of the development are continuing according to plan. Time will show the extent to which the designers' aims have been achieved.

I am extremely proud to have been Chairman of the Project Team for the new Greenwich District Hospital which is an important milestone in cooperation between the Department of Health and Social Security, the Regional Hospital Board and the Hospital Management Committee. The project has given everybody who was involved an outstanding opportunity for research into the best methods of planning, design and construction and it has also shown what can be achieved by goodwill in voluntary cooperation.

I am particularly pleased to have been concerned in the planning of this project from its inception until my recent retirement.

James Fairley

JAMES FAIRLEY
Chairman, Greenwich District Hospital Project Team until autumn 1970

Frontispiece Demolition in progress on the Greenwich site. Phase One has now been built and is in operation; Phase Two is complete and is being commissioned.

Acknowledgements

The research workers who were involved in the project would like to record their thanks to the Department of Health and Social Security, the South East Metropolitan Regional Hospital Board and the Greenwich District Hospital Management Committee for creating a climate in which multi-professional working was able to develop. They would also like to thank their colleagues who were involved in the development work, and particularly Howard Goodman, for providing the opportunity for research.

The authors would like to add a personal acknowledgement to Mrs Elaine Boice who spent many hours typing and assembling the vast amount of information uncovered during the investigation.

The editor is grateful to Mrs Anne Porter for her work in preparing the final draft, to Miss Dorothea Caney for her invaluable assistance in proof reading and to Chris Ridley for taking a number of photographs specially for the book.

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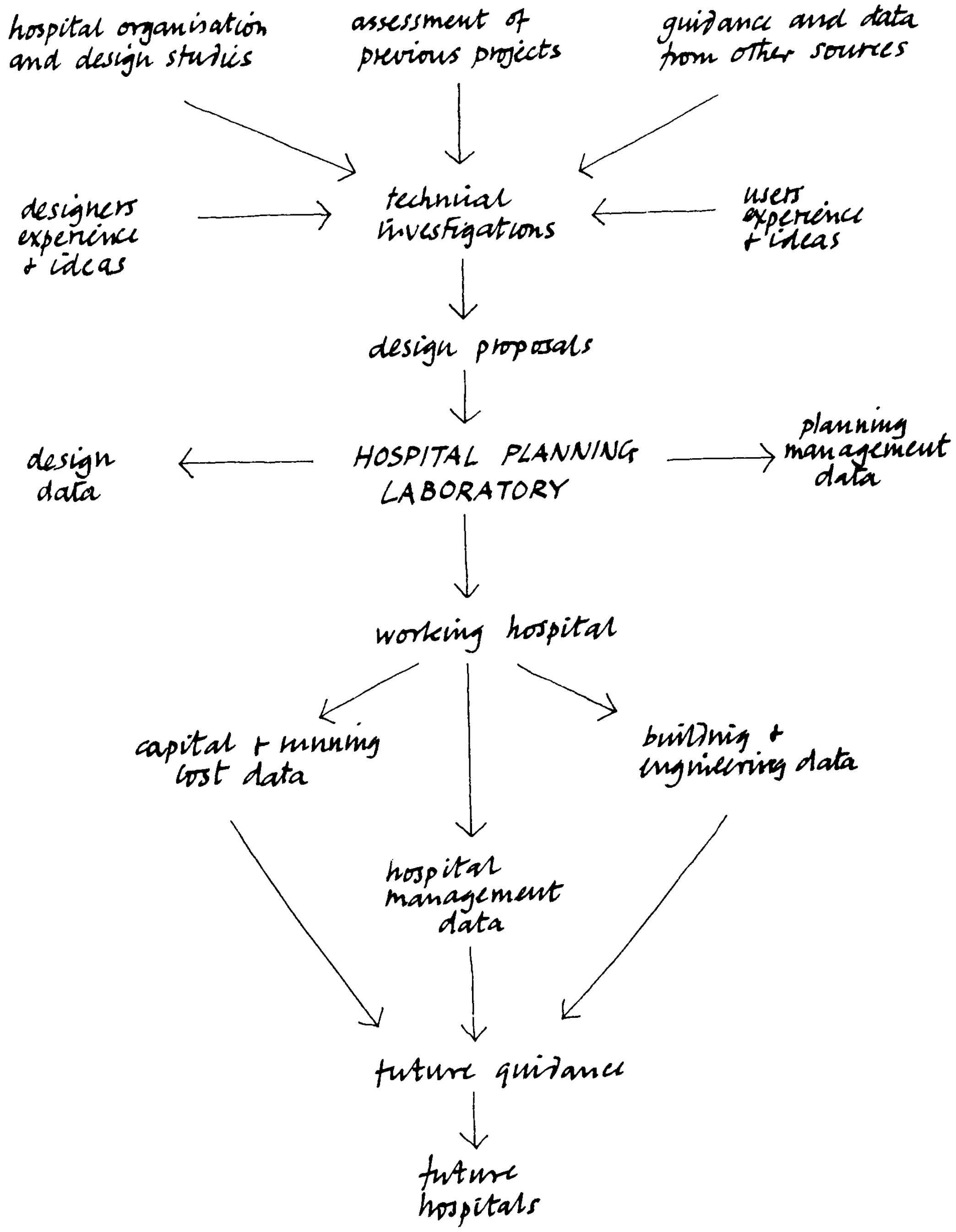


1 The diagram shows the flow of information through the Greenwich research and development project.

1 Introduction

1.1 THE GREENWICH PROJECT There were several reasons why the Department of Health and Social Security (then Ministry of Health) decided to undertake the planning and design of Greenwich District Hospital.

Before starting on Greenwich the Department had already embarked on two other hospital building redevelopment schemes. One, a hospital outpatient department and accident centre, was at Walton Hospital, Liverpool; the other, a hospital kitchen, restaurant and stores building, was at Kingston Hospital, Surrey.

The experience gained in the planning and detailed design of these two buildings indicated that there would be considerable advantages in undertaking a whole hospital project. Such questions as the effect of layout on efficiency, and the cost implications of various forms of supply and distribution, could only be explored in the context of a complete system. Similar considerations applied to some important aspects of inpatient and outpatient care. Also, there were certain possible layouts and shapes for hospitals that were being considered in theory, from the viewpoint of integrating engineering services into the structure, and of providing for growth and flexibility. For proper evaluation, these needed to be tested in practice.

It was seen also that the project gave an ideal opportunity to test planning and design methods: among them research and briefing, and the link between the two.

There was, in fact, the possibility of creating a hospital planning 'laboratory' that would benefit every aspect of the Department's published guidance and its advisory and other work.

1.2 THE PROBLEMS OF PLANNING Planning is an attempt to predict and control the future. It means choosing between alternative courses of action so as to achieve the best possible result. In a technological society, where change is rapid in every area of knowledge, and particularly so in hospitals, this is an extraordinarily difficult thing to do.

At the core of the planner's dilemma are two related problems. The first is getting good information. The second is using it in such a way that alternative courses of action can be proposed, discussed and evaluated before they are put into practice.

It is true that there is now an 'information explosion'. But the trouble is that it is rare for the user of information to find the fragments he requires contained in the explosion. The planner who needs information has of necessity to create at least some of it himself by his own research. The way he does this is of central importance. It will have a direct and determining effect on his ability to foresee alternative solutions and choose between them.

Solutions, or apparent solutions, to any complex problem can be deceptive. What may look like a discrete problem will almost always turn out to be either an amalgam of sub-problems, each of which affects the other, or part of a bigger system of problems. Or both. It is the effect of problems interacting that is so difficult to articulate realistically, but which must be the basis of planning.

All these difficulties are particularly acute in a hospital building. Questions like 'what proportion of health care should a hospital undertake in relation to community care?' are fundamental. Very sophisticated techniques are needed to arrive at any realistic equation between the cost and efficiency of various possible arrangements, and these have to be set against what is or is not acceptable on moral and social grounds. A hospital involves many different specialists within a single organisation, and the services they require depend on quite advanced and expensive technology. Their requirements may overlap and work together, or they may appear to be in direct opposition.

This book is an attempt to discuss that part of the research and development project at Greenwich District Hospital which was concerned with some of these problems. Like its predecessor, *Hospital Traffic and Supply Problems*[1], it is published not only as a record of work done but also because the results have general significance for the principles and practice of planning in general as well as for hospital planning in particular.

The publication is aimed at those people who wish to find out more about the project and its research background than is possible by looking at the drawings or visiting the building. During the five year planning period, and to an even greater extent since the building work started, there has been a steadily increasing volume of enquiries concerning research and planning aspects. It is believed that this book will help in explaining the techniques and methods that were used.

1.3 ARRANGEMENT OF THE BOOK Part One discusses the particular research and briefing methods developed for the Greenwich project, setting them against the general background of planning problems and the then current methods. It also attempts to make some assessment of how far they were successful or unsuccessful.

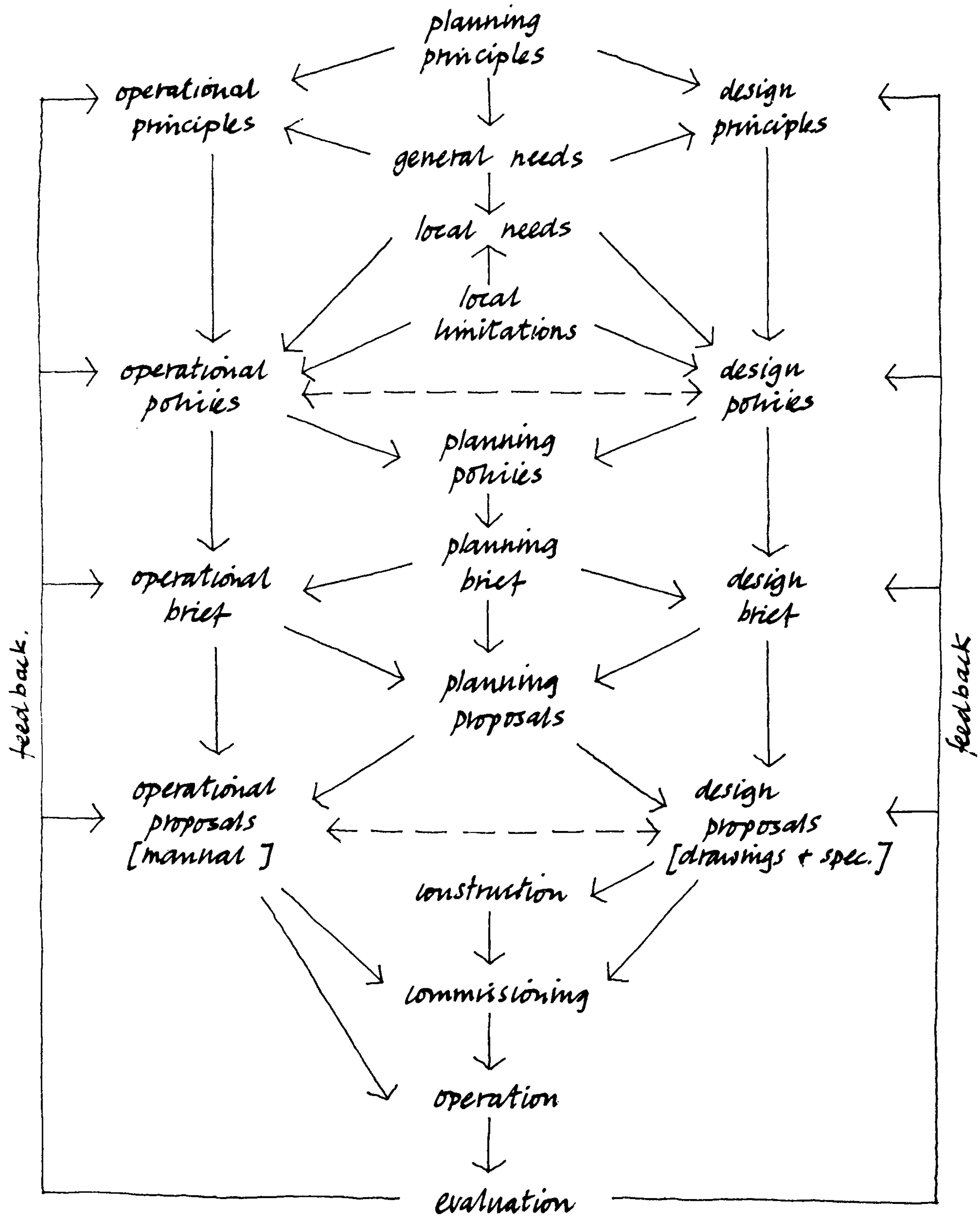
Part Two consists of four case studies showing how the methods were used by the teams who were responsible for the research and planning for inpatient and outpatient services and for the operating and clinical pathology departments.

Throughout the book original documents are used as illustrations where possible, and are reproduced as facsimiles. The appendices contain some more detailed examples of these and also, in some cases, further developments.

References are included on page 136. A separate entry consists of a complete list of the Department of Health series that are referred to. Because of this no further specific references are give in the text to Building Notes or other Department publications.

In the pocket at the back of the book will be found floor plans of the hospital. The bookmark shows metric equivalents of the foot and inch scales quoted in the text with key measurements, like those of the planning grid, shown in bold type.

PART ONE



2 The diagram shows the planning and briefing stages of the Greenwich project and how operational and design aspects were related to one another. Understanding the interaction of these aspects is basic to any interpretation of the context in which the planners worked.

2 Context

The research and briefing methods which are the principal subject matter of this book were not developed in a vacuum. They were related to the other research and development aspects of the Greenwich project in a particularly intimate way. For example, it was not a question of the research and briefing work leading to the choice of layout and shape of the new building. The research took place, instead, within the context of planning and design ideas which arose from other, but related, considerations.

It is important to be aware of this, especially as most theoretical models of the design process show shape and layout arising out of an analysis of 'user requirements' or some similar concept. At Greenwich, research and briefing were carried out to 'fill in' and test an already selected building shape.

This was partly because, as a research and development project, the building had to fulfil many purposes, among the most important of which was the testing of new shapes and layouts. But there is also a more fundamental point which is worth considering and that is, whether or not there is any validity in models of planning or design that present them as a linear process. All experience seems to show that they are a far more complex affair, and that appropriate starting points can be many and varied.

It is, in any case, impossible to understand the research and briefing methods used at Greenwich, and their relationship to the finished building, without grasping the fact that both they and the physical planning of the building went on in parallel and affected one another all the time. How this worked will be made clearer in later chapters, but it does mean that it is necessary at the outset to give the main subjects for investigation implicit in the Greenwich project and to describe the way in which they were embodied in specific proposals for shape and layout.

2.1 SUBJECTS FOR INVESTIGATION The main subjects for investigation were as follows.

1 The effect of layout, construction methods and engineering design on freedom to make alterations in design at the planning stage and in use, and on provision for expansion, phasing and decanting, particularly on restricted urban sites.

2 The design problems associated with deep planned hospital buildings, particularly in relation to mechanical ventilation, control of infection, permanent artificial lighting and absence of daylight and view in internal rooms.

3 The design of communications, supply and disposal systems for economy, reliability and simplicity in use; in particular, the extent to which centralisation and automation could be adopted and their effect on staffing and running costs.

4 Methods of integrating engineering services with the construction and environmental design so as to give reliability and economy in use, an important aspect being ease of maintenance.

5 To study and carry out the design of rooms,

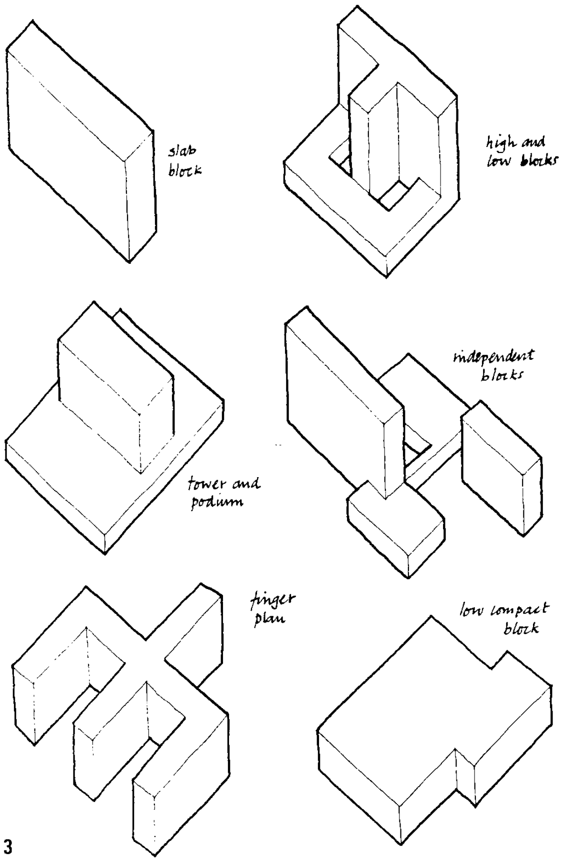
equipment and building components on the basis of user requirements, so as to give convenience and economy in use, and also to test the degree of standardisation acceptable.

2.2 LAYOUT AND SHAPE STUDIES Experience gained in the offices of the firms or authorities working on the design of Princess Margaret Hospital, Swindon; Wexham Park Hospital, Slough; and the new St Thomas' Hospital East Wing Block (among other schemes) led designers at the Department to question exactly which factors in layout could contribute to an improvement in operation. This applied to the whole period of a hospital's life: during development or redevelopment, and for the duration of its use, assuming this to be half a century – or even more.

A study by the Department of work being done in the United States suggested that the pattern of hospital design emerging there at the time (1961–2) was not necessarily the best to adopt in the United Kingdom. The approach there was to plan a building round a vertical core of lifts with the wards grouped round them in a tower, and with the other diagnostic, treatment and supply departments spread out round the base.

This idea worked reasonably well for small hospitals of up to about 300 beds, but when it was used for schemes of 700 or more beds there were several major problems. Probably the most important was that the form of the building began to impose severe restrictions on the layout and location of departments and particularly to restrict their ability to grow and change.

A comparison between the shapes of recent hospital schemes in the United Kingdom and the United States indicated that they could be classified into five or six categories. There were examples being planned or built in the United Kingdom of all but one of these. This was the low, compact shape involving a large proportion of internal rooms and mechanical ventilation. Studies showed that it could have advantages for a site as small as that at Greenwich, particularly as a relatively large amount of accommodation was needed.



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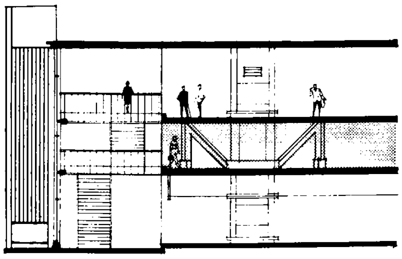
3 Six basic hospital shapes.

2.3 INTEGRATION OF ENGINEERING SERVICES A complication in all the schemes mentioned so far was that the engineering services, being largely accommodated in many small vertical shafts, restricted the possibility of changes in layout and positioning of equipment. It was therefore not possible to allow cheaply and easily for changes in use, or changes of mind. The rigidity of the mechanical and electrical engineering services was, in fact, more restrictive than the structural system used or the building layout and shape.

The designers recognised that it would be more convenient if the engineering services were located so as to avoid getting in the way of usable spaces and rooms, allowing users to 'plug in' to them from any position in any room in the hospital. This was a very difficult proposition but one which was apparently being met in laboratory and factory buildings in the United States and elsewhere. In England a laboratory building at Beckenham for Burroughs Wellcome went



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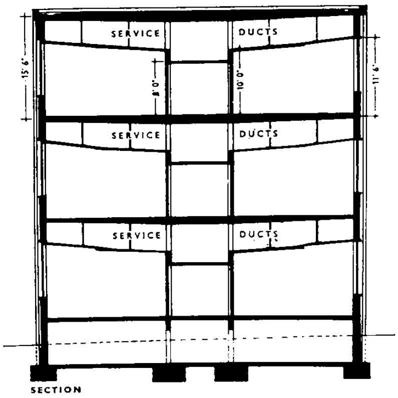

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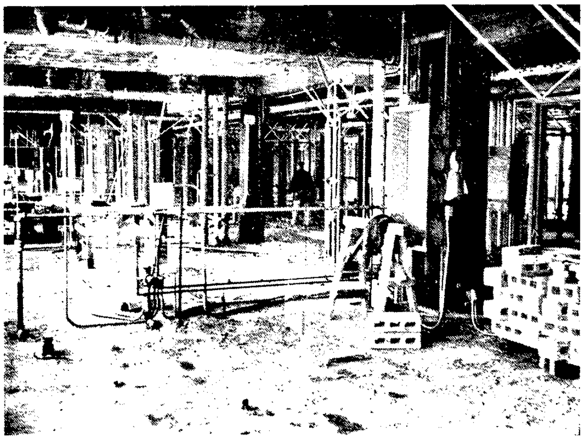

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4 Typical section, Texas Instruments Inc. factory, Dallas USA. (Reprinted from Engineering News-Record, July 16, 1964. Copyright McGraw-Hill Inc. All rights reserved.)

5 Typical section, Wellcome Research Laboratories, Beckenham. (Reprinted by permission of the Wellcome Foundation Limited.)

6 Installing engineering services in a hospital in the USA.

some way to providing the kind of flexibility needed, but the big questions were: how much did it cost; and how much was it worth? Cost data provided by Burroughs Wellcome suggested an increase of the order of 7 per cent in the *construction* costs. This was due mainly to the extra height of the building and the need to provide stronger ceilings which had to serve also as the floors to the service voids. This did not seem an unreasonable price to pay if the users could reap operational (and therefore cost) benefits by having flexibility over the life of the building. There was also the point that separate service voids between floors would make possible freedom of access without interfering with laboratory or hospital work while maintenance and repair work was being carried out. In the event, it has been shown that the cost of the structure at Greenwich compares favourably with other more orthodox hospitals in the United Kingdom. But, although the voids inevitably led to some increase in structural costs, the increase was absorbed by compensating savings on other building elements. There were also savings on the engineering services themselves resulting from the facilities offered by the voids. Altogether, there was an overall saving as explained in Appendix C.

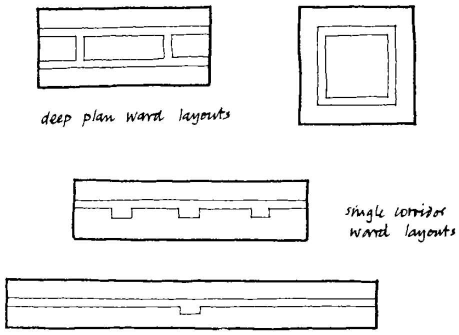
An interesting point of comparison with building practice in the United States was found in the construction sequence adopted there for the building and engineering trades. As soon as the structure was complete, that is, floors and columns in position, the engineers moved in and installed the main pipe and duct work without being restricted by walls and ceilings. This meant that they could easily see what they were doing and work more quickly. As this part of the work is expensive on labour, this method should be more economical than the alternative approach usually adopted in the United Kingdom, which is to put up all the partitions and then cut holes in them to take the pipes and conduits.

A further restriction on planning freedom which still caused concern was the frequency with which columns and shafts appeared in inconvenient places. The solution explored for Greenwich was to see how far it was possible to span a floor structure economically by increasing the distance between each floor and the ceiling below to something like 6 ft, thus reducing the probability of obstruction. Studies by Charles Weiss and Partners, the structural engineers, indicated that it might be economic to span distances of about ten times the total beam depth if an open lattice type of beam were used. As the space between the ceiling and floor above would in any case be needed for engineering services this seemed a sensible approach.

It was realised that if a 'layer cake' of service voids between floors were used, then it would still be necessary to connect up the separate engineering layers with a *limited* number of widely spaced vertical shafts so as to preserve large uninterrupted floor areas.

2.4 EFFECTS OF DEEP PLANNING At the start of the Greenwich project a study was carried out on the merits and costs of deep-plan wards as against the more conventional single corridor type of layout. This study suggested that there were certain operational advantages to be gained by planning more compactly, but at the price of extra capital and running costs for mechanically ventilating the inner area of the deeper layout.

As this first study was limited to alternative forms of layout for a 60-bed ward floor, it was felt to be worth exploring what might happen if the idea of deep planning were taken a stage further. If, for example, several departments were to be grouped together on one level in a deep-plan hospital would it be possible to reap sufficient benefits in terms of convenience, flexibility in use, economy of space and in mechanical transit devices, to help pay for the increased cost of air conditioning? Running costs had to be considered, but it was thought that improvements in environmental conditions and a reduction in cross infection rates that might result from controlled ventilation and sealed windows, coupled with savings on maintenance and cleaning costs, would offset the comparatively high running costs, at least to some degree. In the event, the running costs of the air conditioning only add 2–4 per cent to the total per annum.



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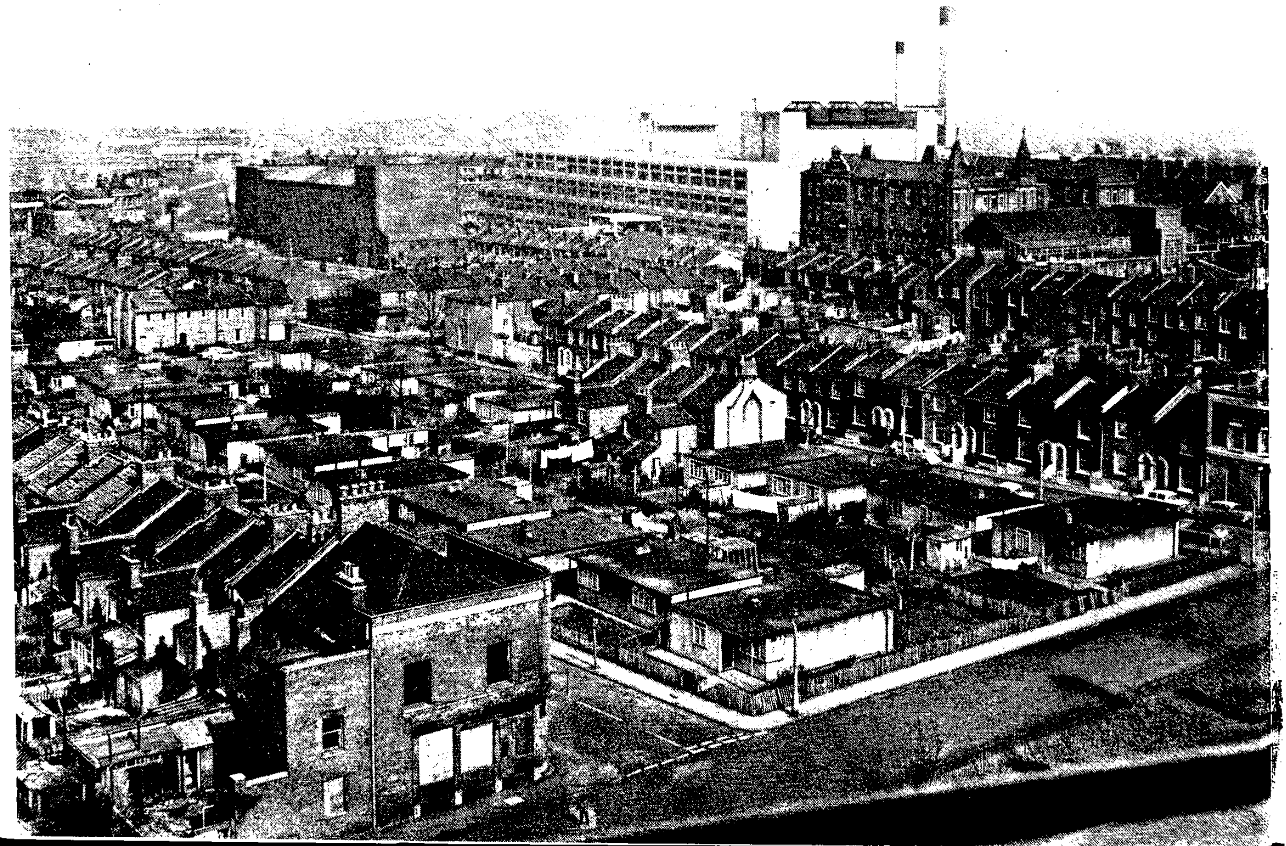

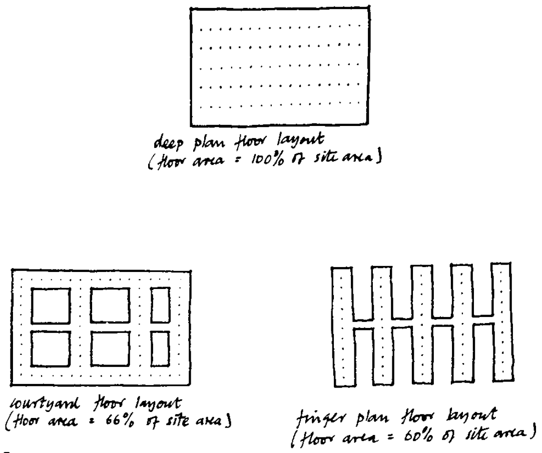

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7 Deep-plan ward layouts compared with single corridor ward layouts. Note that all the layouts occupy the same floor area.

8 Greenwich District Hospital showing the completed Phase One, the older hospital still to be redeveloped, and the surrounding area.

9 Deep-plan floor layout compared with finger-plan and courtyard floor layouts. Note that all the layouts occupy the same site area, but that the deep plan allows 100 per cent usage.

On the capital cost side, it was recognised at initial cost planning stage that the departmental areas for Greenwich would have to be planned to at least 10 per cent less in aggregate than the Building Note standards if costs were to come within the limits allowed. There was thus considerable incentive to find any reasonable way of economising in space without reducing performance or amenity standards.

It seemed more likely that the form of building being considered would offer a better situation in which to make experiments in room layout and to economise in circulation space than would a building strung out in narrow blocks or fingers, or around courtyards. This assumption appears to have been justified as in most cases it has been possible to plan departments in areas at least 10 per cent lower than the Building Notes indicated and with no apparent loss of amenity or standard of provision.

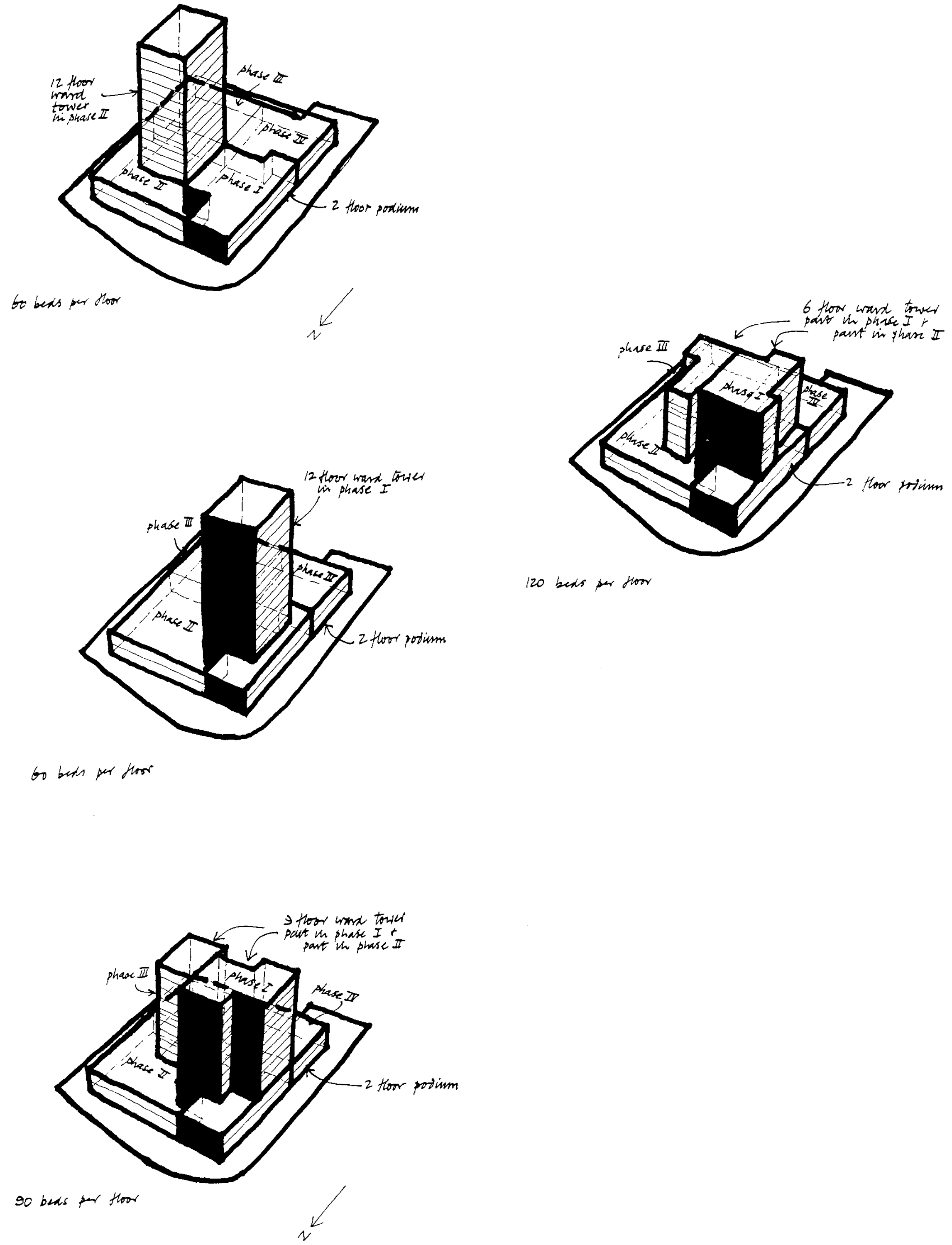
Additional advantages claimed for the low, compact hospital were, that if it proved possible to group functionally related departments horizontally, it might result in a reduction of journey times and also provide the possibility of sharing accommodation or engineering services between departments. Neither of these would be possible in a multi-storey building.

The grouping of traffic-related departments on one level meant that the need to use lifts for a large proportion of journeys between departments could be avoided. Thus, if all the main outpatient departments plus their supporting facilities are at ground level, few if any outpatients need to move off the ground floor. Likewise, if staff movements can be restricted to one floor level during the working day (or night) this again cuts down on inter-floor traffic. Similar considerations were seen to apply to supplies. This would be convenient and save in engineering plant.

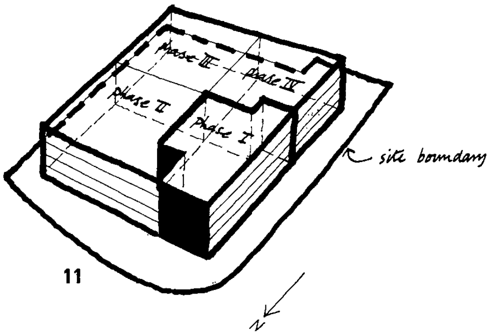
2.5 SITING AND SHAPE ALTERNATIVES The site and existing buildings at Greenwich posed particularly difficult design problems which had to be taken into account from the start, and which partly determined the physical framework in which the detailed design was carried out.

To begin with the site was excessively noisy from heavy road traffic on two sides, and also heavily polluted from industrial smoke and traffic fumes. The existing buildings left only a very limited site area for building in the first instance. The immediate surroundings, being mainly two and three storey terrace houses in good condition, meant that there was little likelihood of any increase in the size of the site for some time. However, the acquisition of some adjoining property was considered for limited expansion.

Where a hospital needs to be redeveloped on a congested site, it may be suggested that it would be cheaper and easier to build a totally new hospital on a clear site and so avoid all the problems generated by phasing and decanting during the period of redevelopment. However, there were no suitable alternative sites near enough to the locality to be served.



10 Alternative building shapes for the Greenwich site.



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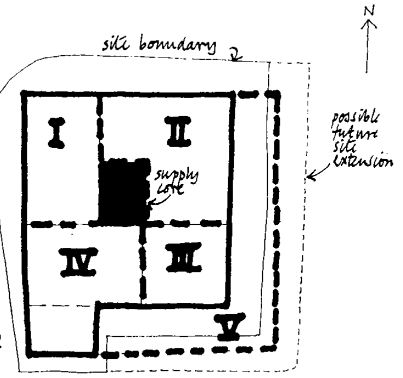

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11 Low, compact building shape on the St Alfege's site showing possible phases of development.

12 Low, compact building shape on the St Alfege's site showing phasing round supply core.

When St Alfege's Hospital was chosen as the site for the third Department development project it was realised that this was to be a challenge to the designers as to how to carry out a surgical operation of major proportions on an already ailing hospital. It had to be treated as a 'transplant' operation, in that a major part of the hospital had to be removed while it continued to function at nearly full output for the period of redevelopment. However, bomb damage from the Second World War and subsequent further demolitions had cleared an area of the site which could be built on without serious encroachment on essential existing buildings, and this gave some room for initial manoeuvre.

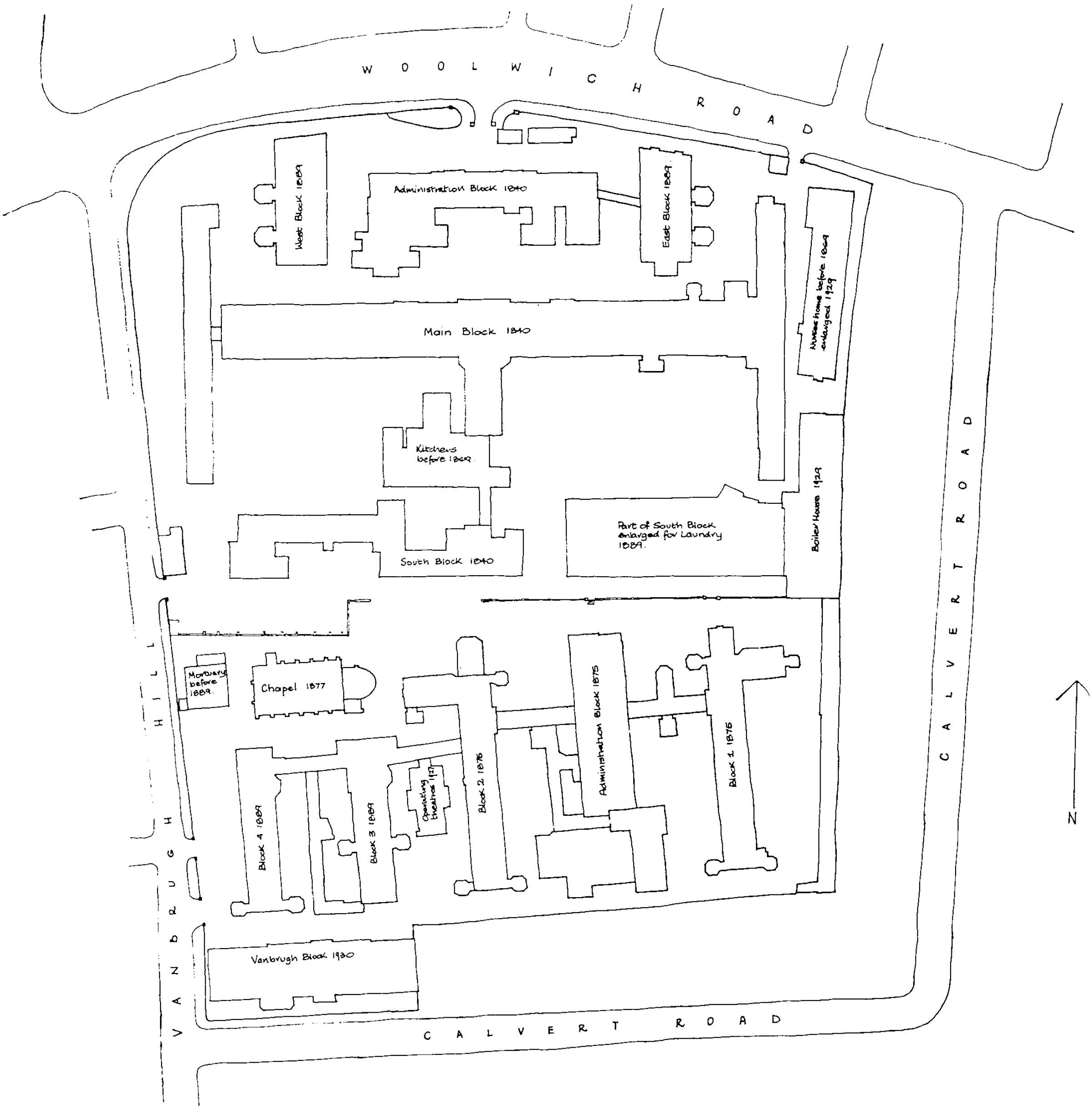
Apart from the low, compact shape, which meant a building on about four floors, the alternatives open to the designers for possible building shapes were various combinations of tower and podium. The first two tower and podium schemes considered were for a 12-storey tower block with 60 beds per floor. This first scheme would have provided all the beds in the first phase, the remaining departments being built in a two-floor podium when the rest of the hospital site had been cleared. The second scheme would have provided all the wards in Phase Two. The third tower and podium scheme had a ward block of nine floors with 90 beds per floor, and the fourth had 120 beds per floor on seven floors. It was not considered that a ward block of this form could be built in two phases without considerable extra cost and inconvenience.

In none of the tower and podium schemes could provision be made for the replacement of the outpatient department in the first phase, nor could they meet the suggested criteria for convenience of movement between departments. Equally, they did not allow for flexibility and growth. So the proposed compact shape, although relatively unknown for a hospital, looked as though it would provide advantages. It could be phased by horizontal extension round a core containing the main supply and communication services. For a site as congested, noisy and dirty as Greenwich the argument for mechanical ventilation was in any case attractive and might have been desirable even if a tower and podium scheme had been adopted. But it could be provided more cheaply in the compact shape. It was also possible to provide the departments most urgently needed in the first phase in suitable locations relative to the likely final arrangement of departments.

2.6 THE DESIGN Although dealt with fairly fully elsewhere, a description of the main characteristics of the design adopted is repeated here so as to provide an idea of the physical framework within which the investigation, briefing and detailed design were carried out.

Apart from the site boundaries and the existing buildings, the physical limitations imposed on the siting and layout of departments and rooms were those imposed by the designers themselves. Their choices were based on the alternatives available for the shape and size of the elements involved, for example, the number, shape and size of floor areas, structural columns, service shafts, courtyards and the main circulation routes.

The hospital was to be on four floors each measuring


W O O L W I C H R O A D
Administration Block 1840
West Block 1889
East Block 1889
Nurses home before 1869 enlarged 1929
Main Block 1840
Kitchens before 1869
Part of South Block enlarged for Laundry 1889
Boiler House 1929
South Block 1840
Mortuary before 1889
Chapel 1877
Administration Block 1875
Block 1 1875
Block 2 1876
Block 3 1889
Block 4 1889
Operating theatre 1927
Vanbrugh Block 1930
V A N B R U G H H I L L
C A L V E R T R O A D
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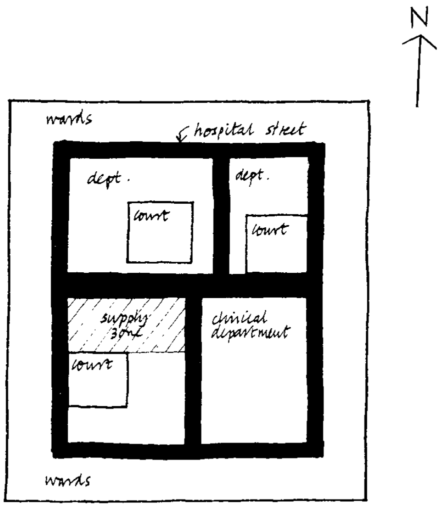
13

about 400 by 450 ft, with two or three large courts puncturing the otherwise solid building. Each floor was to consist of a peripheral band of ward accommodation outside a main hospital street system enclosing four inner zones. These were to be separated by a cross pattern of streets radiating in each direction from the centre. The wards would occupy the peripheral band on the upper floors, other departments being located according to access and traffic considerations.

The vertical dimensions between floor and ceiling, and the depth of the inter-floor service area, were decided on the basis of a minimum universal ceiling height of 9 ft for all departments (including operating theatres and x-ray department), and a minimum service area height consistent with easy access for installation and maintenance of plant. This was determined as 7 ft from floor above to ceiling below, giving a clear internal height of 5 ft $7\frac{1}{2}$ in for the void, with interruptions by beams at 16 ft centres. The overall floor-to-floor height of 16 ft related conveniently both visually and structurally to the horizontal grids of 16 ft and 64 ft.

To achieve the desired degree of freedom in layout of departments, rooms and equipment, it was proposed that engineering service pipes, conduits or ducts should be capable of being fed through the floor or ceiling at virtually any point. Ultimately, it



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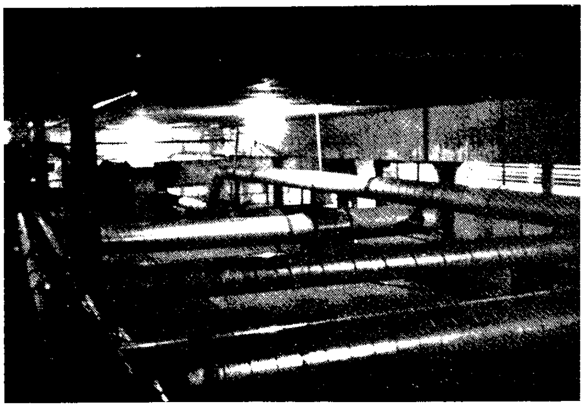

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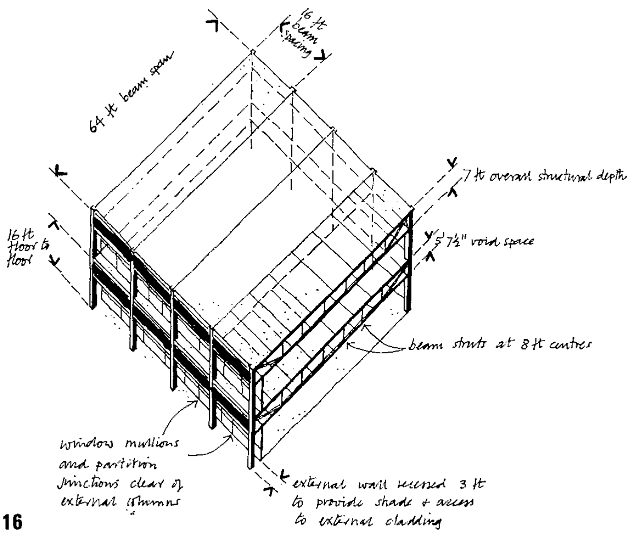
13 The Greenwich site at St Alfege's showing the buildings existing before redevelopment.

14 Greenwich—a typical floor plan.

15 Greenwich—view in the service area.

16 Greenwich—the structural system and dimensions of the planning grid.



16

	brief dated July 1962			agreed Aug 1969
Medical	114	162	now incl. with medical	153
Chest diseases	40			
Dermatology	8			
Paediatrics	20		plus four mothers	49
Isolation	18			18
Neurology	4			–
V.D.	2		now excluded	–
Surgical	111	203	now incl. with surgical	172
E.N.T.	18			
Orthopaedic	62			
Urology	10			
Dental	2			
Gynaecology	32			35
Obstetric (maternity)	80			81
Special care babies	-		unit at Lewisham.	20
Geriatric	223			180
Psychiatric	59			59
TOTAL	803			767 [747 if s.c.b.s excl.]

ORIGINAL PROPOSED ALLOCATION OF BEDS

NB 8 sick staff and 12 intensive therapy included in general bed numbers.

17 The table shows the proposed allocation of beds at Greenwich as contained in the original brief (1962) and as agreed in August 1969.

was agreed that it would be acceptable if a 9 in diameter hole for a duct or pipe could be made in any 2 ft square of floor or ceiling. The layout of walls and partitions was to be based on a planning grid of 2 ft in accordance with the then current recommendations on dimensional coordination. This related to the larger scale structural grid of 16 ft which proved to be an economic spacing for columns carrying simply supported steel and concrete beams spanning 64 ft. The external columns were placed outside the peripheral walls to avoid awkward junctions between partition walls and columns, and to give maximum freedom in the arrangement of rooms within the discipline of the 2 ft planning grid. The external 'eyebrow' thus formed also helped to give some solar shading and a means of easy access to the outside wall for maintenance and cleaning.

2.7 OUTLINE HOSPITAL POLICIES So far, this section has concentrated on describing the way in which the subjects for investigation in the Greenwich project were embodied in a building layout and shape related to the site. This description, by itself, does not give a complete basis for understanding the research and briefing methods. There were also a number of outline hospital planning policies which were established at the outset and which form an essential part of the context.

These may be summarised as follows.

1 A district general hospital of about 800 acute, maternity, geriatric and psychiatric beds and related diagnostic, treatment and outpatient services to be provided on one site to serve a population of about 160,000 people.

2 Staff residential and industrial supply service facilities to be housed independently of the main clinical services. Management and training facilities to be provided alongside or within the main hospital. Close collaboration with local health authorities and general practitioners to be encouraged.

3 Facilities, such as supply services, which can be shared for a larger unit than a district general hospital, to be centralised to serve a group – or larger unit – as appropriate. As many facilities as possible to be shared between departments in the hospital to economise on capital and running expenditure, provided this does not interfere with efficient operation.

4 Communications for people, ideas and information to be simple, quick, direct and reliable. Ease of control and supervision to be aided primarily by layout, or by electrical or mechanical communication systems – where suitable layout is not possible.

5 Departments to be located to give maximum convenience for access by patients and staff, especially for emergency cases and for the disabled and aged. Layout of accommodation to encourage ease of orientation for staff, patients and visitors.

6 Supply and distribution of goods and disposal of waste to be simple, reliable, convenient and quiet as far as is consistent with considerations of infection control, security and economy.

7 Environmental control to be achieved by exploitation of building shape in combination with full use of reliable engineering design techniques.

8 Space provision to be equivalent to Building Note 3 standards, or less where research indicates that performance requirements are not jeopardised. The main building support structure to be designed to last for at least 60 years, but the secondary cladding and finishing elements, and the engineering services, to be designed to be replaceable within this period.

9 Equipment to be so located and designed that maintenance, repair or replacement will involve minimum interference with normal operation of the hospital.

10 Cleaning and maintenance of the building to be effected with the minimum cost and inconvenience to users.

11 The building and engineering services to be easy to adapt to varying functions and to allow provision for the hospital and its constituent departments to grow – or shrink – as needs and resources dictate.

12 Staffing costs to be kept to the minimum consistent with a good standard of service to the patient.

	PD	A	COM	SD	PHA	CAT	TRG	IP	MAT	OP	REC	SA	RES	RL	EQ	CM	IC	F	N	COL	EW	O	X	PA	AE	MI	PHY
PD																											
A	x						x				x	x		x	x												
COM	x	x		x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x
SD	x	x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
PHA	x	x	x	x				x	x	x	x			x	x	x		x	x	x		x			x		
CAT	x	x	x	x				x	x			x		x	x	x		x	x	x							
TRG	x	x	x	x	x	x		x				x		x	x	x		x	x	x							
IP	x	x	x	x	x	x	x		x		x	x		x	x	x	x	x	x	x							
MAT	x	x	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x		x			x		x
OP	x	x	x	x	x	x	x		x		x	x		x	x	x	x	x	x	x					x		
REC	x	x	x		x		x	x	x	x		x		x	x	x		x	x								
SA	x	x	x	x		x	x						x	x	x	x		x	x			x	x	x			x
RES	x	x		x		x	x					x		x	x	x		x	x	x							
RL															x	x	x				x	x	x	x	x	x	x
EQ				x										x		x	x	x	x	x	x	x	x	x	x	x	x
CM	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
IC			x	x		x	x	x	x	x				x		x					x	x	x		x	x	
F	x	x	x	x	x	x	x	x	x			x	x			x					x	x	x	x	x	x	x
N	x	x	x	x	x	x	x	x	x	x	x	x	x			x					x	x	x	x	x		x
COL			x	x	x	x	x				x				x	x						x	x	x	x	x	x
EW	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x		x	x			x	x	x	x	x	x
O	x	x	x	x	x		x	x	x	x	x			x	x	x	x	x	x		x		x		x	x	
X	x	x	x	x			x	x	x	x	x			x	x	x	x	x			x				x	x	
PA	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x		x	x	x	x				
AE	x	x	x	x	x		x	x	x	x	x			x	x	x	x	x	x		x	x	x	x			x
MI		x	x	x			x							x	x	x		x			x	x					
PHY	x	x	x	x		x	x	x	x	x	x			x	x	x		x	x	x	x						

Columns: DESIGN ASPECTS; rows: OPERATIONAL ASPECTS

KEY

- A administration
- AE accident and emergency
- CAT catering
- CM cleaning and maintenance
- COL colour and lighting
- COM communications
- EQ equipment
- EW engineering and works
- F fire safety
- IC infection control
- IP inpatients
- MAT maternity and ante-natal
- MI medical illustration
- N noise control

- O operating
- OP outpatients
- PA pathology
- PD phasing and demolition
- PHA pharmacy
- PHY physical medicine
- REC records
- RES residential
- RL room layouts
- SA staff accommodation
- SD supply and disposal
- TRG training
- X X-ray

3 Requirements for Research and Briefing

The requirements for research and briefing at Greenwich were determined by the fact that it was a research and development project. The intention was to *expand* the range of possibilities rather than to *contract* it. We have already seen how this provided a physical context, but it provided a theoretical context as well. This was of equal importance. The creation of a hospital planning laboratory situation meant that it was possible to place research and briefing in relation to a logical sequence of planning. It also meant that there would be an opportunity to evaluate the effectiveness or otherwise of the methods used.

In order to take advantage of these opportunities aims were set out as follows.

1 To develop a coordinated briefing and planning method.

2 To provide a basis for the production of the detailed design proposals for Greenwich.

3 To provide guidance for general application to hospital buildings.

It might be argued that, in essence, the situation was simple enough. Research was necessary where there was insufficient information available on which to base planning decisions, and briefing was no more than the interpretation of those decisions in a form intelligible to designers. In practice, however, this clear cut pattern was confused by the complexity of the problems of hospital planning and by various difficulties of organisation, communication and implementation. It is worth discussing these briefly because they formed the wider background of requirements against which the specific aims were seen.

3.1 PROBLEMS OF COMPLEX HOSPITAL BUILDINGS So far as complexity is concerned it is hard to imagine a single building type which involves such a closely interwoven pattern of functions and activities as does a hospital, nor one where the activities depend so closely upon one another. This means that decisions about any one activity are certain to affect many others, often in ways that are difficult to predict.

In a hospital system the elements involved consist of such dissimilar things as functions, departments, building components, rooms, people, activities and equipment. When these are linked together one by one they amount to considerably less than if they are planned as interacting parts of a total system. For example, structural systems consisting of beams, columns, panels and so on, do not realise their full potential until they are assembled in the right pattern according to the nature of the load to be carried and the part each element is intended to play in carrying the load. In particular, the nature of the interconnections or joints between each element and the others may be decisive in determining their efficiency or load carrying capacity.

In a similar way, if departments are treated individually they will be unable to cope with as large a total load as when they are acting in combination. Studies of this aspect of hospital planning by the

18 The matrix diagram shows in detail the complexity of interaction between operation and design in the Greenwich project.

Institute of Operational Research[2] have shown how the size of departments can be reduced if they are treated as a combined system rather than as separate entities. If the work pattern in one department, say an outpatient clinic, can be arranged to reduce peaks in the work load of another, say the x-ray department, a saving in total space and staff for departments may result. Or, if the peak demands of one department on a facility, such as changing or dining accommodation, can be timed to coincide with troughs in demand by another department, then the shared facility can be smaller.

There is also the form of interaction which, if not properly considered, may lead to inconsistencies in working methods or incompatible equipment with consequent annoyance to users or waste of resources. In making a decision on any part of the system the effect of that decision should therefore be considered, both in relation to the whole of which it forms a part, and also in relation to other parts of the system.

Matrix diagrams are an example of the kind of aid that can be used as a means of checking the likelihood or extent of potential interactions, but these cannot adequately represent the extent of interaction of even a relatively simple system involving decisions at different levels of importance. For this a three-dimensional matrix would be needed. Computers can sometimes help in identifying those decisions which must be linked, but in practice experience and good organisation can go a long way to ensure that planning decisions are compatible. For the Greenwich project it was essential to develop methods of articulating the complexity of the system involved, but equally essential to do this without employing highly sophisticated methods outside the range of ordinary management techniques.

3.2 ORGANISATION AND COMMUNICATION

At the International Building Exhibition Conference at Olympia, London, in 1965, Professor Page said that, at the start of a project, a client seldom knows what he really needs: 'he (the client) only knows where the shoe pinches and cannot make the imaginative jump from the present facts to future possibilities.'

During the early stages of the Greenwich project comments concerning recently completed hospitals revealed that quite often, when a building was completed, the user had not got what he thought he was going to get. And worse, that this situation often arose when user and designer each thought that they had understood the ideas, language and requirements of the other. This was an area of misunderstanding that had to be probed and allowed for in the research and briefing work.

It was seen as comprising two related problems which worked together to prevent good communication. First, the users and designers often came together in a structure which emphasised the disparity of their roles rather than their continuity. Second, the users themselves frequently had no common identity of aims.

The users of a hospital comprise many different professions and among them there will certainly be real clashes of interest. In this kind of situation one of three things can happen: one group gets what it wants and the others do not; a compromise is reached which does not fully satisfy any group; or all find agreement by identifying and reaching a common objective.

A briefing organisation was needed that would lead to the possibility of common objectives being established between users and between users and designers.

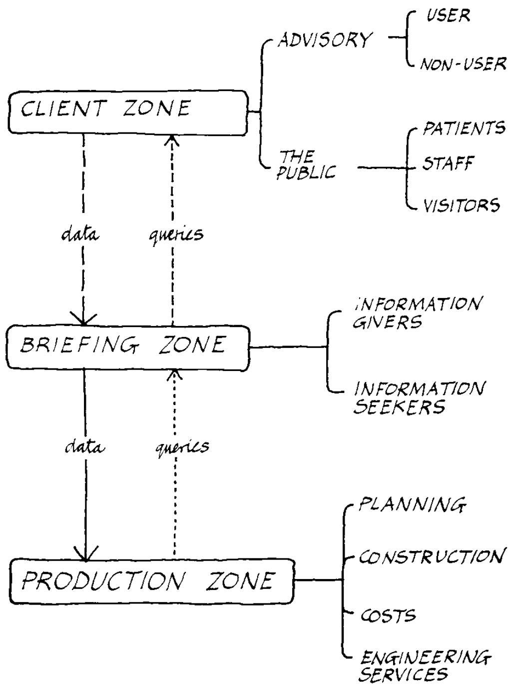
There was, in addition, a serious difficulty concerning the various media for recording research and the resulting design decisions. It was quite clear that these were being constantly misused – or, more likely, misinterpreted. Words that meant one thing in one discipline meant something quite different in another. Plans and drawings often seemed to confuse as much as they enlightened. It was decided that this whole area needed to be examined in detail and rationalised as far as possible. The question really was: how can the discussion of a complex system involving people, buildings and equipment be made real and intelligible in terms of words, drawings, plans and mock-ups?

3.3 IMPLEMENTATION Decisions once made can be recorded, but machinery is needed to ensure that they are carried out. Instances have occurred in many projects where decisions have been altered without reference back to the people who originally made them. This may occur where a department head or room user decides to use the facility in a different way. Often, however, the users prove not to have knowledge of the original intentions behind the design. A link in the chain has been left out, frequently leading to inconvenience and waste in operation.

But the implementation of decisions is just as crucial between the briefing and design stages as it is between design and use. A design brief may be produced in considerable detail by the briefing team but, unless it is completely comprehensive and is fully understood by the designers and users, there are likely to be failures in performance which are only identifiable when the operational stage is reached.

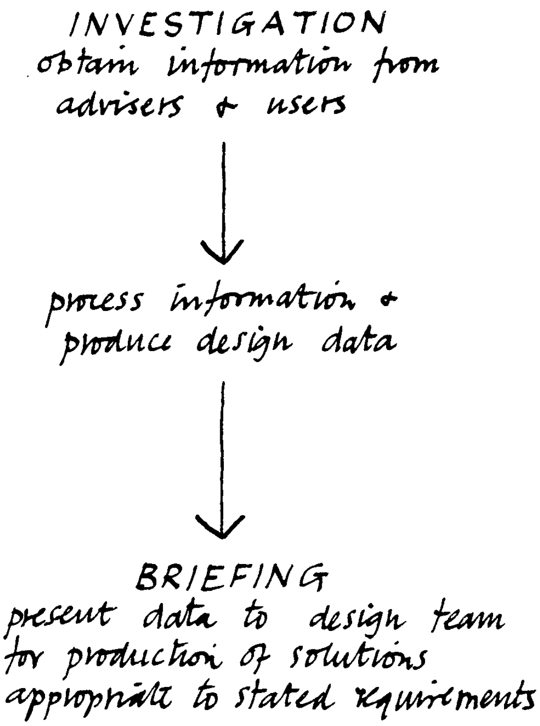
In short, the methods used for research and briefing should lead logically to design and operation. In the Greenwich project it was recognised that this requirement would have a considerable effect on, for example, the form of the briefing organisation and the way it related to the commissioning and management organisations of the hospital. It was also an important factor in determining the choice of methods of communication and recording.

ACTIVITY 'ZONES'



19

4 Organisation and Communication



19 The diagram shows the three broad zones of activity involved in designing any hospital building. Data flow in one direction and queries in the other.

20 The diagram shows, in the simplest terms, the briefing process.

In the broadest sense of each word, organisation and communication are the key factors in research and briefing. They were certainly considered so at Greenwich. At first sight it might appear possible to discuss them separately, but at every point one is dependent upon the other. This chapter, therefore, looks at both together. However, the combination is potentially a formidable one. Because of this it is presented rather differently from others in the book. Instead of the more conventional form of continuous text, the sub-sections that follow are self-contained sets of notes on particular aspects of research and briefing at Greenwich.

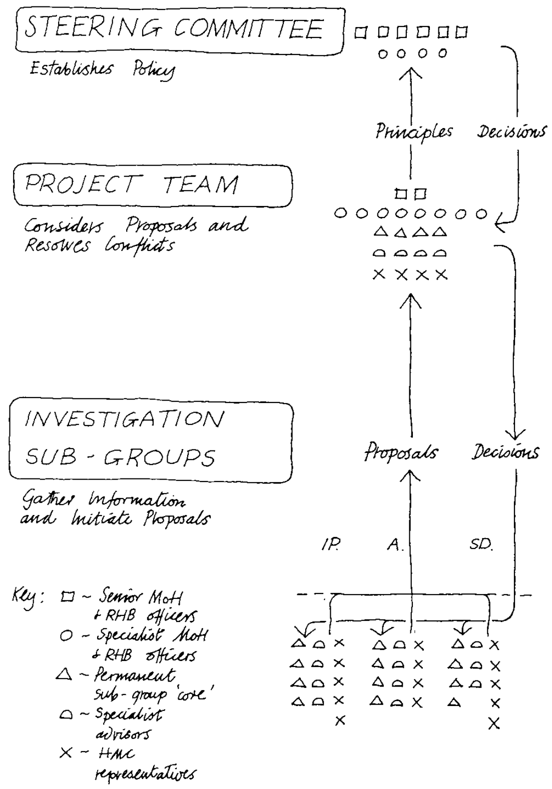
The notes fall into three interrelated groups. The first group deals primarily with organisation; the second with problems of data collection, organisation and communication; and the third with the merits and demerits of particular forms of communication. The titles in the groups are as follows.

4.1 THE SCOPE OF BRIEFING ORGANISATIONS

As building types become more complex, and the number of people involved in their production grows, so the need for completeness and clarity of the brief increases. In order to produce a brief which fully recognises the interaction of all hospital activities and processes, a briefing organisation must be designed which is capable of collecting, assessing and presenting all the available data relevant to the problem and then producing an objective report. Any such organisation must be multi-professional at all levels of work.

In order to clarify the situation, it is possible to identify three broad zones of activity involved in producing a building. First, there is a 'client zone', containing information givers. Second, there is a 'briefing zone', containing both information givers, and information seekers. And third, there is a 'production zone' which includes designers of all kinds: architects, engineers, quantity surveyors; and all those people concerned with construction.

Diagram 19 shows these three zones with data flowing in one direction and queries in the other. This situation seems to apply to most building types, and certainly to all hospitals. The production zone is the same for all major hospital projects, but a briefing organisation is necessary to resolve problems presented in the first two zones, and to communicate effectively with those involved in the production zone.


STEERING COMMITTEE
Establishes Policy
Principles
Decisions
PROJECT TEAM
Considers Proposals and Resolves Conflicts
INVESTIGATION SUB - GROUPS
Gather Information and Initiate Proposals
Proposals
Decisions
IP.
A.
SD.
Key: □ ~ Senior MoH & RHB officers
○ ~ Specialist MoH & RHB officers
△ ~ Permanent sub-group 'core'
⌓ ~ Specialist advisors
× ~ HMC representatives

21

1	Phasing and demolition	PD
2	Communications	COM
3	Administration	A
4	Records	REC
5	In-patient care (acute)	IP/ac
6	In-patient care (geriatric)	IP/ger
7	Maternity and ante-natal care	MAT
8	Radiography (X-ray)	X
9	Medical photography	MP
10	Pathology	PA
11	Physical medicine	PHY
12	Operating (surgery)	O
13	Out-patient clinics	OP
14	Accident and emergency services	AE
15	Supply and Disposal (catering	SD/cat
	(linen and textiles	/lin
	(housekeeping	/hk
	(medical	/med
16	Laundering and linen services	LA
17	Central Sterile Supply	CSS
18	Pharmacy	PHA
19	Training	TRG
20	Staff residential accommodation	RES
21	Building maintenance and engineering services	BE
22	Cleaning and control of infection	CCI
23	Equipment (generally)	EQ

22

21 The diagram shows the three-tier briefing system adopted for the Greenwich project.

22 The list shows the range of functions considered by the Investigating Sub-groups in the Greenwich project.

This general theoretical structure was the basis for the specific organisation evolved for the Greenwich project.

4.2 THE BRIEFING ORGANISATION FOR GREENWICH Four authorities were involved in the Greenwich project and all had to be represented in the briefing organisation. These were as follows.

1 The Department of Health in its normal role as the approving and advisory body.

2 The South East Metropolitan Regional Hospital Board (SEMRHB) as the client.

3 The Greenwich District Hospital Management Committee (GDHMC) as the users.

4 The Hospital Design Unit of the Department (a multi-disciplinary team), together with private consultant structural engineers as the designers.

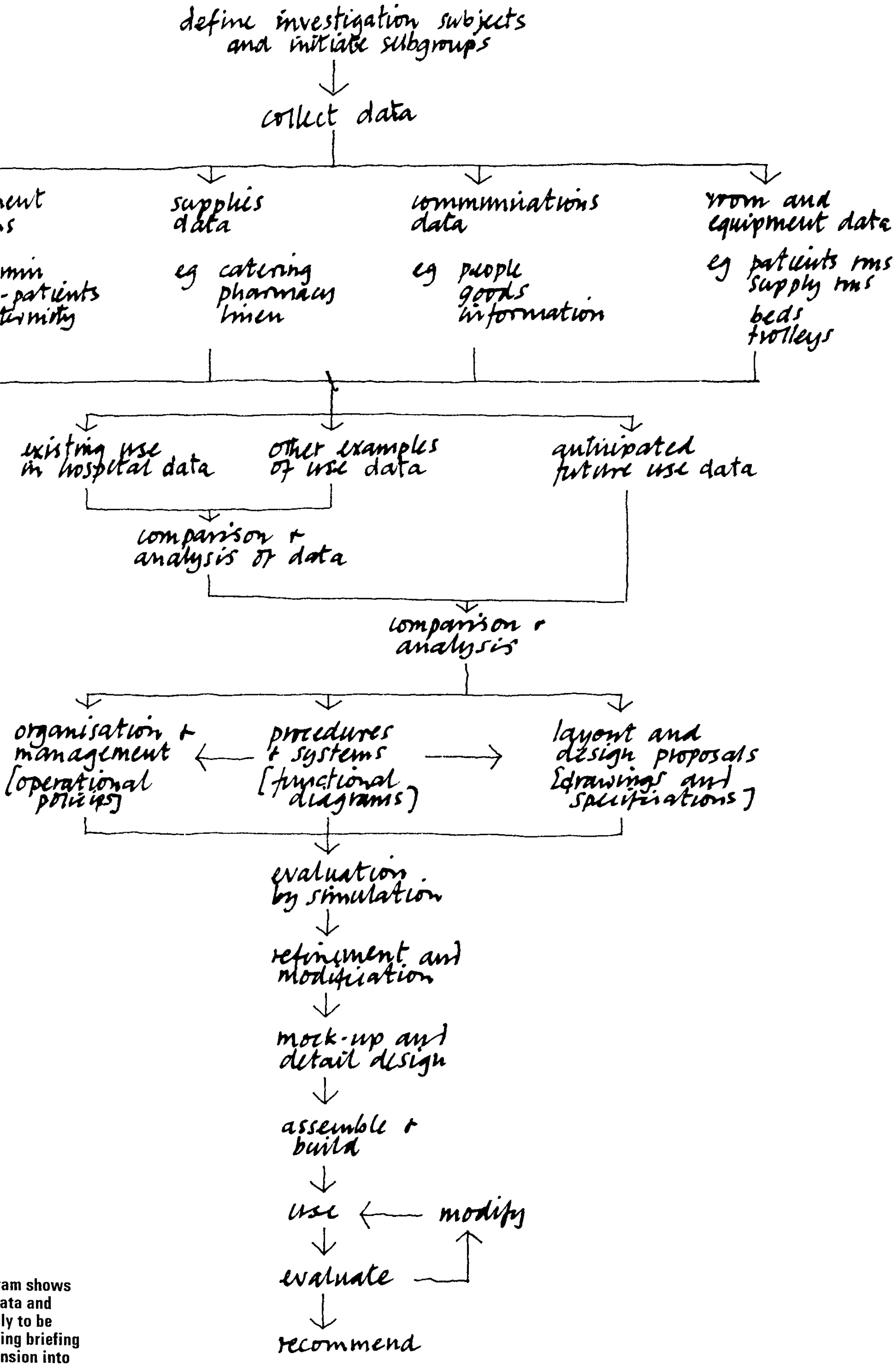
Although the titles used may vary, a three-tier briefing system appears to be common in most regional hospital board projects. A similar structure was adopted for Greenwich following proposals made by the SEMRHB.

At the top level was a body called the Steering Committee. In most regional hospital boards its equivalent would be known as the Central Planning Group. The task of such a group is normally to settle policy on a regional basis. But because of the special nature of the Greenwich project, and the large number of people involved, the Steering Committee (comprising senior specialist officers of the Department and the SEMRHB) was established for this one project. In the event, the Steering Committee only met a few times and its functions became absorbed with those of the lower level committee, the Project Team. Its concern was with the details of the project. In other situations a project team may well deal with a whole series of projects, but once again the nature of Greenwich made special provision essential.

At 'ground level' came the Investigating Sub-groups whose job it was to conduct the detailed briefing investigations. The members of each of these groups were selected to consider the range of functions set out in Diagram 22.

Staffing this organisation was shared between the Department, the SEMRHB and the GDHMC, care being taken to ensure multi-disciplinary groups at each level. The Department provided the research and development team and members of its administrative, medical, nursing and technical staffs worked throughout the committee structure: the 'design idea' was developed in the Hospital Design Unit. The SEMRHB made a complementary contribution at all levels, except that of building production design, and in addition provided the chairman for the Project Team and the managerial secretariat.

The GDHMC provided its chairman and senior hospital officers to serve on the Project Team, and both senior and junior hospital officers to take part in the Investigating Sub-groups. They also undertook a considerable amount of survey work which was used as the basis for the operational policies of the new hospital.



23 The diagram shows the range of data and activities likely to be necessary during briefing and their extension into design and use.

The medical officer and administrator who were responsible for processing the scheme through the Department attended all meetings of the Project Team and both the SEMRHB and the Department were able to call in specialist advisers from time to time.

4.3 RESPONSIBILITY FOR DECISION-MAKING IN THE GREENWICH BRIEFING ORGANISATION It has already been described how the research and briefing work at Greenwich had to fit into the context of the project as a whole. It was not a question of layout and building shape arising out of an analysis of user requirements. Rather, the basic physical limitations were intended to be as flexible as possible.

It was essential, for example, to carry out a preliminary exercise to decide on the zoning of departments, as this would form the basis of the development control plan. Until this was done work could not begin on the detailed investigations of functional requirements. This order of working worried some of the users involved who thought that this would decide too many important aspects of the building and reduce the following investigations to the level of simply trying to validate the original idea! It was important, therefore, to explain that the zones were not to be regarded as implying that firm decisions had been made, but that they helped in giving some idea of general physical relationships and overall size. This was a 'which came first, the chicken or the egg?' argument, but it is important to recognise that it is probably impossible to plan any project completely without preconceptions. Previous experience is a valuable starting point and, in the event, the proposed framework did not seem to hinder the breadth of the research and briefing work.

As a fundamental starting point the SEMRHB produced a briefing document (known as the 'Green Book') which provided statistical and other data, outline hospital policies, and proposals for the organisation of the project. This was in constant use as a reference point and was not seriously deviated from.

Within the briefing organisation the responsibility for decision-making was more complex. Planning seldom presents choices which are clear cut and, as has already been pointed out, the problems involved frequently interact. It was essential, therefore, to establish various levels of importance in decision-making, otherwise all decisions would have to be taken at the highest level.

For example, many decisions were taken at the level of the Investigating Sub-groups without reference to the Project Team or Steering Committee. It was only when uncertainties or conflicts arose that reference to a higher level of authority was needed.

In a similar way, it was necessary to distinguish between various methods for solving problems, and between the contributions that could be made by the particular professions represented in any one group.

Starting with the Investingating Sub-groups, each shared a common nucleus consisting of the project secretary, a doctor, a nurse, an engineer and two architects. This nucleus was purposely kept as small as possible. Around it a number of specialist advisers were built up according to the subject under discussion.

The responsibility of individuals within the Sub-group was purposely kept fairly fluid. For example, any member or members of the group might be asked to make visits and report back, to look up references, to talk to other individuals working in the same field, or to undertake pilot studies or mock-ups. However, the key to the success of the Sub-groups lay in the technique for directing the meeting and obtaining and recording the user information.

The job of the specialist advisers was to offer facts and opinions, and to answer queries. The value of the answers depended largely on the quality of the enquiry. The investigators were trying to assess need on behalf of somebody else, and often found that they had gathered 'loaded' information. One problem that often occurred was that the choice of alternatives offered for discussion was limited by the previous experience of the adviser. On occasion, none of the alternatives offered might be appropriate to the case under consideration.

It seemed, therefore, that such information seeking and recording might be the job for a hospital administrator, that is, the Project Secretary, once he had become familiar with the investigation method. However, it was quickly apparent that this was not the case. Asking the questions and recording the answers excluded the Project Secretary from the discussion, and when the recorded data was processed it was discovered that it did not reveal the topics of most interest to someone concerned with design. Hence, a reallocation of tasks within the Sub-groups took place at a very early stage.

Because of his training and experience, and because of his ability to provide a link between the different professions, the hospital administrator was relieved of any recording duties at Sub-group level so that he could take a fuller part in the discussion. Additionally, because the reason behind certain questions is often only fully understood by someone trained in design, and because a design training is necessary in order that the recorded data should be fully understood by design team members, one research architect was given the job of leading the discussion and another the responsibility of recording the opinions and comments made. This arrangement continued throughout most of the investigation stages of the project.

Coordination between Sub-groups was achieved mainly by having a small nucleus of people who could represent sufficiently the various viewpoints. This nucleus, moving from one Sub-group to another, consisted of the two briefing architects, one each from the Department and the SEMRHB, and the Project Secretary and a doctor, both from the SEMRHB. The interests of the Department and the GDHMC were normally represented at Sub-group meetings by specialist advisers.

At Project Team level the Project Secretary acted as secretary in the normally accepted sense of the word. Generally, and particularly during the investigation stages of the project, members of the Sub-group nucleus were present at all Project Team meetings together with advisers from the Sub-groups who might be affected by the decisions to be taken.

As the project moved from investigation to implementation, the Sub-group representation reduced and the Design Team representation increased. However, at Project Team level there was another important permanent representation: that of the user. In the Greenwich project this representation normally comprised the group secretary, the matron, two clinicians and a lay member of the GDHMC in the person of the Chairman.

So far as local medical representation was concerned, it was considered to be vital that the doctors attending the Project Team should have been nominated by and have the full confidence of their colleagues. At this level the doctors in the hospital were frequently involved in discussing proposals which had developed at a level uninhibited by the constraints that applied in the existing hospital. In this context it proved to be valueless to bring proposals to the Project Team for a 'yes' or 'no' answer. Full constructive discussion of each proposal in terms of the whole hospital was essential, and for this to be realistic the Project Team representatives had to have the full confidence of their absent colleagues. This they had.

4.4 POSSIBLE METHODS OF DATA COLLECTION

How data are collected affects their subsequent availability and use. It is a mistake to think that miscellaneous information about anything so complex as a hospital can be organised into a coherent pattern after it has been collected. The method of collection has to be assessed in this light.

At the outset of the research and briefing work various possible methods of data collection were considered. They are discussed briefly here with some notes as to their suitability in the context of the Greenwich project.

Looked at in the broadest terms there appear to be four possible methods of gathering information.

First, statistical records can be used to obtain a picture of patterns of activity over a period of time. Rates of through-put, peaks and troughs in demand, and rates of growth or shrinkage can be established far more reliably if good records have been kept over a number of years. In many cases, however, facts will need to be obtained specially for a planning project, to establish the scale of provision needed.

Second, information can be collected from users – staff, patients and visitors – by means of questionnaires. This method requires very careful preparation and may involve fairly elaborate analysis and interpretation. Response rates can sometimes be very disappointing.

Third, information on user processes may be gathered by observing what happens at present, either by being a discreet 'fly-on-the-wall', or by taking part in the processes as a patient or member of the staff. The information can be amplified by recording comments from various participants on their activities, and by photographic means.

Observations may either be carried out in the organisation being planned for, or in other organisations as a basis of comparison, or both.

Fourth, discussions can be held which allow users and advisers to express their points of view and to describe processes in which they are expert, mainly for the benefit of the designers, but also incidentally for the benefit of their colleagues, who may have been working alongside them for years without knowing very much about the total process.

Care must be exercised in interpreting figures collected for purposes other than planning. The circumstances to which the figures relate must be known so that adjustment can be made to allow for changed circumstances in the future.

Each of these four methods – statistical records, questionnaires, observations and discussion – may be used as a check on the others.

In addition to these general categories, it was thought worthwhile to examine the practicability of using any of the existing more specific methods of collecting information about user requirements. Here, three possible systems – the Room Data Sheet method; the Activity Data Method and a Royal Institute of British Architects (RIBA) method were considered. Each of these was related to the idea of analysing in detail a particular activity or space.

The Room Data Sheet method (RDS) was devised by a number of architects working in hospital planning. It was first presented at the RIBA hospitals course, and afterwards was further developed by an inter-hospital board study group. As the name implies RDS takes 'the room' (as part of an accepted accommodation schedule) as its basis. However, the object of the Greenwich investigation was to start by questioning the whole purpose and organisation of the hospital, so to begin at room level would have been too restrictive. RDS was rejected, but it was appreciated that it had much to offer as a means of communicating design data at a later stage of planning.

Instead of assuming a schedule of rooms, which in turn may presuppose a design solution, the Activity Data Method (ADM)[3] is more fundamental. It records details of the activities which are to take place. However, it is necessary to compile a complete list of activities as a first step and to do this a formalised organisational structure is needed. Once again, this would have been too restrictive. It was, however, accepted that this type of information would be needed for the detailed analysis of activities confined to particular rooms or spaces, and it has been used as the basis for the report of the Department's User Requirement Study Group.

The *RIBA Handbook*, published in July 1965, contained a section on the study of user requirements which suggested a more comprehensive approach than either RDS or ADM. A draft of this publication became available to the research architects in July 1963, and offered the possibility of systematically analysing a total organisation where the various activities, equipment and people involved could be identified from the outset. But, as before, it did not provide the information needed to build up an organisational picture from first principles. It was, therefore, decided to adopt a new method for the Greenwich project.

4.5 METHOD OF DATA COLLECTION FOR GREENWICH: *BRIEFING BY FUNCTIONS* Lord Llewelyn-Davies[4] has said that the brief should aim to give the designer 'complete comprehension' and that anything less is baffling. Accordingly, it was considered essential, in the Greenwich project, to avoid any investigation technique which would tend to 'freeze' ideas on hospital planning. The technique also needed to allow for changes of people, processes and policies which seem to take place continuously in large organisations such as hospitals. For example, the matron who was in post at the start of the project left before Phase One was opened. As a result there has been a change in the policy relating to progressive patient care, from progression within a ward to progression within a group of wards.

The Greenwich investigation began by examining each of the main functions and the potential organisation patterns at *whole hospital level* rather than by studying the design requirements of individual departments.

If the complete hospital were to be more than just a collection of individually planned departments it was vital to obtain proper coordination of working arrangements and to acquire an understanding of the way in which the hospital worked as a complete system. Obviously, the policies governing the operation of the whole hospital have important departmental, room and equipment implications. At Greenwich, therefore, department, room and work-space planning was not considered in detail until the major organisational, traffic and supply policies had been settled in outline for the whole hospital.

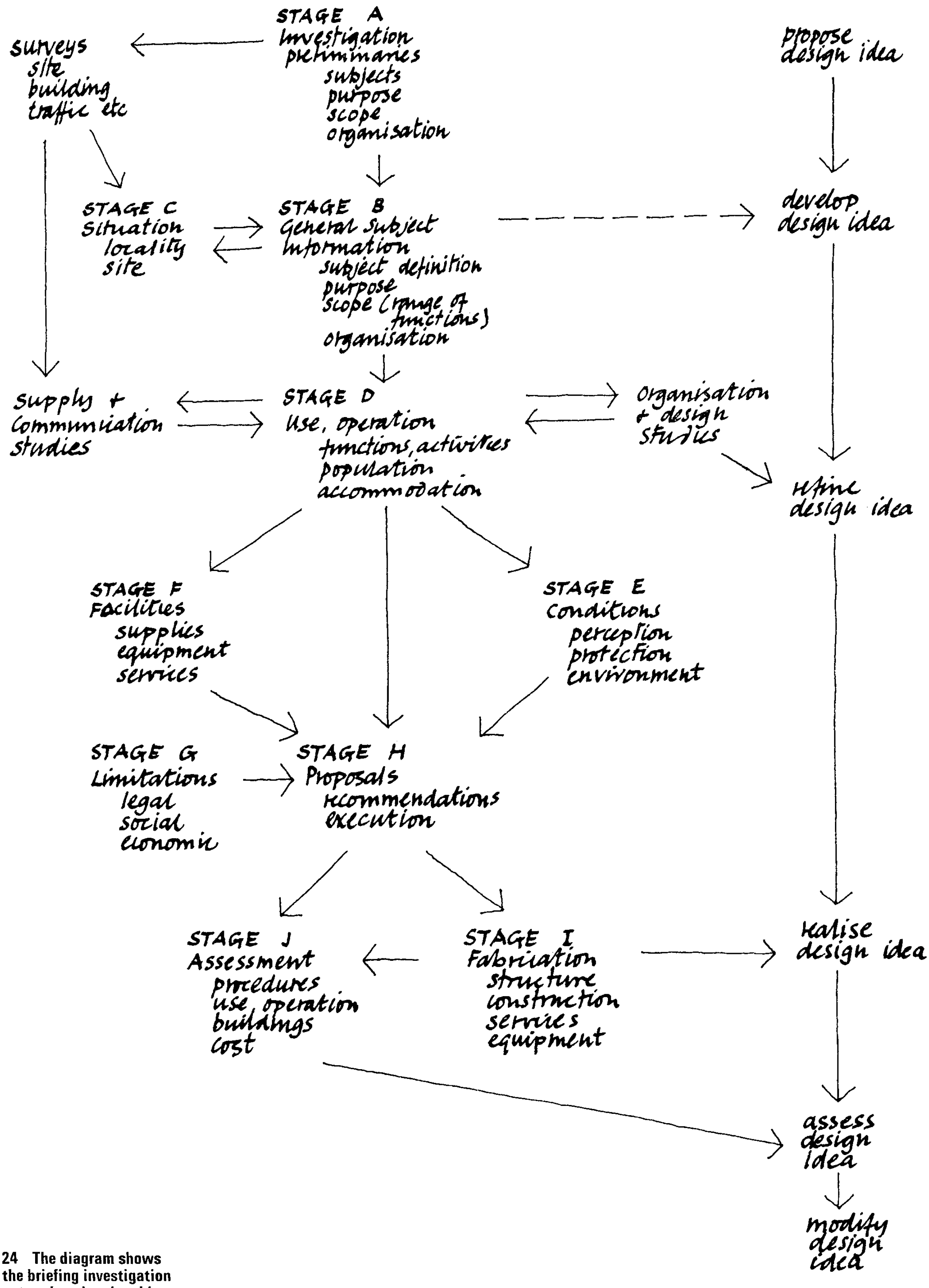
For example, 'inpatient care', as a hospital system, was examined prior to considering the detail design of 'wards'. This enabled the whole range of a patient's needs to be considered from the time he first saw his family doctor until after he was discharged from hospital.

The implications of this approach are seen in detail in Part Two which shows how it was applied to the research and briefing work for four specific hospital systems – inpatient and outpatient care and the operating and clinical pathology 'departments'.

4.6 METHOD OF DATA COLLECTION FOR GREENWICH: *PROCEDURE HEADINGS*

As described in subsection 4.4, obtaining information about user requirements can be tackled in a number of ways. At Greenwich a combination of them was adopted. To facilitate this work and to make it coherent, a series of procedure headings and check lists was developed. The main procedure headings followed a logical sequence and were as follows.

A Decide how you are going to carry out the investigation.
B Find out the general facts about the subject being studied.
C Find out about the place where the subject is to be situated.
D Find out how it is to be used or operated, by whom and the accommodation needed.
E Find out what conditions are required for proper use or operation.



24 The diagram shows the briefing investigation network as it existed in the Greenwich project.

F Find out what facilities are required.
G Find out what limitations there are on the use or design of the subject.
H Propose a design to meet the requirements stated.
I Decide how to fabricate the design.
J Find out how it works in use.

This list, enlarged to give it a hospital context, is shown in detail in Appendix A.

The procedure headings and supporting check lists were available in book form to those concerned with the investigation and briefing process. This book contained a brief description of the method, a summary of the main procedure headings and detailed subdivisions supplemented by check lists. The headings were used as a vehicle, or agenda, for discussion and for reference during the later design stages.

Each procedure heading used as the basis of discussions was given a serial letter and number. Thus, INVESTIGATION PRELIMINARIES was coded A; GENERAL INFORMATION was B; SITUATION was C; USE AND OPERATION was D; and so on (see Appendix A). Each subheading of the above headings was then given a serial number starting with SUBJECT definition as 1; PURPOSE as 2; SCOPE as 3; ORGANISATION as 4; LOCATION as 5; SITING as 6; and FUNCTION OF SUBJECT as 7. Further subheadings were then given serial numbers within each group. PURPOSE, coded B2, contained:

B2/1 HISTORICAL BACKGROUND
2 EXISTING SITUATION
3 OBJECTIVES
4 FUTURE TRENDS

Diagram 24 shows the relationship of the various procedure headings to one another. Down the side are six stages which represent the 'design idea' and its development throughout the project. This design idea acted as a control for the investigation, being developed and modified as necessary during the detailed investigation period.

For certain types of investigation, for example, surveys, organisation studies and so on, some sections of the procedure headings were either inappropriate or did not apply, in which case they were missed out, or the sequence or content was modified as necessary.

4.7 METHOD OF DATA COLLECTION FOR GREENWICH: ***RECORDING*** A simple form was designed upon which to record the notes of meetings. It was laid out so as to be usable in a variety of different ways

1 Simply as paper, with guidelines and a standardised heading at the top.

2 As a permanent record card, for filing the information from meetings under subject headings for subsequent reference and for correlation of information.

3 As a card for filing design decisions, schedules, and so on during the design stages.

In addition, any assessment of the building which might be made at a later date could be recorded and filed alongside the statement of requirements and design decisions made earlier.

In effect the form represented the basis of a complete and standardised documentation and classification system for the whole project.

The form was printed in grey and made up in pads of 100 sheets, ISO A4 in size (the same as the page size of this book), but divided exactly in half, with a repeat page heading at the top of the lower half so as to form two ISO A5 size index cards. Each half sheet unit was intended to contain only one procedure aspect of a subject, so that it would be easy to add further data later in the enquiry without upsetting the sequence of information. The record of discussions was roughly written out at the meetings, noting details identifying the subject, meeting number, those present and the initials of the recorder. In the left-hand column was entered the procedure heading number from the standard list, the right-hand column being used for cross references to other subjects. Nearly all the Investigating Sub-groups followed the same sequence and recording method, so giving a systematic pattern to the whole investigation and making it much easier for those involved to find their way around the recorded data.

Simple abbreviations were used such as IP for Inpatient care, TRG for Training and CAT for Catering. A full list is given in Diagram 22. All sub-group discussion forms were coded with the relevant abbreviation, each meeting was given a serial number and each sheet was given a further serial number. A typical sheet would thus read IP 7/12 representing the twelfth sheet of meeting No 7 of the Inpatient Care Investigating Sub-group.

4.8 METHOD OF DATA CORRELATION FOR GREENWICH The Greenwich documentation system consisted of a number of more or less sequential steps or stages of progression. It ran from the statement of guiding principles and the identification of needs, to the production of commissioning and operational manuals. At a later date evaluation will be added to the sequence. These steps corresponded quite closely to the Hospital Building Procedure Note 4 and the RIBA Plan of Work stages. However, the purpose of the various types of documents produced was not simply to meet the needs of the approving authorities or of any *one* group of users. There was also the question of the correlation of information between groups. Basically, this resolved itself into a matter of classification.

The Department's procedure for approving projects fixed many documents to a specific time during the

25

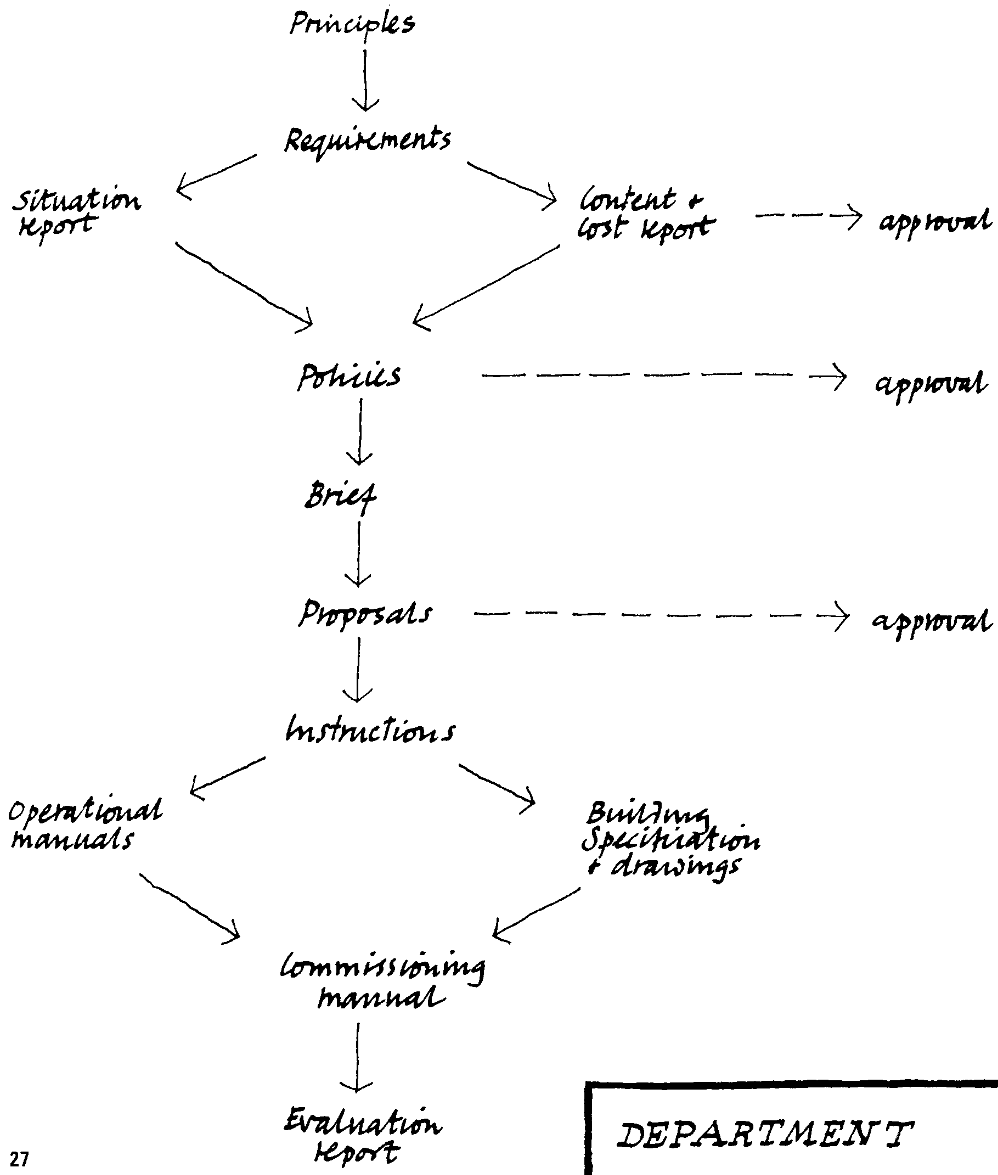
Office	**M.O.H. and S.E.M.R.H.B.**	ref.	class
Job	**GREENWICH DISTRICT HOSPITAL (St. ALFEGE'S)**	by	
Subject		date	

RIBA stages		HBPN stages
A	general planning principles	pre A
	identification of needs	A
B	effect of limitations	B
	analysis + synthesis	
C, D	outline design proposals	C
E	detail design proposals	D
F, G, H	specification, tender and contract	E
J, K	site supervision	
L	completion of building	
M	commissioning	F
	operation	
	evaluation and modification	G

26

25 Greenwich—the form used as the basis for collecting and recording data.

26 The table shows the main stages in planning and how the RIBA Plan of Work stages relate to those of the Hospital Building Procedure Note.



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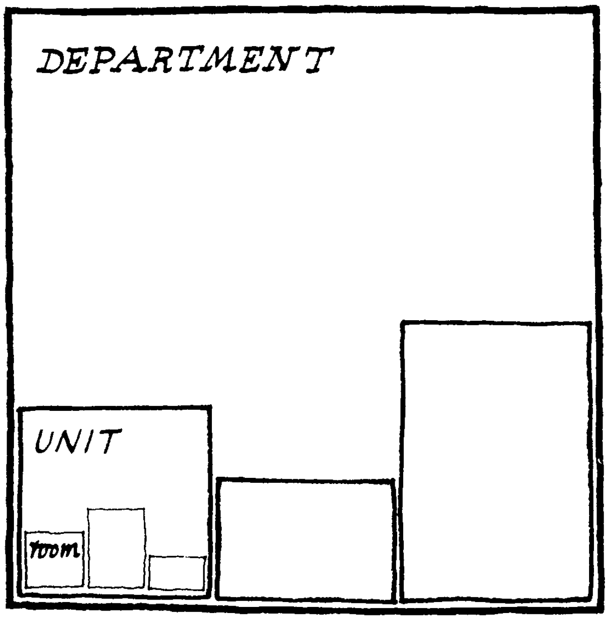

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27 The diagram shows the main stages in planning documentation at Greenwich and how they were related to the Department of Health's approval procedure.

28 and 29 The diagram and table show how size or scale can be used as a basis for classifying and coordinating documents. 28 shows departments, units and rooms as successively smaller steps down a scale; 29 shows this concept extended to give a complete table of sizes which can be used in project documentation.

development of the project, but this represented only one possible use of each document. It was a very inflexible and unsubtle kind of classification. Diagram 27 shows how the planning stages at Greenwich were interpreted so as to allow the classification of documents according to their use as well as the mechanism of approval.

Another concept which was used as a basis for coordination was the size or scale of the thing to which the document referred. Hospitals, departments, rooms and items of equipment are successively smaller steps down the scale. A table of sizes which can be used in project documentation is given in Diagram 29. The idea of sets of elements making up larger sets is another way of looking at this concept as shown in Diagram 28.

Many classification systems have been invented to try to deal with the problem of arranging subjects or concepts in some sort of useful or systematic order. Library systems in common use, such as the Universal Decimal Classification (UDC), or the Bliss Bibliographical Classification, form groups of related subjects which are then subdivided according to certain guiding principles. Other classifications such as the architectural SfB system use descriptive characteristics or 'facets' for organising and retrieving data.

These basically bibliographical or technical systems do not necessarily lend themselves to the classification of data for a planning and building project. They were considered for use at Greenwich but were rejected in favour of an elaboration of the abbreviation system described in 4.7. During the Greenwich research and briefing work it was found that most documents only needed correlation under two or three such divisions but that, nevertheless, this made them accessible at the right time, at the right scale, and to the right people.

1	International	eg World Health Organisation
2	National	eg National Health Service
3	Regional	eg Regional Hospital Board
4	Local	eg Local Health Authority
5	Project/Building	eg Hospital Management cttee
6	Department	eg Inpatient wards
7	Unit	eg Intensive therapy unit
8	Room	eg Bed room
9	Work space	eg Bed space
10	Equipment	eg Bed
11	Component	eg Head board
12	Item/material	eg locking handle / metal

29

A	Administration, management	a	architecture
B	Building, construction	b	briefing process
C	Culture, art, sport	c	content
D	Design, planning	d	drawing techniques
E	Engineering	e	ergonomics
F	Finance, commerce	f	space needs
G	Geography	g	layout, access
H	History	h	shape, form
I	Information	i	siting
J	Justice, law	j	zoning
K	Knowledge, science	k	grouping
L	Life, domestic science	l	location
M	Medicine, disease	m	models
N	Nursing, welfare	n	mock-ups
O	Organisation	o	design process
P	Philosophy, religion	p	design principles
Q	Equipment, plant	q	dimensional coord.
R	Research	r	design requirements
S	Sociology, staff	s	design synthesis
T	Teaching, education	t	presentation methods
U	Use, operation	u	growth + change
V	Environment, safety	v	evaluation techniques
W	Wates, products	w	
X	Execution, production	x	phasing
Y	Supply, storage	y	
Z	Projects	z	

30 The table shows an extended alphabetical subject classification for the coordination of planning documents. Each capital letter is related to smaller subdivisions as shown in detail for the Design, Planning division.

4.9 THE PROBLEM OF DATA PRESENTATION

Much of the confusion between designers and users comes from the way in which data are presented. This is not simply a problem at the point where drawings or models have to be 'approved', though it is acute there. It is also a question of what form of data presentation can be used to make choices and discussion realistic and clearly understandable. This is particularly the case at the planning stage which is inevitably more 'remote' from the real world than, say, the detailed design stage or the evaluation stage.

Although it is normally assumed that planning and design discussions have to be conducted in words there are other possibilities. Adaptable diagrams showing functional relationships, computer programmes modelling operational systems, and variable three dimensional mock-ups of proposed rooms or equipment are obvious examples which are in daily use in various areas of planning or design. The intention of all these is to give substance to alternatives and to make them comprehensible. They can often be linked directly to the method that will eventually be used to put into practice the decision that they have helped to articulate.

The following subsections, 4.10 to 4.14, discuss the use made of various forms of data presentation in the Greenwich project and comment on the experience so gained.

4.10 DATA PRESENTATION FOR GREENWICH: *DOCUMENTS, WORDS AND MEANINGS*

Much of the information gathered in the course of planning any building or carrying out any research project is conveyed and stored by the use of the written word.

Many of the meetings and discussions on requirements and design possibilities for Greenwich, although initially using the spoken word, were converted into written form. This was in a summarised version, on the ISO A5 forms described in 4.7, so that as much evidence as possible could be stored and retrieved as and when needed.

Some members of the team considered that there was too much question asking and writing down. But the hospital planning laboratory situation was a unique opportunity for collecting a great deal of detailed information about various users' and advisers' ideas on hospital operation and design. If it had not been systematically recorded there would have been no chance of looking at it in its entirety and picking out the bits which seemed the most important. The written word appeared to be the most useful way of achieving this end.

However, it is evident that no amount of organisation or documentation can ensure good results if the people concerned do not read the words involved, or if they understand by them something different from that intended by the writers. With increasing specialisation, and the widespread use of jargon as a form of shorthand within professions, this is a problem likely to get worse rather than better. For example, an editorial group preparing an as yet unpublished glossary of hospital planning terms under the auspices of the King's Fund found that some words were simply not capable of an agreed interdisciplinary definition. Additionally, some words carry with them an emotional charge which is of its nature and essence irrational, or rather, intuitive. Arguments about the difference between the meaning of the words 'training' and 'education' are indicative of such misunderstandings.

There is also the point that documents which require action to make them effective are a dead letter without an organisation to put them into practice. Nearly all hospital evaluation studies have revealed failures resulting from the non-implementation of carefully considered and recorded decisions made by planners. Experience in the Greenwich project confirmed the importance of this factor.

4.11 DATA PRESENTATION FOR GREENWICH: ***DRAWINGS AND DIAGRAMS*** A problem that continually occurs whenever a layout drawing is shown to a user is, that it is frequently taken as a definite proposal when, in fact, it may only be intended to illustrate an idea in the early stages of formulation. Drawings and diagrams are tantalisingly precise on those occasions when they are intended to be only a working hypothesis. On the other hand, they are frequently not sufficiently clear when intended to communicate a complex set of definite proposals.

As an aid in planning and design, drawings are used for two main purposes: exploration and explanation. The designer often explores an idea with the aid of drawings. The drawings may then be turned with very little modification into the means of explanation to someone else. Drawings produced in this way are frequently confusing to others than the designer, and their use as a basis of communication is likely to be very inefficient.

At a more detailed level of presentation a layout drawing of equipment in a room may be a useful way of checking that the equipment fits in two dimensions, but it does not convey at all clearly how it will appear or work in actuality. Even three-dimensional diagrams or perspective sketches are inclined to be misleading if not carefully drawn to avoid distortion.

Another problem is, that in order to economise in time and manpower, one diagram or drawing is often made to serve two or more purposes. The client may be asked to approve the layout of a department or room from a drawing intended for others involved in design or construction, such as the structural engineer or services engineer – or even the contractor. Dimensions, symbols and codes used on a contractor's drawing are meaningless and confusing to the user as a basis for approval.

Difficulties of interpretation are perhaps even more acute where an organisation or system, rather than a design, is being represented in a diagram. Yet the discussion of organisations and systems is at the core of the planner's work. It was therefore decided that an aspect of the research at Greenwich would be to attempt to develop a form of diagram which would effectively represent organisations and systems at a stage before, but related to, design proposals.

Apart from the fact that this was a serious problem in general terms, there were three more specific aspects related directly to Greenwich which made it particularly important. These were as follows.

1 It was necessary to take a synoptic view of related activities which, when looked at collectively, would establish the context of any individual activity.

2 No previous efforts had been made to look at the 'network' of hospital activities in diagrammatic form and to discover the degree of their interaction.

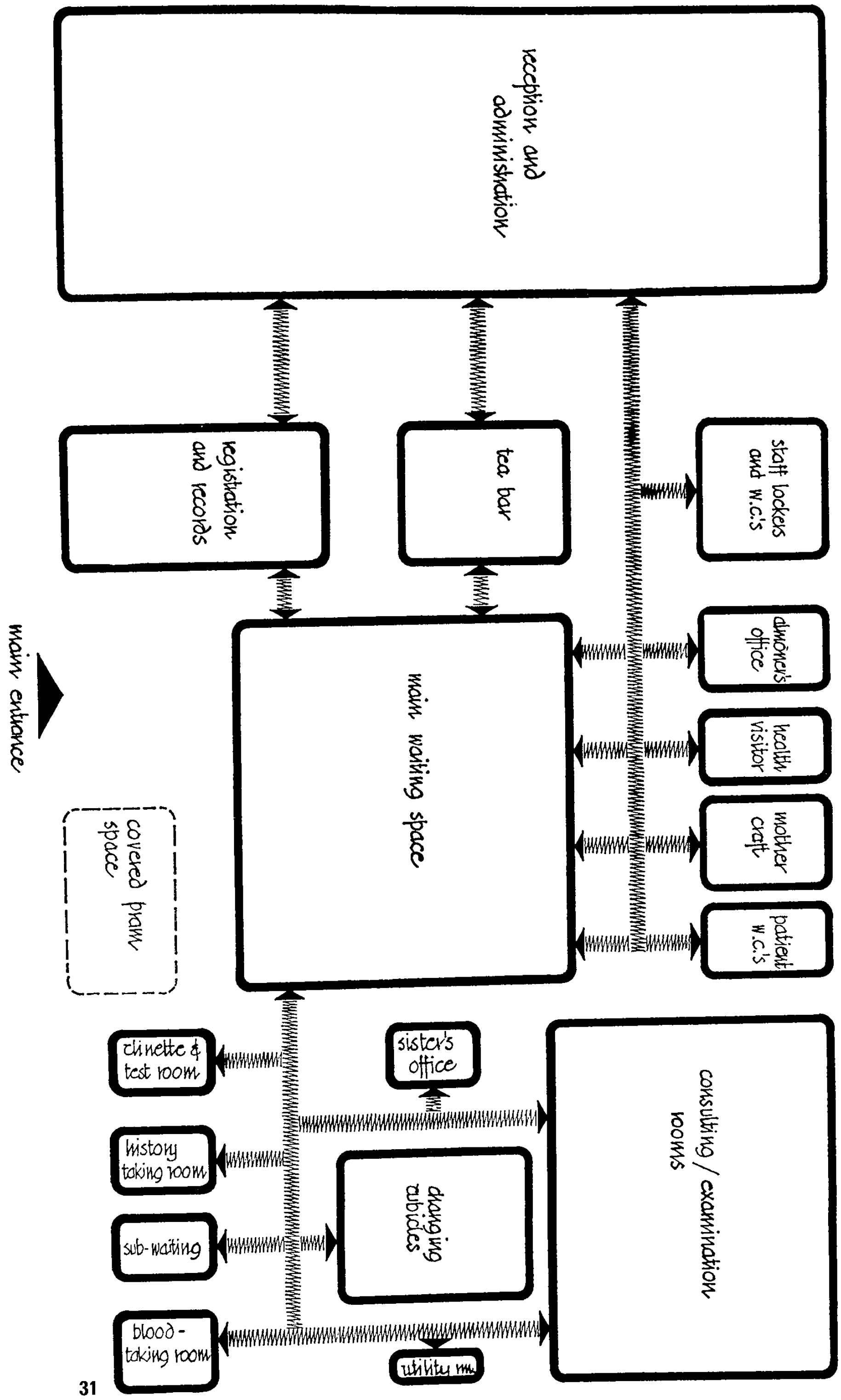
3 An unambiguous vehicle was required for understanding, discussing and approving operational methods and policies.

A problem which the researchers had to solve was to devise a form for such diagrams so that they would reveal any gaps in knowledge, and also provide a basis for producing and evaluating layout proposals at hospital, department and room level. The traditional types of flow or bubble diagram, used to indicate space relationships, were thought to be not only inadequate for understanding functions, but also misleading as they might be taken as space planning proposals.

A device used by industrial plant engineers, known as a 'process chart' or 'functional diagram', was adopted for the Greenwich project, and on such diagrams were represented sequences of *events* applying both to people and things. This clarified the nature of the relationship between the various functions and activities and could be produced so as to illustrate different degrees or levels of detail.

31 (opposite) The traditional type of flow or bubble diagram. Diagrams of this type may be mistaken for definite space planning proposals, when intended simply to represent functions.

32 and 33 (overleaf) Greenwich—examples of functional diagrams. Diagrams of this type, based on the process charts used by industrial plant engineers, proved to be a good way of representing planning proposals. They did not suggest actual spaces and, where these needed to be explored, they were shown explicitly as such. Further examples of functional diagrams will be found in Part Two of this book.


reception and administration
registration and records
tea bar
staff lockers and w.c.'s
almoner's office
health visitor
mother craft
patient w.c.'s
main waiting space
main entrance
covered pram space
consulting / examination rooms
sister's office
clinette & test room
history taking room
sub-waiting
changing cubicles
blood-taking room
utility rm.

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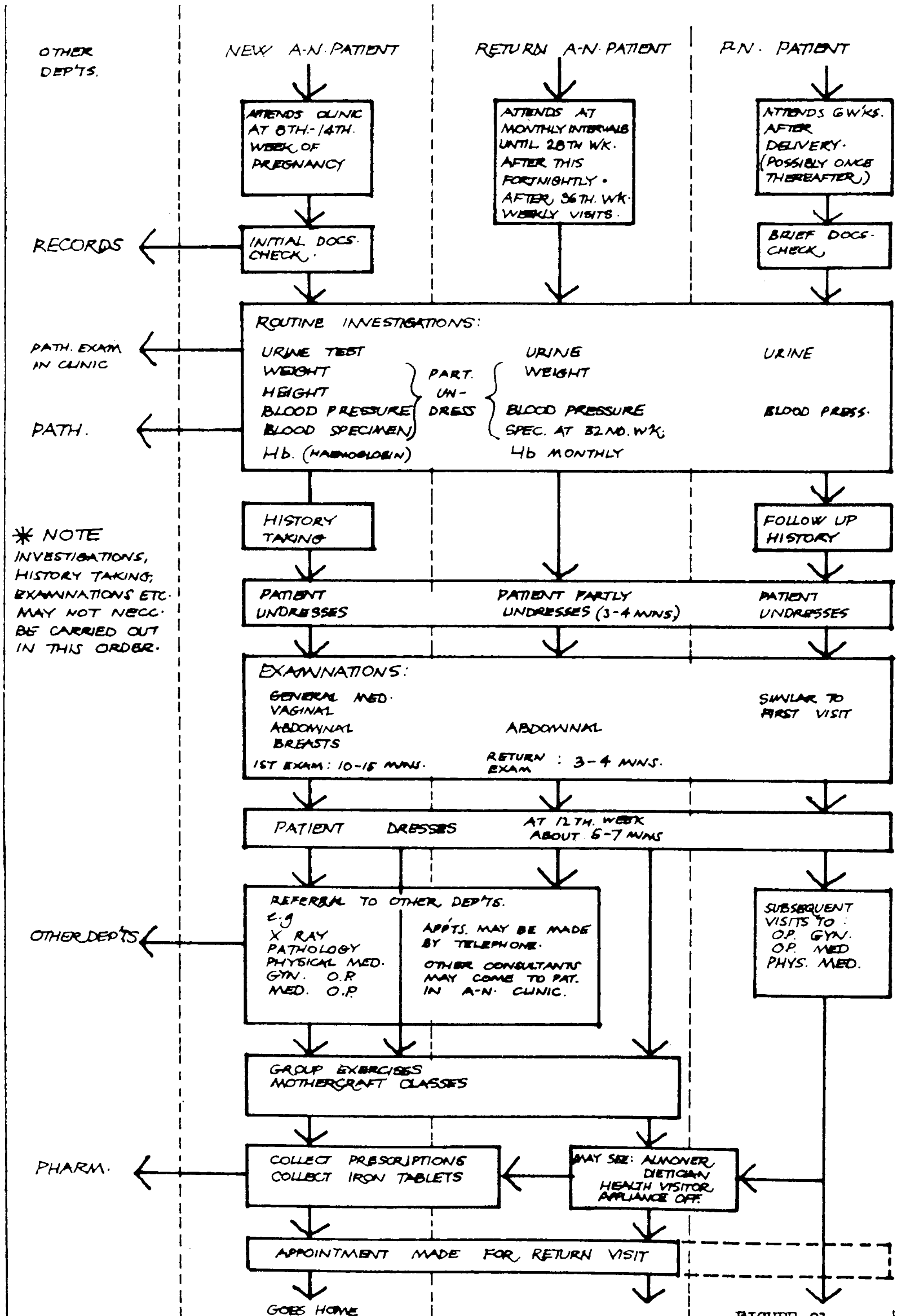

FIGURE 21

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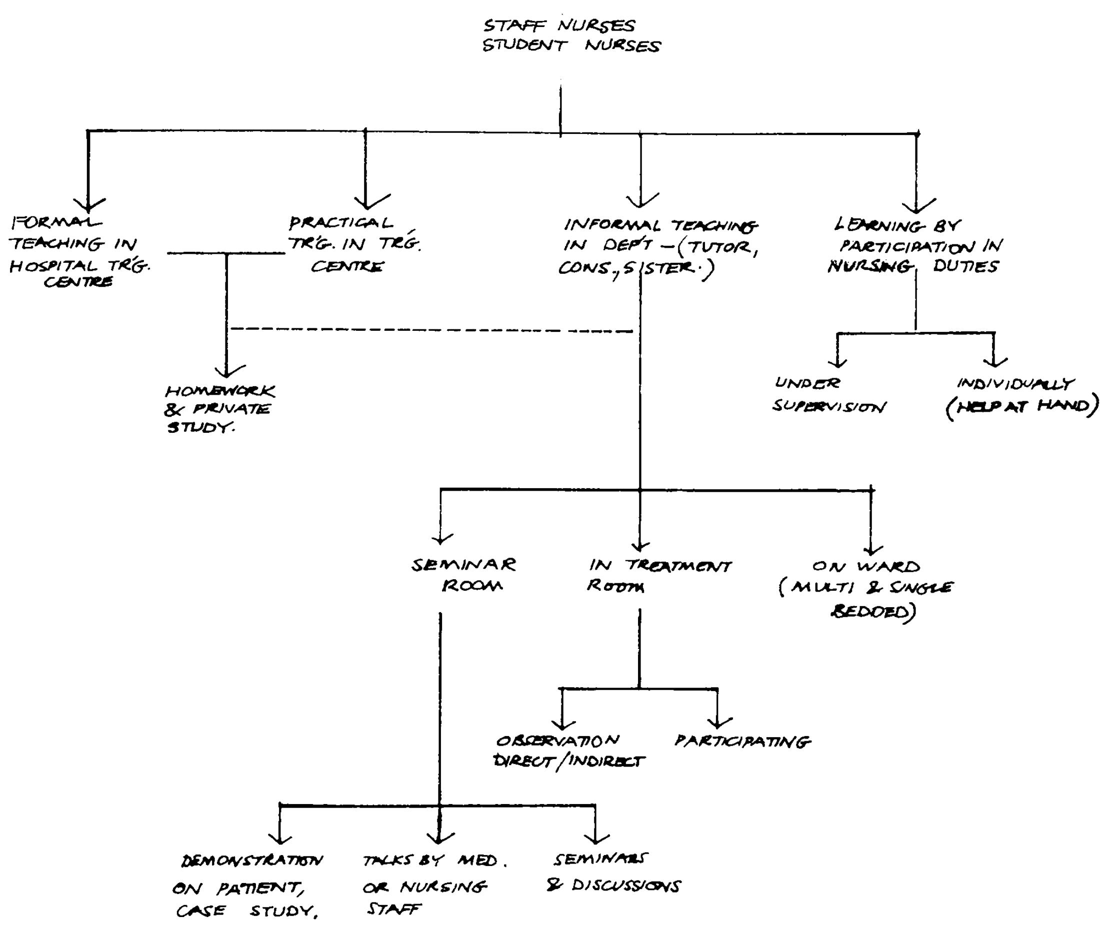
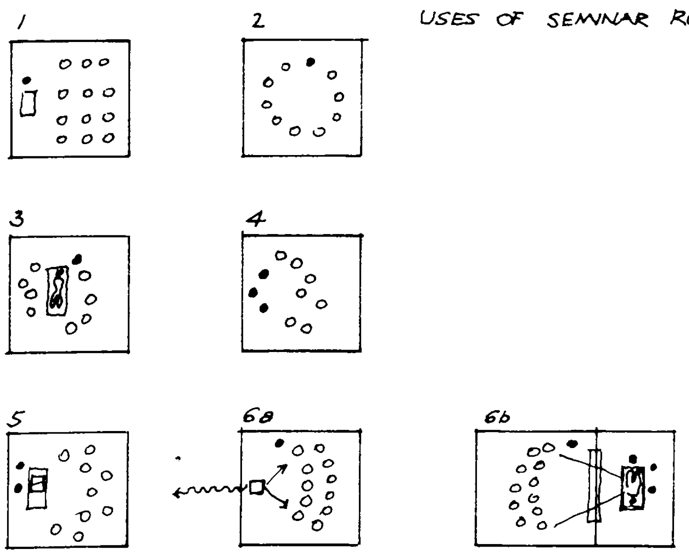
PATIENT SEQUENCE	REF 2/01

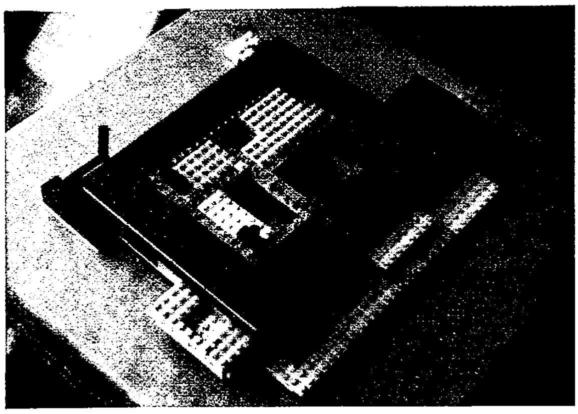


USES OF SEMINAR ROOM

1. FORMAL TEACHING TO GROUPS.
2. INFORMAL DISCUSSIONS
3 CASE STUDY
4 BRIEFING NURSING TEAM
5 TEACHING SESSIONS WITH MEDICAL ST'S. & TECH. STAFF.
6a OBSERVATION OF TREATMENT AREA BY CLOSED CIRCUIT T.V.
6b. OBSERVATION OF TR'T. AREA FROM ADJOINING ROOM.



IN PATIENT CARE. G.D.H.	M.O.H. Architects Branch	IP / 29
TRAINING, NURSES. USES OF SEMINAR RM.	Ref. 3/7 5/2	



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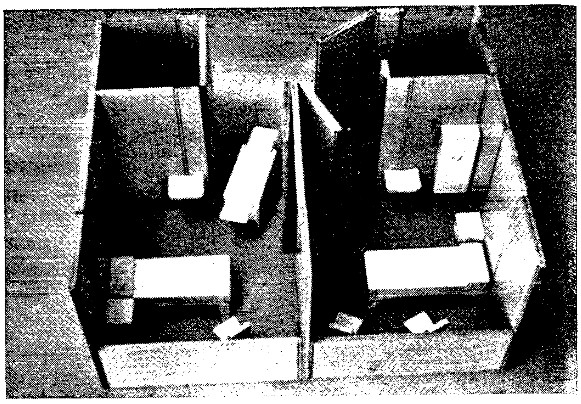

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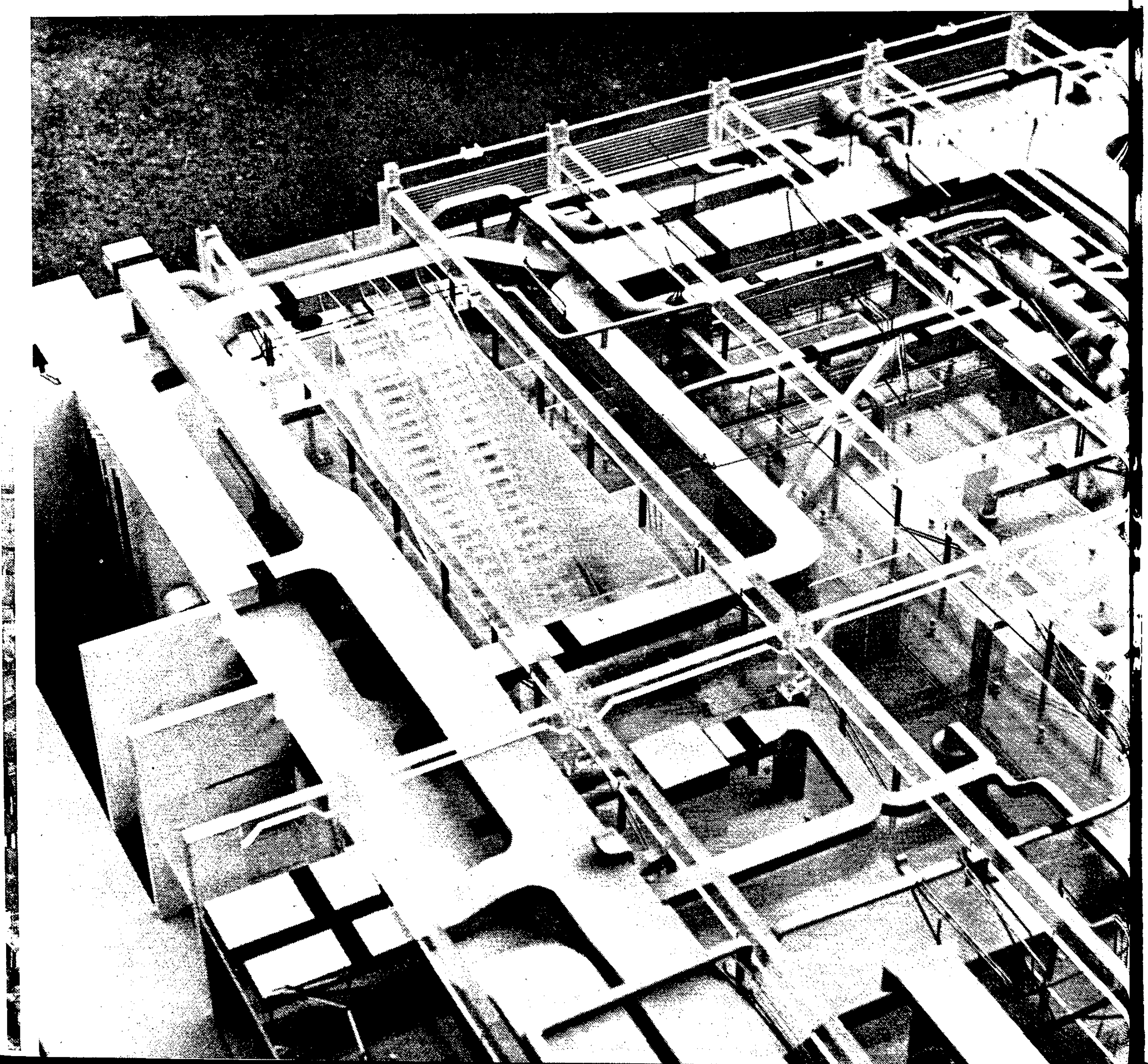

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4.12 DATA PRESENTATION FOR GREENWICH:

MODELS The use of models was foreseen from the start of the Greenwich project. Many of the design ideas were worked out with their aid and the resulting proposals were put to the users in the same form.

Various types were used. For example, ideas on the size, shape and possible layout of the whole hospital in relation to the site and organisational requirements were tried out, using a proprietary toy building kit consisting of coloured interlocking plastic bricks. These were used in a variety of representational scales, and the colours proved helpful in distinguishing between different functions, zones or phases.

Another modelling device which was used to a limited extent in the layout of rooms and equipment was originally developed by the Building Research Station. This consisted of panels of metal-faced plywood with magnetic edge strips so that the panels could be assembled edge-to-edge in the form of rooms. In addition, moulded plastic units representing beds, tables, sinks and so on were available which could be attached to the wall panels by a small piece of magnetic strip. The scale used in this system could be varied from $\frac{1}{2}$ in to 1 ft (about 1:25) up to 1 in to 1 ft (about 1:10). Any smaller scale became too difficult to manipulate while a larger scale was too cumbersome to accommodate and move about.

A model was made to demonstrate the engineering services and plant in the shafts and voids. Solving the complex interrelationships of conduits, valves, pipes and ducts with structural elements may be assisted by models to work out the best locations and routes for the service elements. This technique has been widely used in the design of chemical engineering plant and laboratory engineering services in the United States. It has probably not received sufficient attention in the United Kingdom.

Models were sometimes used in engineering design as the only means of calculating or checking the sizes or arrangements of elements. For example, the chimney height and the shape and location of the ventilation intakes and exhausts for Greenwich were checked on a large-scale model in a wind tunnel. This was to ensure that the smoke from the boiler-house chimney did not enter the ventilation system and that wind pressures around the face of the building would not upset the discharge of vitiated air.

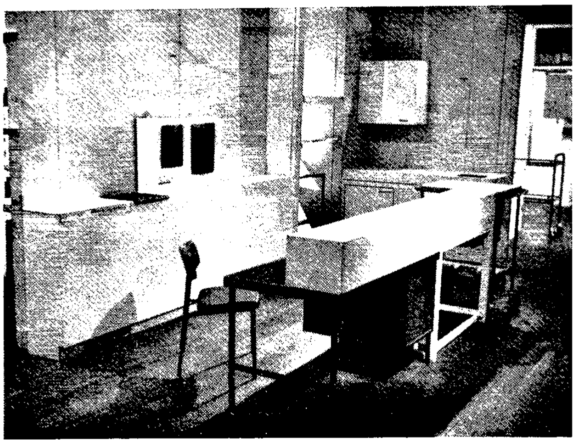
Other tests were carried out at the Building Research Station with transparent rooms, using smoke trails to determine air distribution patterns.

One form of model building, which until recently has been rather neglected in planning work, is the mathematical model. Various applications of this technique were used in the Greenwich project, including solving the traffic circulation and lift location problem by manual simulation techniques, as recorded in *Hospital Traffic and Supply Problems*. This approach was also used in the optimisation of the number of consulting rooms for the outpatient clinic. Similar techniques were used to arrive at the number

34 Greenwich — model using a proprietary toy building kit. Colours were used variously to distinguish between functions, zones or phases.

36 Greenwich — model using metal-faced plywood with magnetic strips. This device was originally developed by the Building Research Station.

35 Greenwich — model of the engineering services and plant.



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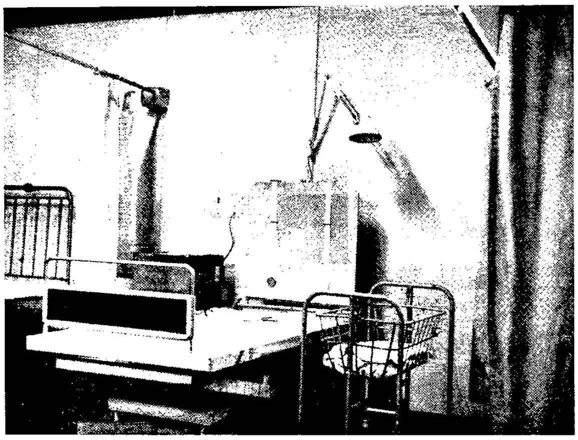

37 Greenwich—mock-up of the staff base in a ward.

38 Greenwich—mock-up of bed area with King's Fund specification bedstead.

39 Greenwich—prototype of the structural system being erected.

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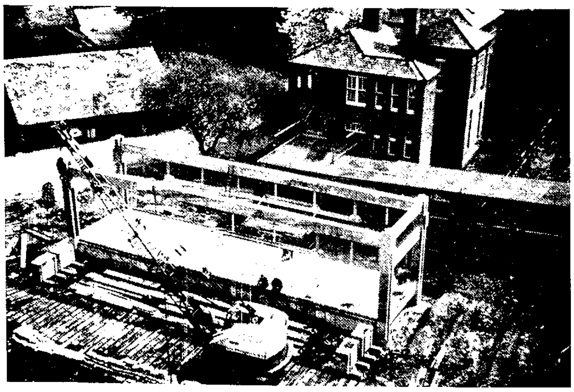


of operating theatres needed to deal with the expected load.

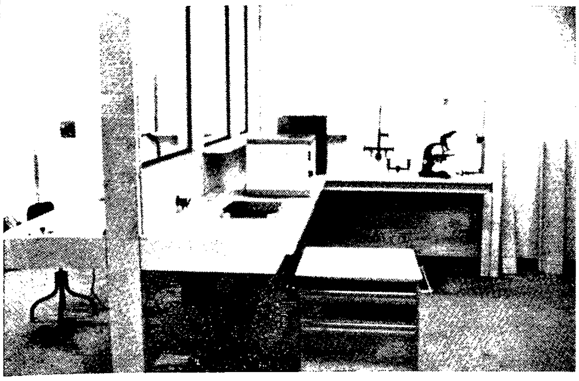
4.13 DATA PRESENTATION FOR GREENWICH: ***MOCK-UPS*** Experience on previous projects had suggested that many room layout problems could not be satisfactorily resolved by means of representational drawings. They either did not show things in relation to one another sufficiently clearly or misled users as to what was proposed. It is also probably a conceit of architects to think that they can fully visualise the three-dimensional interrelationship of elements in a room from a layout drawing, perspective sketch or small-scale model. It was therefore proposed that as many rooms as possible in the hospital should be mocked-up at full size in sufficient detail to enable the users – and the designers – to explore and explain the way in which they would be used.

The mock-ups had to be relatively easy and cheap to construct and take down. To make mock-ups of a number of rooms in conjunction with one another needed a fair amount of space and this was not readily available. After considering a number of possible locations for the mock-up facilities an unused Nightingale-type ward was eventually chosen at Hither Green Hospital.

The mock-up rooms were constructed out of 9 ft high panels made up from 4 in $\times$ 2 in timber framing with $\frac{1}{8}$ in hardboard facing painted pale grey. These were made in widths of 1 ft, 2 ft and 4 ft to give various room sizes. No false ceiling was provided, but spot lights for photographic purposes and such items as cubicle curtain track were suspended from a framework at ceiling level. Equipment was either purchased or borrowed from manufacturers or suppliers, or it was itself mocked-up from hardboard, square section steel tube or other easily obtainable materials. Doors were simulated by a hinged side member and top and bottom rails which could be cut to fit with corner braces for stiffness.

The aim was not to give an impression of reality, but to provide an easily adjustable space planning area in which users and designers could visualise the essential dimensional characteristics of a room or the arrangement of equipment. In the event, a number of important modifications were made to the layout and sizes of some rooms. As only a limited amount of time and labour was available, mock-ups were concentrated on those rooms and spaces which were either novel in some way, or which occurred frequently in the hospital and which would, therefore, affect a large number of users and bear a great proportion of the total cost. A list of the principal mock-ups follows.

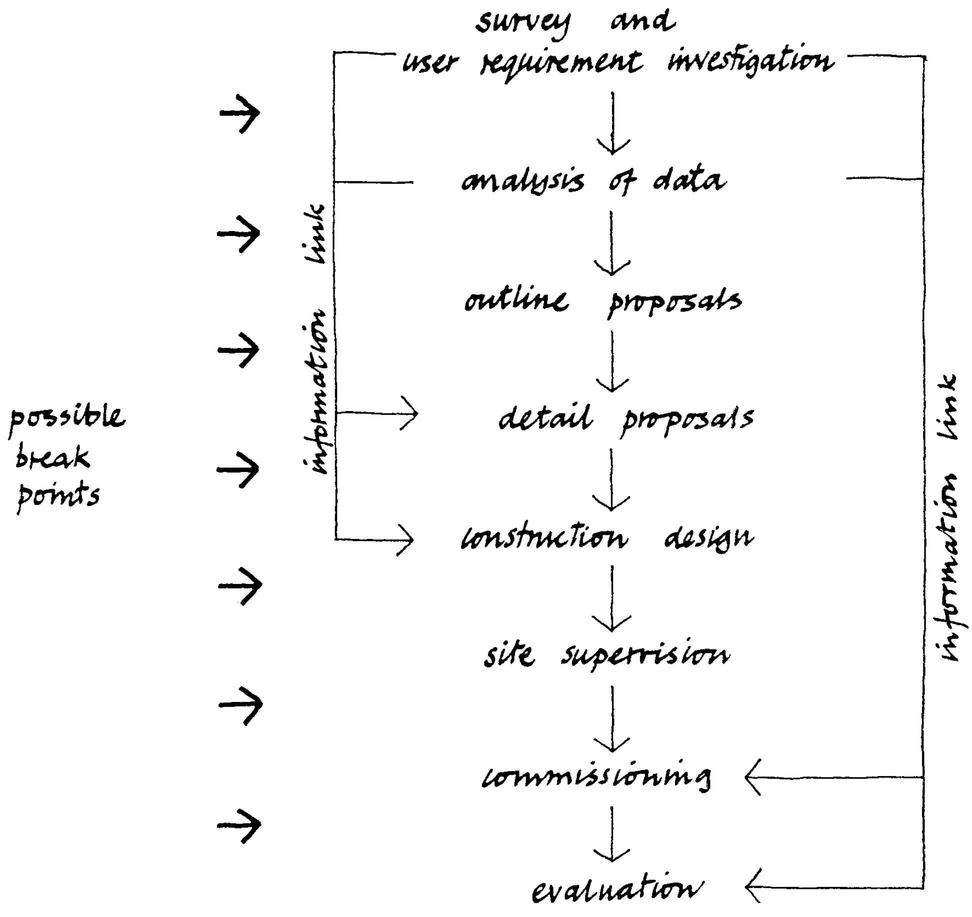
6-bedded room for patients – or 5-bedded room with day space
Staff base in ward
Clean utility area
Combined consulting/examination room
Combined delivery room
Operating theatre
Anaesthetic room
Scrub-up room
Various pathology laboratory and office spaces
Stores area with shelving
Supply delivery trolleys



40 **Greenwich— prototype of the laboratory benching system.**

4.14 DATA PRESENTATION FOR GREENWICH: ***PROTOTYPES*** A further use of 'models' during the Greenwich project was in the form of prototypes of various kinds. These ranged from one of the structural systems including a complete bay together with windows, doors and all engineering services, to mock-ups and prototypes of the laboratory benching systems and bedside lockers. Several of these have been described elsewhere; the bedside locker and the laboratory benching system are described later, see pages 80 and 134.

In a number of cases, the prototype was preceded by a mock-up in order to get the basic shape and size approximately right. The purpose of making a prototype was always to construct and test a 'working model' as distinct from a dummy. In this respect it demanded a great deal more time and effort than a mock-up, and was only thought to be worthwhile where a genuinely novel principle or method was being proposed.



41 The diagram shows the traditional 'break-points' in the process of planning from investigation and briefing through to use and evaluation.

5 Synthesis

Problems are probably best solved by a person acquiring knowledge and then using it himself to produce answers to the problems which he encounters. However, a large project such as that at Greenwich necessarily involves a number of people who must define common objectives and share their knowledge, experience and abilities in order to produce results. No one person can cover all aspects or stages of the work even for a part of the project.

Traditionally, the grouping of people into professions has determined one set of change-over points so that doctors, nurses and hospital administrators have been the generators of user information for architects and engineers. Architects have tended to act as coordinators in the overall process of planning, design and construction, so that they more than any other profession have been involved continuously in the process of translating ideas into reality.

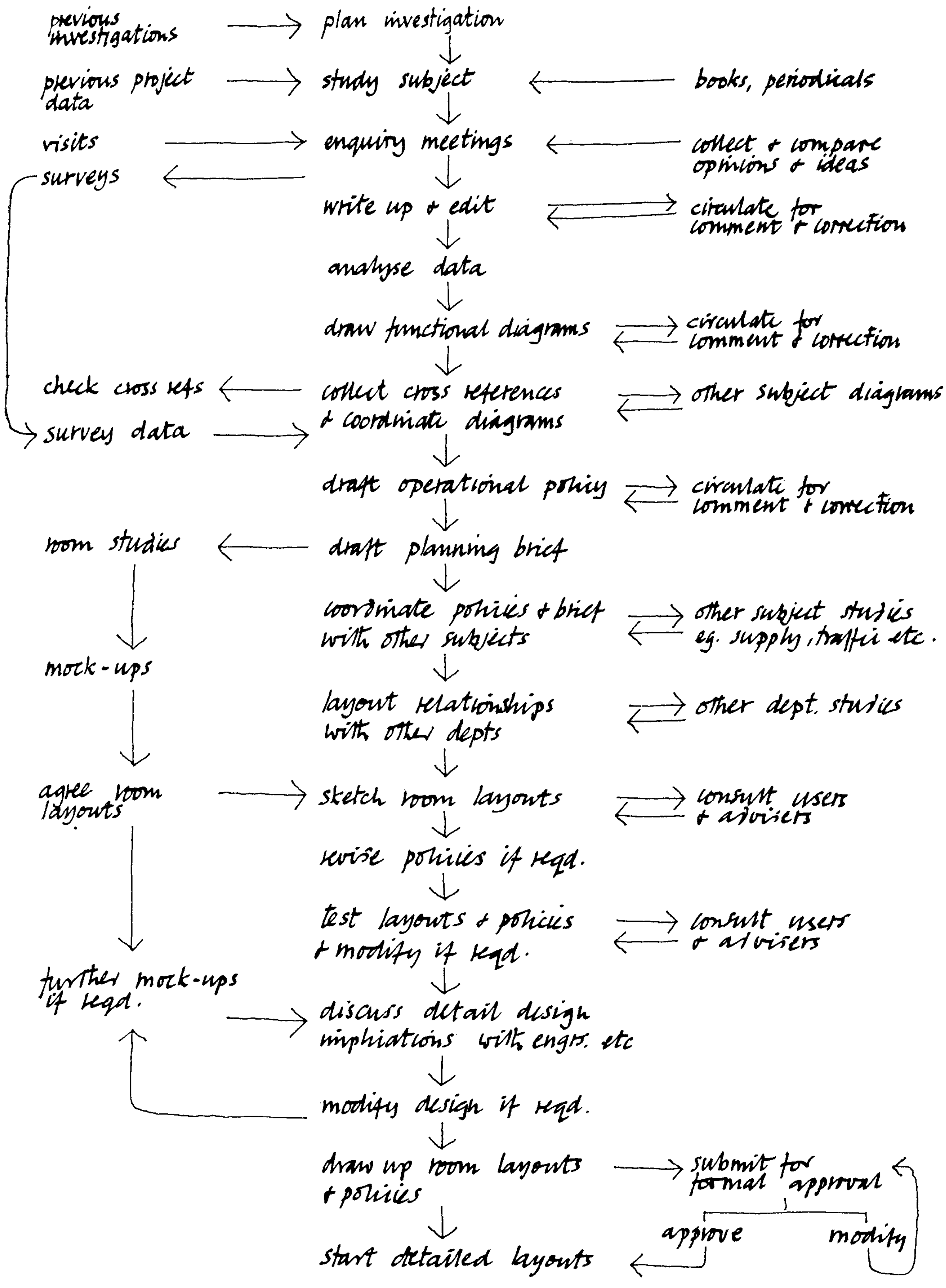
The users have found themselves living with the results of the ideas for longer than anyone else, but frequently they have not been as deeply involved as the architects and engineers in the translation process which determined them. For the design professions, therefore, there has developed the particular problem of having to split up the translation process into stages between break-points corresponding broadly to: briefing; analysis; outline proposals; detail proposals, construction and engineering design; site supervision; commissioning; and, finally, evaluation.

We have already seen how, at Greenwich as in many other projects, the aim of the briefing organisation was to try to get as much continuity as possible between the various stages of work so as to minimise the loss or aberration of information. The key element was to get the various professions to be involved together in the overall research and briefing process; all would thus have a share in the formulation and development of ideas, and hence a better understanding of the project as a whole.

It was seen to be particularly important for the users to participate in the development of design ideas and solutions, and similarly for the designers to involve themselves in the development of operational policies and methods. They would then be able to design knowing as much as possible about the user requirements they were attempting to meet, and would have shared directly with the user in deciding just what his requirements were.

In short, the aim of the briefing organisation and the methods it used was to prevent the operational and design aspects of the project from becoming separated. The break-points mentioned above were, as far as possible, absorbed into a continuous process, and this continuity was reflected in staffing, documentation and implementation.

Ideally, there should have been an orderly progression from information collection and analysis, to operational policy decisions and design proposals. There should then have been a further stage of synthesis with detail design, commissioning policy and operational manuals all originating from the same basis. Diagram 42 shows the processes and interactions involved.


previous investigations
plan investigation
previous project data
study subject
books, periodicals
visits
enquiry meetings
collect + compare opinions + ideas
surveys
write up + edit
circulate for comment + correction
analyse data
draw functional diagrams
circulate for comment + correction
check cross refs
collect cross references + coordinate diagrams
other subject diagrams
survey data
draft operational policy
circulate for comment + correction
room studies
draft planning brief
coordinate policies + brief with other subjects
other subject studies eg. supply, traffic etc.
mock-ups
layout relationships with other depts
other dept. studies
agree room layouts
sketch room layouts
consult users + advisers
revise policies if reqd.
test layouts + policies + modify if reqd.
consult users + advisers
further mock-ups if reqd.
discuss detail design implications with engrs. etc
modify design if reqd.
draw up room layouts + policies
submit for formal approval
approve
modify
start detailed layouts

Much of the theoretical structure for the synthesis of operational and design aspects was, in fact, realised in practice. For example, the notes and functional diagrams prepared by the Investigating Sub-groups were used as the basis for the preparation of operational policy statements and design briefs. The operational policy statements and functional diagrams complemented each other. Together they described what was intended to happen, and how it should be brought about. While the functional diagrams and operational policy statements were being formally agreed, briefs were prepared as the basis for the building design team to work from. These briefs aimed to describe the accommodation required for the proposed activities and in most cases included sketch layout proposals within the limits of the development control plan.

There were difficulties, however, and, as will be seen from the case studies in Part Two, there were variations in the application of this theoretical pattern. Here it is worth discussing what seemed to be the main conflict because it is instructive in the broad context of planning.

On several occasions there were problems during the translation of user requirement information collected by one person into policies and design proposals by others. A good example is the clashing doors in the outpatient department. The receivers of the information would usually find it necessary to do some investigation on their own regardless of the fact that, in the information collector's opinion, sufficient data were available to enable planning proposals to be formulated.

It seemed, therefore, that the designer needed to involve himself in the process of enquiry in order to have confidence in his design proposals. What to one designer was perfectly adequate information for his own purpose was inadequate when used as a basis for someone else to work from.

It was this fact that led to a change in the pattern of briefing for Greenwich compared with the original intention which was to have one team carrying out the investigation and another team doing the planning. Rather than a small group of people being involved in acquiring the briefing data over a wide range of subjects, thus ensuring good cooperation between them, it became necessary for one architect to take only two or three subjects at most and follow these through from briefing to the point where the production drawing team took over.

Not only this, but in addition the briefing architect frequently had to produce the detailed layout drawings and then act as adviser to the production architects and engineers in deciding the most appropriate way to provide the services and constructional elements. Even this arrangement had its problems as, not infrequently, the production architect or engineer would change half-way through the development of the detailed design and someone else would have to try and pick up the threads, aided if possible by the briefing architect.

All this meant that the benefits of continuity between different subject areas were in danger of being lost when a briefing architect in such a situation could

42 The diagram shows the main processes and interactions involved in an orderly progression from information collection and analysis through to detail design. It is presented from the point of view of one of the investigating sub-groups.

only have time to oversee his own subject area. In essence it was the fundamental difficulty of the conflict between 'lateral continuity' across the development of the whole project and 'sequential continuity' in the development of a particular service or area. There seems no doubt, however, that the methods used allowed for a synthesis which made it possible for the hospital systems to be planned together, ensuring the minimum distinction between operational and design problems and their solution.

43 Greenwich—the completed Phase One as seen from Woolwich Road.

6 Benefits of Research

The Greenwich project has involved a big commitment of resources, human and material. In its scope it must be one of the most ambitious building research and development schemes ever undertaken in Britain. It is therefore important to make some assessment of the benefits that have come from the work, particularly so far as planning and briefing methods are concerned.

In this context it is necessary to make clear distinctions between the various purposes of the project. On one level it is possible to discuss benefits simply in terms of the planning, design and construction of a new hospital for Greenwich. Here the methods used can and will be evaluated directly in the functioning hospital. On another level, there is the question of the design idea and other novel features such as peripheral banding of wards and separate engineering floors. None of these could have been experimented with in practice outside the framework of a research project. Their evaluation in the functioning hospital will complete a cycle of information which has already proved of great value, and which has had a direct influence on Department projects, for example, the 'Best-buy' hospital, CUBITH, 'Harness', and published guidance.
A complete list of subjects for evaluation at Greenwich is given in Appendix B.

Inevitably, the work on methods is the most difficult to assess. How far should the approaches used at Greenwich become normal in hospital planning? How have they affected the Department's own approach, and the guidance it issues? How much use have they been to planning teams at regional boards?

The methods used were intended to *expand* the range of planning possibilities, rather than to *contract* them. They also put research and briefing into a logical pattern for the planning, design, construction and evaluation of a building. At a time of increasing operational and technological change, increasing cost difficulties, and the related answer of standardisation both these are of central importance. If the control of cost means standardisation, then standardisation must not mean ossification. The adoption of appropriate methods of enquiry, communication and organisation is likely to be the key to this problem.

Without reliable and compatible information on user needs and design implications over the whole range of hospital activities, it is not going to be possible to plan and design hospitals that will work at anything like their full capacity. Many of the savings in space, and hence cost, at Greenwich were only possible because information had been collected and collated in such a way as to show that the required standards could be achieved in spite of reductions in the area of accommodation or the numbers of rooms provided. This kind of discussion and assessment will be increasingly important in the future, and will have to take into account the relationship between capital and running costs. To do this the link between operational and design aspects, insisted on at Greenwich, will have to be maintained and expanded. Cost details of the Greenwich project are given in Appendix C.

Although benefits obtained by reason of a thorough study of user needs can be very direct, there is also the point that the users concerned feel more assured when they have been involved in the decisions affecting the operation and design of their departments. When key staff are appointed *after* the main decisions have been taken they are bound to feel less sympathetic to the planning proposals than if they had been involved in contributing to them from the start. In showing how important this aspect is, the Greenwich project has thrown further light on the problems of standardisation. It suggests that it may be necessary to allow the individual user a fairly wide area of choice and, therefore, involvement in planning. In short, the degree to which standards can be fixed will have to be set against the efficiency and satisfaction of those people who have to work within them.

Experience at Greenwich also brought into focus the fact that there are few educational and career opportunities in hospital planning for those other than architects. Continuity of people involved in the project was very important, but very hard to achieve. There are at present no permanent full-time courses in hospital planning* and no recognised qualification or degree in the subject in the United Kingdom. Equally, there is no easily recognisable professional career structure. These three factors must lead to a wastage of valuable experience and knowledge.

Experience in the use of the briefing methods developed for Greenwich has already suggested a number of improvements to the Greenwich documentation scheme, and these are shown in Appendix B. This work has influenced the Department's requirements for the format and presentation of operational policy and other planning documents.

While it may appear that hospitals have been and are being planned, designed and built without much concern for the systematic methods and approaches discussed in this book, there is equally evidence of widespread failure to reach objectives or to know whether objectives have been reached or not. Useful information gained in one project is not applied in another. Expensive skills are wasted, or are not available when they are needed. It is certainly not claimed that the methodology used at Greenwich is perfect or that it should be applied in circumstances which may be very different. It is argued, however, that the fundamental style of the enquiry has proved valid, and that it probably provides the means for investigating and recording the design requirements of anything from a new town to a door knob.

*A one year post-graduate course in health building design has now been established in the Medical Architecture Research Unit at the Northern Polytechnic, London.

PART TWO

7 Inpatient Services

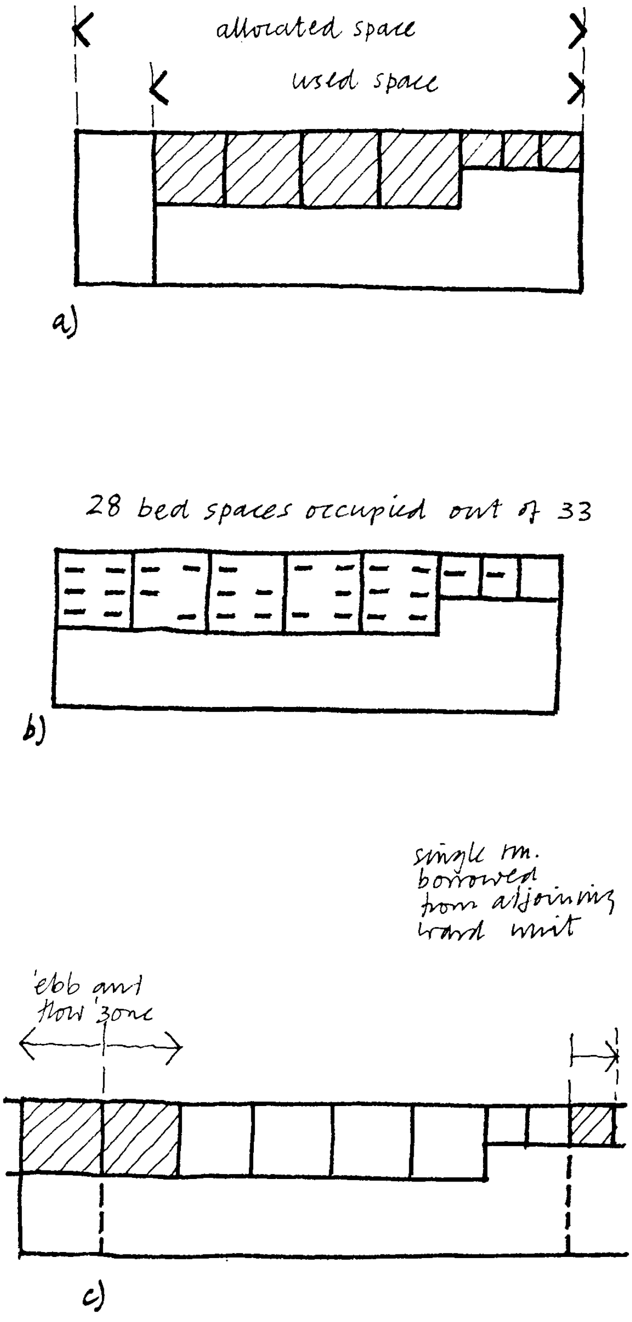
7.1 BACKGROUND AND AIMS The wards, forming approximately half the accommodation in the main hospital complex, have a big influence on the operational and design policies of the whole hospital. Inevitably, the policies of many other departments and services in the hospital are strongly influenced by inpatient care policies while whole hospital policies, such as those relating to catering and communications, are partly governed by decisions on nursing methods and the design of wards.

At the start of the research and briefing work the objectives of inpatient care were set out as follows: 'to keep the patient in conditions which will enable diagnosis, treatment and rehabilitation to be carried out with the minimum distress or pain and with the maximum economy, comfort and speed.'

The main objectives of ward design, on the other hand, were stated in the following terms: 'to provide facilities for the proper care and comfort of inpatients including: proper supervision of patients by staff; control of incidence and/or spread of infection; control of nuisance from noise, smell, light and heat; efficient use of the time, manpower, supplies, equipment and space available; and providing for adaptability to meet changing circumstances.' It was also stated that a possible reduction in the number of beds in relation to the outpatient load should be foreseen, and an allowance made for proposed housing developments within the hospital's catchment area at Kidbrooke and Erith. The approximate total population to be served by the hospital's general acute, maternity, geriatric and psychiatric beds is 165,000 people. The original statement of beds to be provided is shown in Diagram 17.

Having decided on the general form of the building and started discussions on inpatient nursing care requirements and policies, the next step was to explore the type of accommodation that would satisfy the requirements as far as they were known or understood at the time. The idea of the race-track hospital had originated in part from the race-track ward study referred to earlier. As one of the advantages claimed for this layout was the possibility it gave for variations in size of groups of beds – or nursing units – round the periphery of the ward floor this principle was applied to the whole hospital ward accommodation. The total number of beds to be provided was in the region of 800, of which about 300 were to be medical, 180 surgical, 80 maternity, 50 paediatric and the remainder geriatric and psychiatric. These numbers are only given approximately as they continually changed in detail over the planning period.

Studies carried out by the statistics branch of the Department have shown that the average length of stay for medical cases has fallen nationally from about 22 days in 1953 to about 16 days in 1967. Corresponding figures for surgical cases are about 14 days in 1963 to about 12 days in 1967. Gynaecology shows a similar gradual drop over the same period from 11 to 9 days. Maternity cases showed a more pronounced drop from 14 days in 1953 to about 10 days in 1966 (the latest date for which figures were available) while, at the same time, the number of births in hospital rose from under 60 per cent to well over 70 per cent with a sharp increase since 1960. There was no reason to suppose that the



44 Three alternative methods of varying the beds in a nursing unit so as to accommodate changes in seasonal demand: by allowing each nursing unit to use all or less of its space; by allowing each bed room to accommodate more or less beds; or by allowing 'ebb and flow' zones between units with differing seasonal peaks.

Greenwich admissions pattern would vary substantially from the national figures so it was clear that changes in the allocation of beds to specialties would have to be allowed for.

Seasonal variations in demand were also believed to give rise to problems in allocation of beds and further studies by the statistics branch confirmed this on a national basis. Taking a 33-bed medical ward as a norm it was shown that – apart from chest cases – the maximum demand in 1959 occurred in the first quarter of the year – January to March – with a demand for nearly 38 beds, while the minimum for the year occurred in the third quarter – July to September – with only 30 beds being needed. For surgical beds the pattern was quite different with the maximum in the second quarter of 36 beds, while the minimum occurred in the first quarter with only 30 beds, the other two quarters being on the norm of 33 beds.

To see how individual monthly peaks compared with the quarterly figures for the same specialties, it was shown that in 1959 the maximum rate of admissions was in February with a figure of 41 beds compared with the norm, while the minimum occurred in August with only 29 beds. For surgical cases the comparable figures were 37½ beds in April and 26½ in December. If beds were to be allocated according to demand based on these figures, it was clear that a considerable 'swing' between beds allocated to medical and surgical specialties would have to be allowed for.

Further comparisons between the maximum and minimum demand for beds for chest diseases showed variations between 40 and 25½ beds in February and August respectively, while for geriatrics and chronic sick the figures were 40½ in February and 28½ in December.

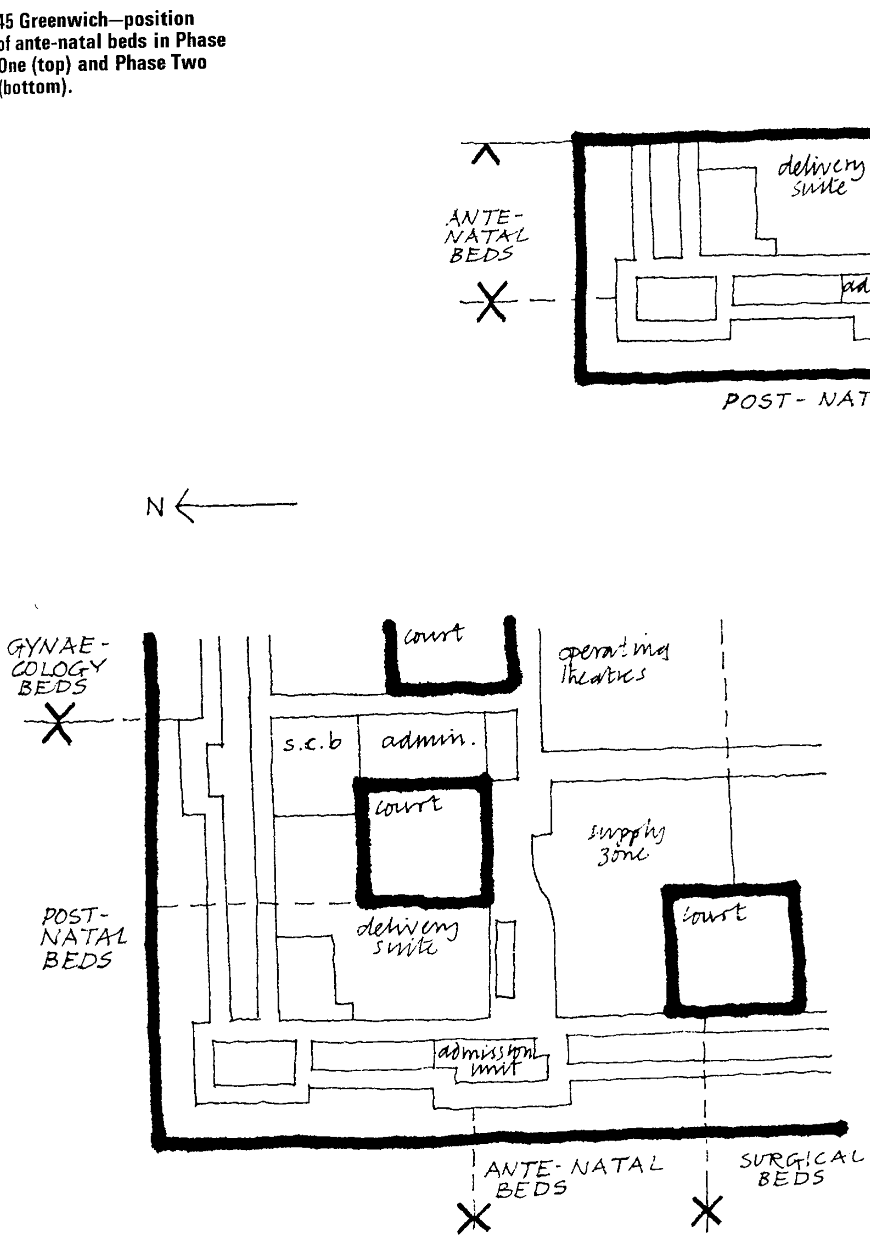
With such variations it was obvious that it would be an advantage if the number of beds in nursing units were not fixed. This could be done in several ways: by allowing each nursing unit to occupy all or less of its allocated space according to need; by allowing each bed room to accommodate more or less beds according to the number the nursing unit needed to house; or by allowing only so much space needed for overall peak demand in the hospital, but allowing the areas allocated to individual nursing units to 'ebb and flow' at the boundaries according to the pressures on each ward unit.

In practice, something from each of these approaches has been adopted, as it was obviously impracticable to arrange the nursing units so that an expanding ward at one time of the year was always next to a shrinking one.

Phasing was another factor which suggested that ward areas should not be allocated to particular specialties. Some nursing units would have to change from one specialty to another from time to time as the hospital developed. It was also realised that certain specialties such as obstetrics, paediatrics, geriatrics and psychiatry had to be accommodated in wards with particular facilities. However, the areas allocated to geriatric and psychiatric patients might be allowed to merge somewhat, as the definition of the patients involved is not always clear cut. The same uncertainty may exist between medical and surgical cases in some instances.

The tendency for patients to be grouped according to the degree of nursing care needed (progressive patient care) is another factor influencing allocation of beds. At various times in the history of the project up to the completion of the first phase, there were major changes in the policy of zoning according to degree of care. It varied – in discussion at least – from the allocation of a complete floor (regardless of clinical specialty) to those patients most nearly ready to go home, to the allocation of beds by degree of dependency within each nursing unit. The maternity unit, which is made up of three roughly equal nursing units of 26 to 28 beds, was modified in the first phase so that the ante-natal beds are now where the post-natal beds will be in the second phase.

45 Greenwich—position of ante-natal beds in Phase One (top) and Phase Two (bottom).



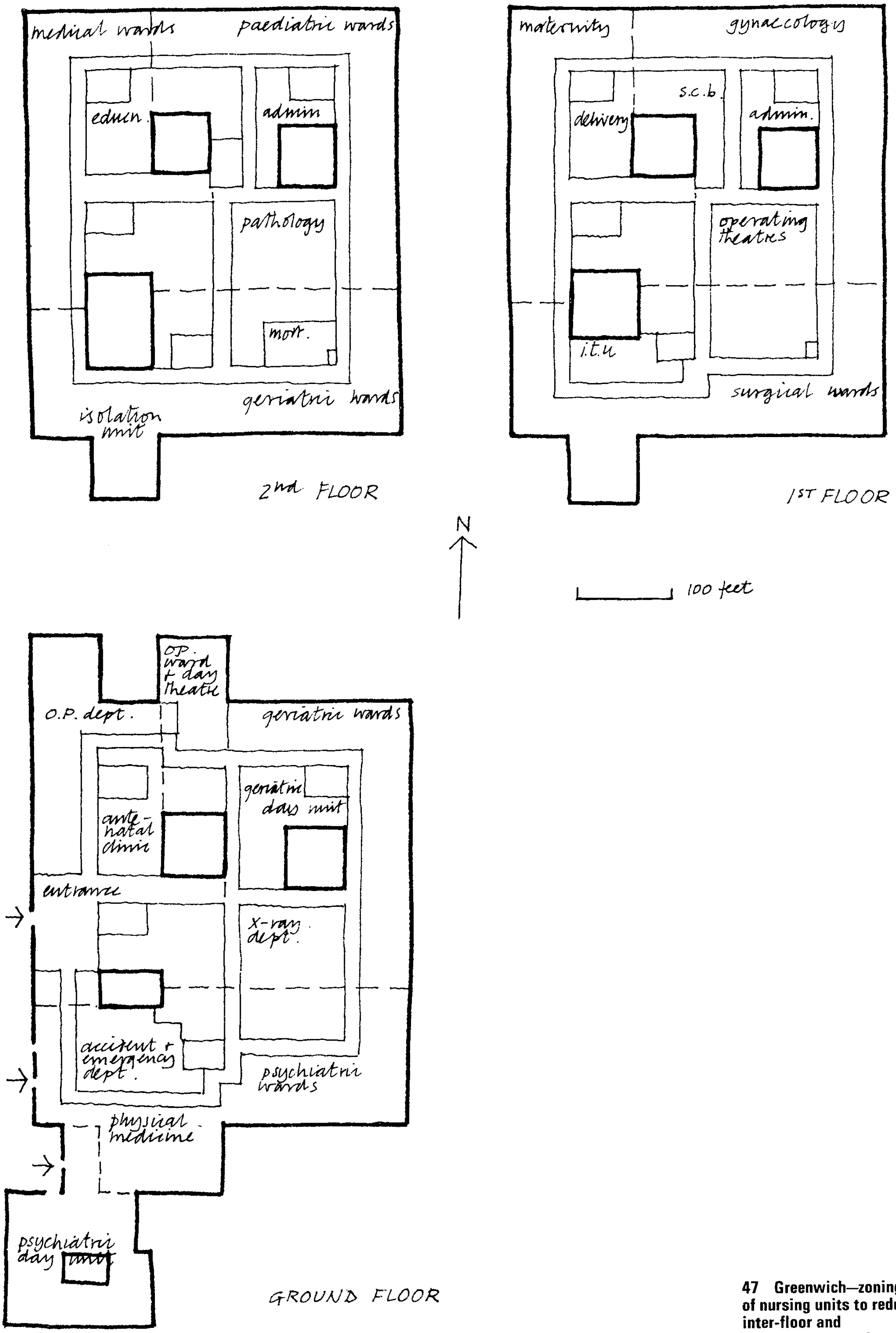
floor	specialty	beds in each phase I	II	III	specialty total	floor total	notes
ground	Geriatric		90	20	110		see also 2nd floor
	Psychiatric			59	59		
	A/E observation			(8)			} not included in total
	O.P. day beds		(13)				
						169	
first	Maternity	62	19		81		
	Surgical		50	122	172		incl. orthopaedic neurol
	Gynaecology		35		35		
	Special care babies		20		20		
	Intensive therapy			12	12		
						320	
second	Paediatric		49		49		
	Medical	73	44	36	153		
	Isolation			18	18		
	Geriatric		8	62	70		see also Ground fl
	Staff beds				8		
						298	
All floors						787	

46 Greenwich—allocation of beds to floors and phases at the time of writing (1970).

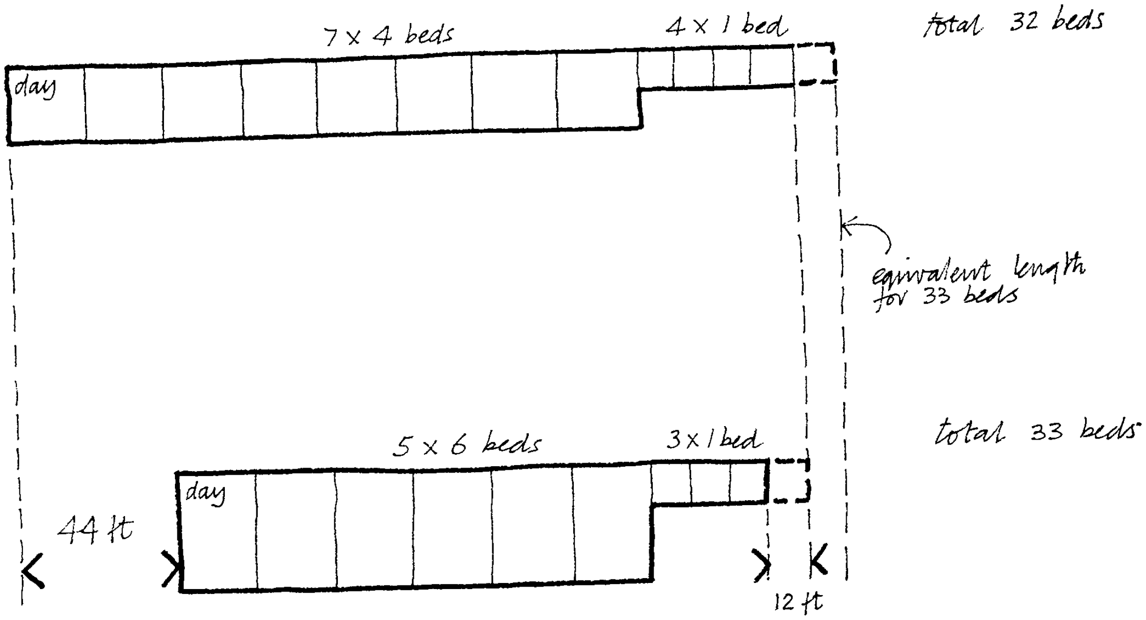
In practice, then, the flexibility in grouping and allocation has been made use of, not only to secure better utilisation of beds (which was the main objective) but to meet the difficulties caused by having to phase the rebuilding on a very restricted site. The allocation of beds as agreed at the time of writing is as shown in Diagram 46.

7.2 ZONING AND LAYOUT OF WARDS The zoning of wards to reduce inter-floor and inter-departmental traffic was a major factor in deciding to place medical and isolation wards on the top floor, together with the pathology department and education centre. The operating theatre and maternity unit fitted logically together on the first floor with the surgical and gynaecological beds and intensive therapy unit. The geriatric and psychiatric wards and day hospital are well placed on the ground floor for access from outside, together with the outpatient, x-ray, accident and physical medicine departments.

The next problem was to relate ideas on ward planning to the overall concept of the hospital. Wards were assumed to occupy those areas lying outside the 'main streets' of the hospital floors, with the possibility that some special wards, such as intensive therapy, might occupy inner areas. The preliminary studies on structure had suggested that a completely unobstructed strip about 60 ft wide would be available for accommodating the wards. It was clear that an



47 Greenwich—zoning of nursing units to reduce inter-floor and inter-departmental traffic.



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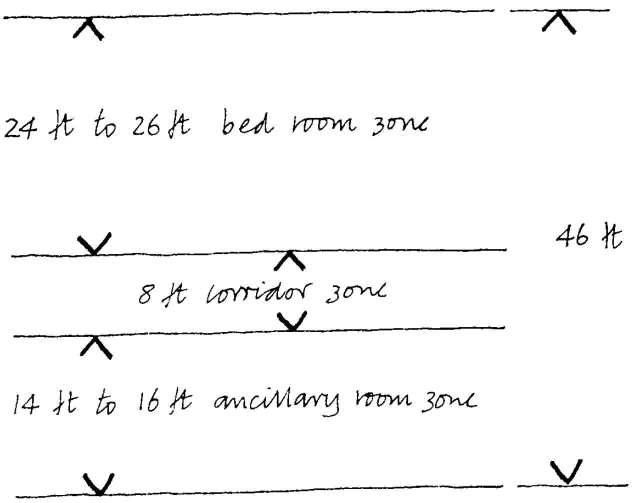
48 The diagram shows how a nursing unit with 4-bedded rooms is 56 ft longer than one with 6-bedded rooms where the unit contains 33 beds.

early choice had to be made between four and six beds to a room. A quick check established that anything less than three beds deep was wasteful of space in terms of depth, and of length of perimeter wall. It was also considered that four-bedded rooms were uneconomical where every square foot was estimated to cost from £8 to £10. Walking distances covered by nurses also increase if four-bedded rooms are used, as the extra length of a ward compared with one composed of five or six-bedded rooms and some single rooms, amounts to about 50 or 60 ft assuming 30 beds per ward.

Having established that six-bedded rooms would probably have to be used, this indicated that the ward zone would need to be about 50 ft or more wide, assuming 8 ft bed centres, an 8 ft corridor, and ancillary rooms or spaces 14 – 16 ft deep. The bed room depth of 26 ft was based on the assumption that a 2 ft wash-basin and cupboard area would be required between the bed areas and the corridor in addition to the 3 ft × 8 ft for the bed spaces.

7.3 SIZE AND ARRANGEMENT OF BEDROOMS
As recorded in Chapter 2, the decision had been taken to use a planning grid of 2 ft. This meant that multi-bedded rooms would either be 20 ft, 22 ft, or 24 ft wide – less the partition thickness. Evaluation studies at Musgrave Park[9] had indicated that the 20 ft wide rooms there were rather too small, and 21 ft, or 21 ft 8 in, was being advocated more commonly as a suitable dimension. However, 23 ft or more was not uncommon in the United States. As it was anticipated that further developments in bed design would tend to cause a lengthening of the bed, it was decided to select 22 ft as a standard width of multi-bed rooms.

This decision left unresolved the question of the width of the single rooms. Would they be 10 ft wide, or 11 ft



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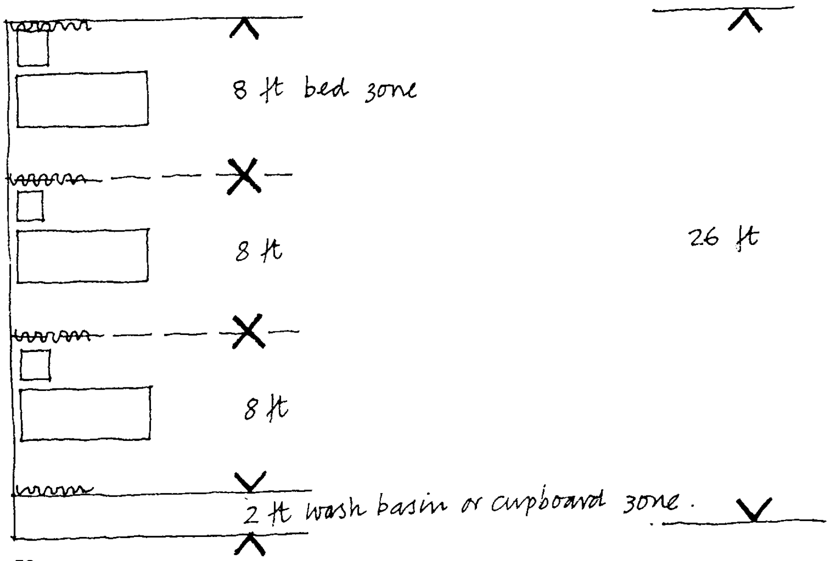

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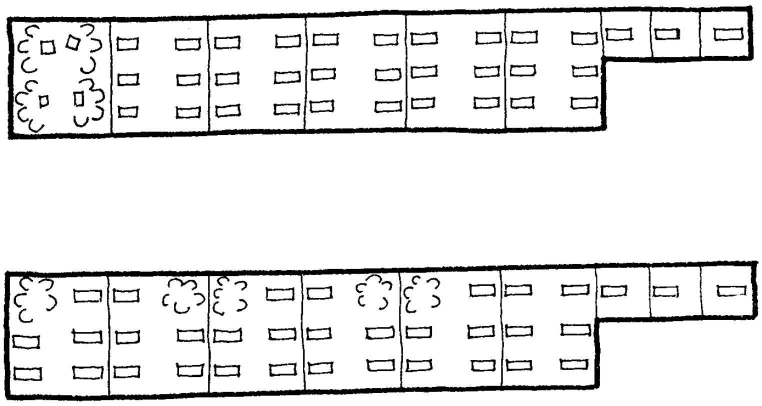

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49 Greenwich—dimensions of ward areas.

50 Greenwich—dimensions of bed areas.

51 Alternative ways of arranging day spaces in nursing units: large separate day space with five 6-bedded rooms; or six 5-bedded rooms with a 'day corner'.

or 12 ft? As the planning grid did not allow for 1 ft increments, and the Musgrave Park report had particularly criticised 10 ft wide rooms, it was decided to make all single rooms 12 ft wide although some doctors' and relatives' rooms – which can be used as single rooms for patients in an emergency – were left as only 10 ft wide.

One further refinement was to establish that, where space allowed, the six-bedded room to be used for the more seriously ill patients (who might require bulky equipment) should be 24 ft wide. This also permitted it to be converted at a later date into two 12 ft wide single rooms if the need arose. The single rooms obviously needed to be deeper than the nominal 8 ft bed space allowed for multi-bed rooms, but 10 ft was considered to be too shallow if the room was to be used for sitting in, and for any bulky equipment, so a 12 ft square room was agreed.

It is a good example of the parallel development of operational and design aspects in the Greenwich project, that while the design study just described was going on, the functional investigation was also proceeding in the Inpatient Care Investigating Sub-group. Another parallel study which helped to provide information was the Inter-hospital Board, User Requirement Study Group's work on common user spaces. One of the architects who worked on this later joined the Department's team, and made many useful contributions to the ward-planning study, notably on space round the bed and in organising the mock-up programme referred to in 4.13.

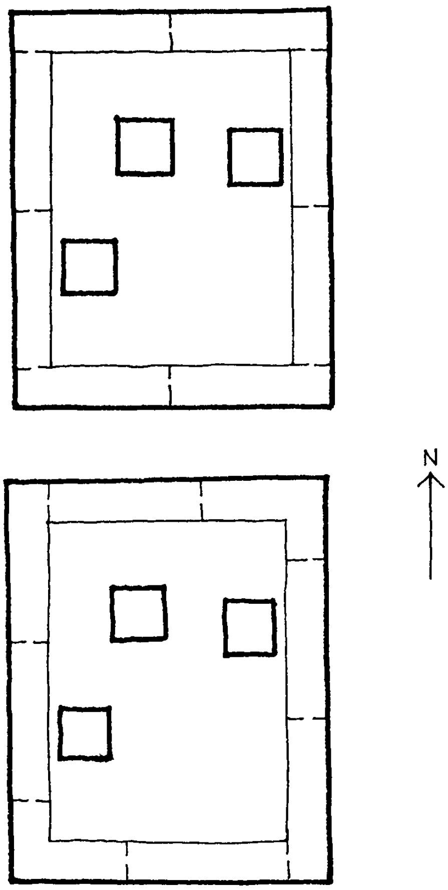
7.4 NUMBER OF BEDS IN A NURSING UNIT The Building Note recommendation on the size of units at the time of the Greenwich project was for about 30 beds which, for approximately 300 beds on the two upper floors, meant ten ward units per floor.

As some of the beds would be in special wards in the inner zones on each floor, and other beds such as those used for isolation would need more space than those used for general acute cases, it was clear that the development control plan had to show that the proposed number of beds could be got onto the site in the building shape proposed, and that sufficient could be included in each phase to maintain the required number of beds as the old wards were demolished.

Owing to local social and clinical factors, it was argued that the proportion of single rooms in a general ward could be as low as one in ten of the total number, or three in a 30-bedded ward. This was on the assumption that the higher proportion of single rooms in intensive therapy, isolation, and staff wards would give a proportion of single rooms for the hospital as a whole of about one in seven. This left the number of beds to be accommodated in the six-bedded rooms in general wards as 27 for a 30-bedded ward. Therefore, the choice of bed numbers for the unit as a whole lay between the following

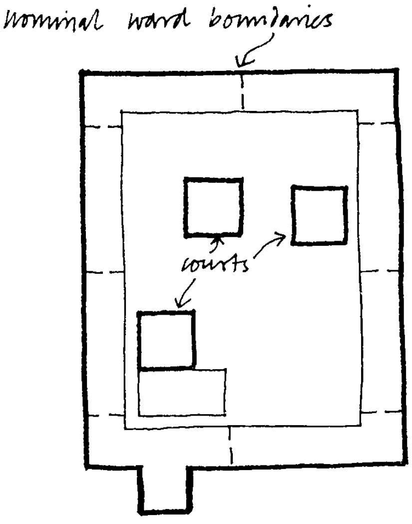
5 × 6 beds + 3 singles = 33 beds
4 × 6 beds + 3 singles = 27 beds
4 × 6 beds + 4 singles = 28 beds

The only way to achieve 30 beds was either to increase the number of single rooms or to alter the number of beds in each multi-bed room. For some



52 **Greenwich—possible arrangements of nursing units around peripheral wall on upper floors.**

53 **Greenwich—adopted arrangement of nursing units on upper floors.**



specialties it was considered that day space was more conveniently provided as part of the bed area than as a separate room. Television would then have to be provided elsewhere, possibly in a TV/dining room grouped among the ancillary rooms on the inside of the ward corridor but, even so, the bed numbers that could be obtained with these combinations worked out as follows

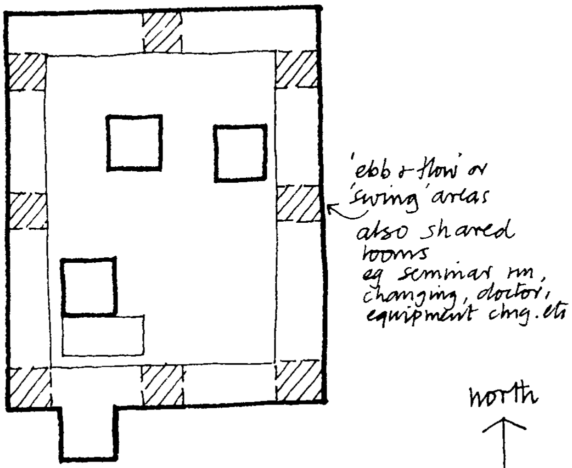
6 × 5 beds + 3 singles = 33 beds
5 × 5 beds + 3 singles = 28 beds
5 × 5 beds + 4 singles = 29 beds
or with a mixture of 5 and 6 bed multi-bed rooms
1 × 6 beds + 5 × 5 beds + 3 singles = 34 beds
2 × 6 beds + 3 × 5 beds + 3 singles = 30 beds

A primary factor influencing the number of beds in a nursing unit was the extent to which a ward sister (Salmon grade 6) could be expected to supervise the patients and staff in her control. Since the days of Florence Nightingale it had been held that the ideal number was about 28, but the Department had carried out comparative studies of activities in various types and sizes of ward unit which suggested that wards of at least 30 beds made more efficient use of staff time than those with 25 or less.

The other factor influencing the choice of size of unit was building cost. Clearly, a unit of, say, 33 beds would be more efficient than one of 29 as there would be less ancillary space in relation to bed space. A comparison was made between the amount of ancillary space needed for the smaller nursing units as compared with the larger. This showed that the space per bed would increase from about 250 sq ft in the case of a 33-bedded unit, to over 275 sq ft for a 29-bedded unit.

A comparison between different ways of arranging the ward units round the peripheral wall suggested that there would be considerable advantages in simplicity and consistency of layout if the nursing units could be arranged more or less symmetrically about the axis of the rectangular shape of the floor. The site, however, dictated that the rectangle was about 60 ft longer in the north-south direction than in the east-west. This difference could be accommodated fairly simply by arranging the single-bedded rooms at each corner so that they faced east and west. The resultant layout for the floor as a whole provided eight more or less standard nursing units, each of 33–34 beds, plus 'swing zones' between some pairs of units to give the possibility of variations in bed numbers to accommodate seasonal and other changes in demand. The total number of beds per floor on this basis was in the region of 300 on the two upper floors, and about 180–200 on the ground floor.

It was evident from various factors that the number of beds originally proposed (803) was higher than could be justified in the future. These were: the shortening length of stay in some specialties; the increasing difficulty in recruiting nursing staff, and shorter working hours for nurses; a possibly reducing population; and the efforts being made to get geriatric, and some psychiatric, patients to return home to be cared for by their relatives but to continue hospital care by attending a day hospital for the whole or part of the working week. As a result there was a re-examination of the number of beds needed in each specialty, and the decision was made



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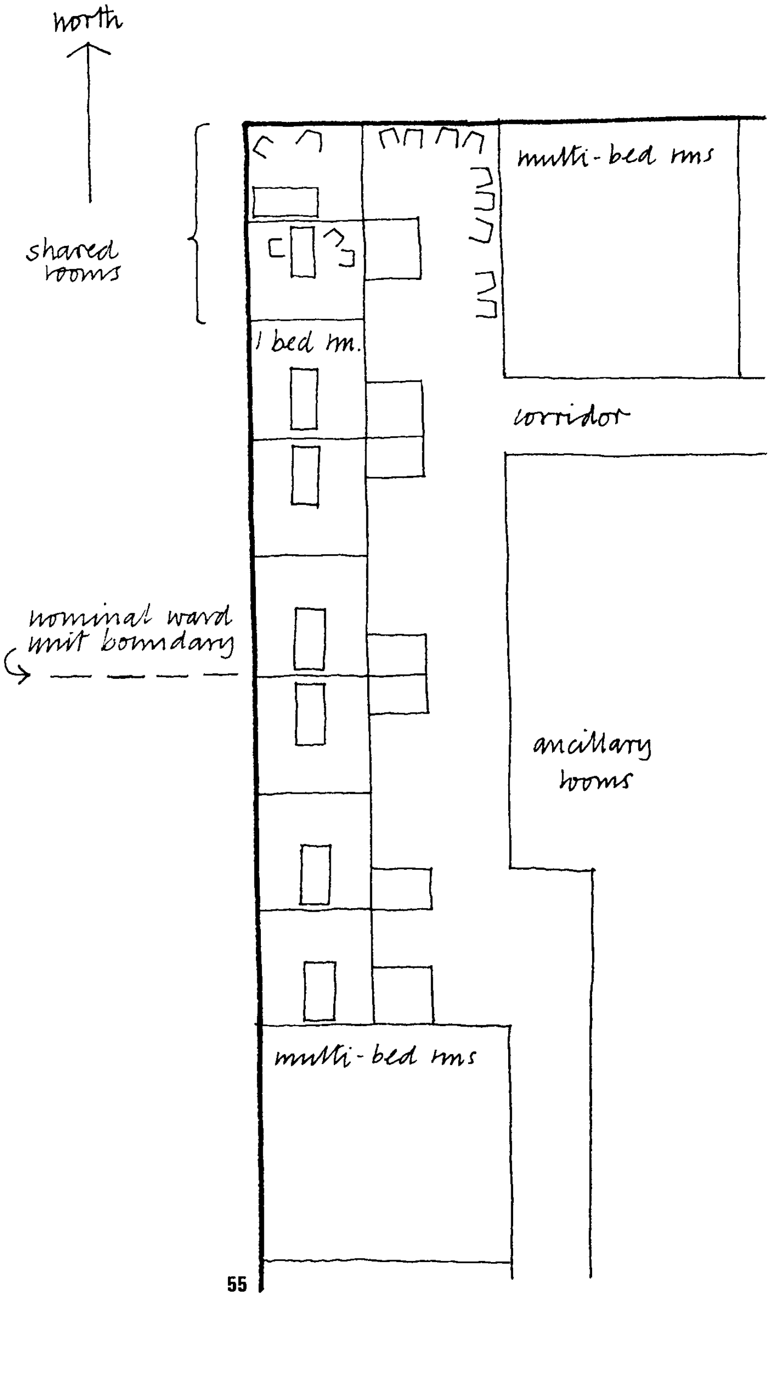

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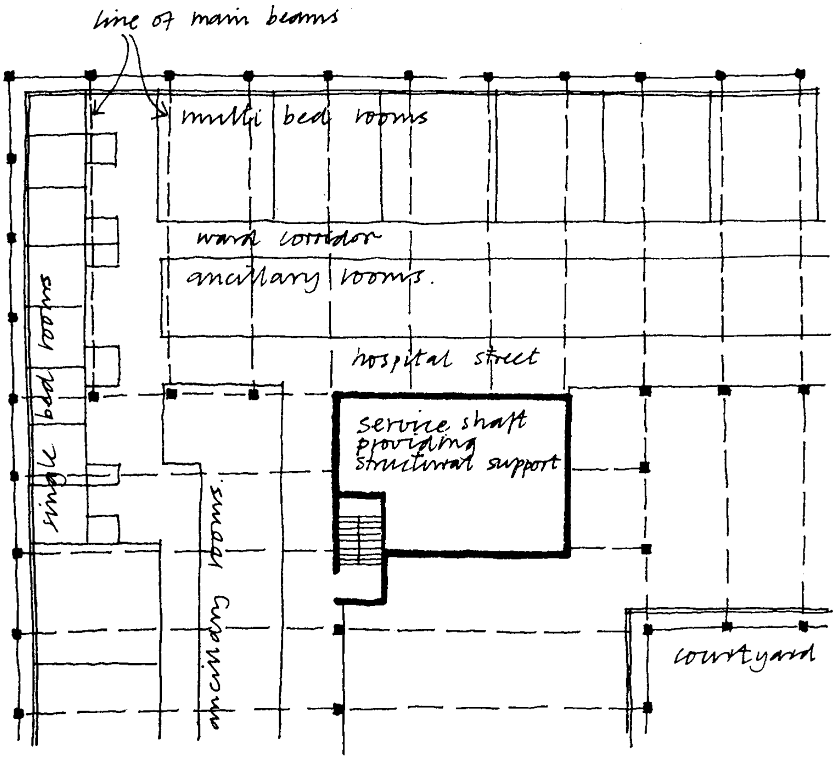
54 Greenwich—'ebb and flow' or swing areas between nursing units.

55 Greenwich—room arrangements at the corners of the building.

56 Greenwich—relationship between structural columns and room arrangements at the corners of the building.



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to reduce the total number of beds to about 770.

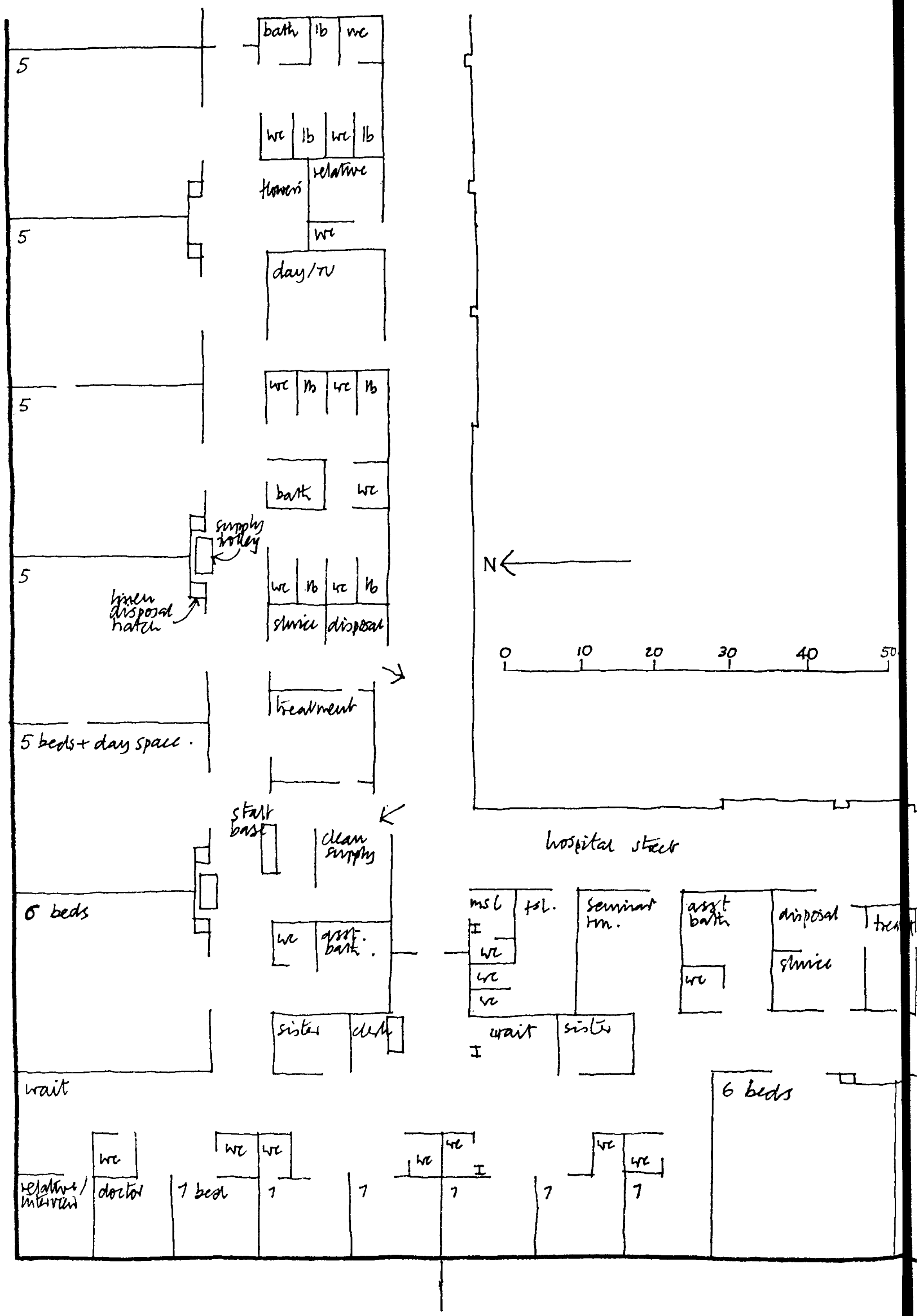
Another factor influencing the precise size and arrangement of nursing units and rooms was the variation in facilities required for special units such as maternity, paediatric and psychiatric. As designed, each of these units is a variation on the common theme; the same principles are followed as nearly as possible in the interests of consistency of layout. Some variations are also due to the need for improvements which became evident as research progressed. Structure was another factor which influenced the layout: however the structural columns were arranged at the corners of the floors, one or two columns appeared in awkward places.

In short, many factors came together in making decisions on the size and arrangement of wards in the various stages of the evolution of policies and proposals. However, the sequence of events progressed more or less as described in Chapter 5, starting with requirements, policies and brief for inpatient care as a whole, and then progressing to the component parts in more detailed and precise terms as the overall picture began to be resolved.

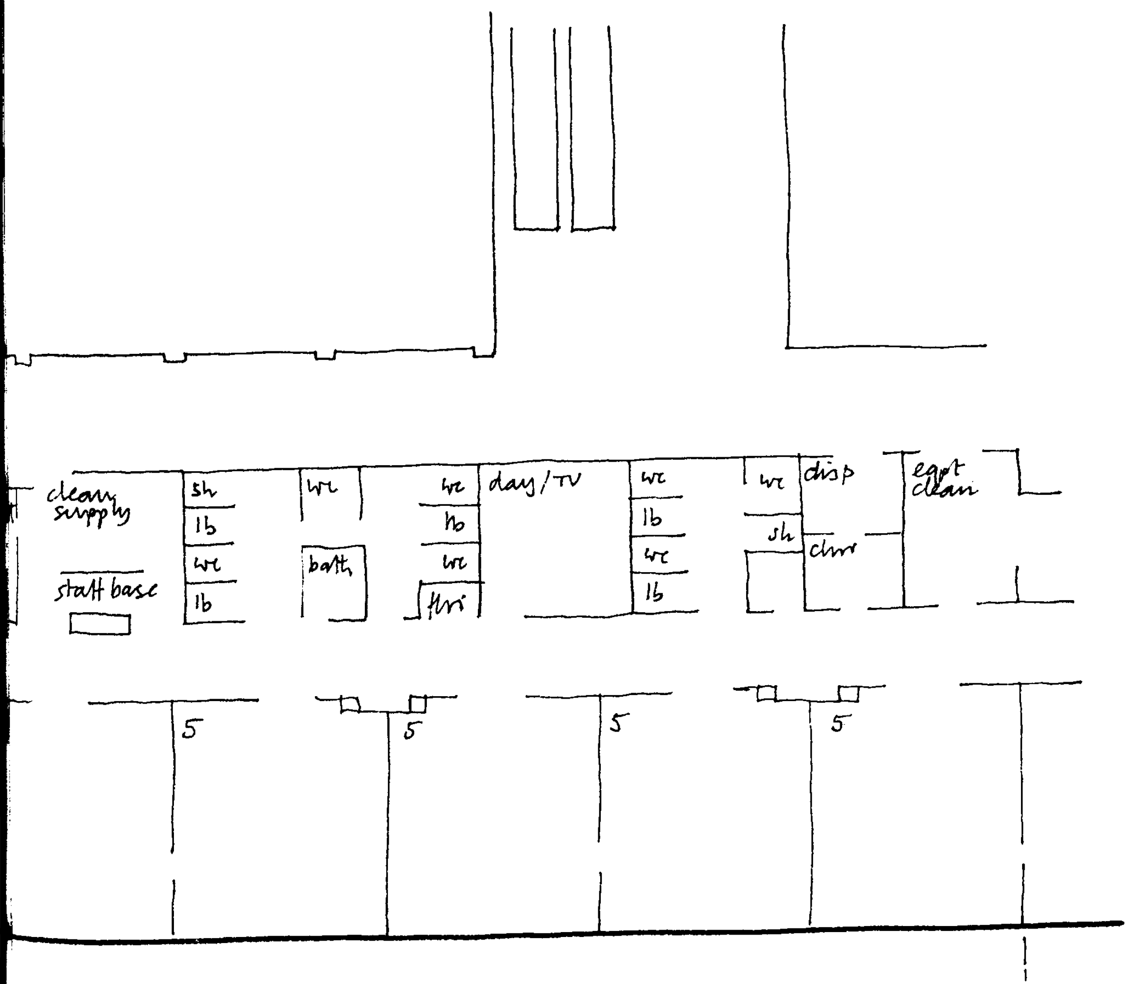
7.5 SHARING OF ROOMS BETWEEN NURSING UNITS One decision which was made quite early in the project was to link adjoining nursing units so that they could share certain rooms where the units met. This principle of sharing was based on two requirements: that maximum economy in use of space could be obtained; and that the layout of individual nursing units and rooms should be as consistent and clear as possible for patients and staff.

As each nursing unit contained both single rooms and multi-bed rooms the first point to establish was how these were to be arranged. By linking adjoining nursing units – so that the three single rooms in each unit formed a group of six single rooms – it was possible to use the middle two to four rooms as 'ebb-and-flow' rooms.

This principle was intended to apply also at the end of the nursing unit where the multi-bed rooms adjoined, though here it meant the reallocation of a whole multi-bed room, unless the adjoining ward sisters could agree to share responsibility for the room as a whole, each assuming control over as many beds in the room as they needed. It is yet to be established how far this degree of non-definition of zones of responsibility can be taken, but if it can be applied to seminar rooms, equipment cleaning rooms, relatives' and doctors' rooms, waiting areas and staff cloakrooms, there seems no reason why it should not apply to bed areas also. The ultimate responsibility for allocation will be with the floor administrative sister (Salmon grade 7), and so long as responsibility for day to day allocation is clearly established it should be possible to obtain a cost benefit on this basis. However, a limiting factor proved to be the nurse call system, a problem which will be discussed in 7.7.


bath
lb
wc
5
wc
lb
wc
lb
flowers
relative
5
wc
day/TV
wc
lb
wc
lb
5
bath
wc
supply trolley
5
linen disposal hatch
wc
lb
wc
lb
sluice
disposal
N
0
10
20
30
40
50
treatment
5 beds + day space.
staff base
clean supply
hospital street
6 beds
wc
asst. bath.
msl
tel.
seminar rm.
asst bath
disposal
wc
wc
wc
wc
sluice
sister
wait
sister
wait
6 beds
wc
wc
wc
wc
wc
wc
wc
relative/interview
doctor
1 bed
1
1
1
1
1

57 Greenwich—the overall concept of ward layout: 68 beds arranged in two nursing units.



58 Greenwich—layout of the Second Floor showing the number of beds to be provided in each phase and in each nursing unit.

7.6 DETAILED FUNCTIONAL INVESTIGATION AND OPERATIONAL POLICIES Having established the overall concept for the ward design, and the general operational principles affecting wards, the more detailed decisions on operational methods and room design were taken. Following the investigation procedure headings listed in Appendix A, the Inpatient Care Investigating Sub-group, discussed at considerable length the way in which the various people concerned envisaged that inpatient care ought to be provided. The notes of the Sub-group record the discussions which took place and, as an example, an extract from these is included in Appendix D.

Following the completion of the first series of discussions, the research architects prepared functional diagrams to aid their own comprehension of the proposals and to get the Sub-group's agreement on the policies represented by the diagrams.

When agreement had been reached, operational policy statements were prepared. As intended in the project as a whole, they were drafted in such a way that they did not assume a particular design solution.

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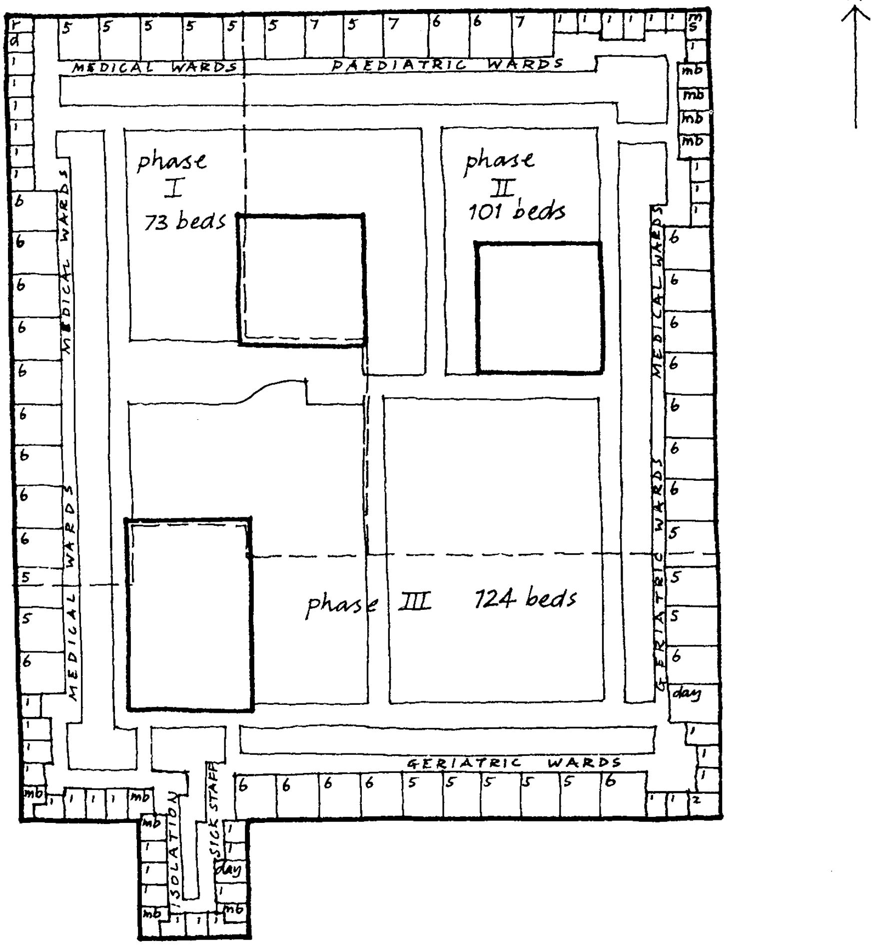


Research architects (1 or 2)
Project Secretary
R.H.B. Doctor

Dept. of Health Nurse planning officers (1 or 2)
" Engineer

RHB Nursing officer
" Architect

HMC Group secretary
" Doctors (as appropriate)
" Matron, assistant matrons and ward sisters (as appropriate)

Other specialist advisers as required
eg: domestic management
catering
records etc.

59

59 The list gives the composition of the Inpatient Care Investigating Sub-group.

Rather, they were a description of an activity or function that could be used as a basis on which to test or verify the validity of design proposals. Examples are given in Appendix E. For the designer the operational policy statements were relatively meaningless unless related to design policy statements. Examples of these are given in Appendix F.

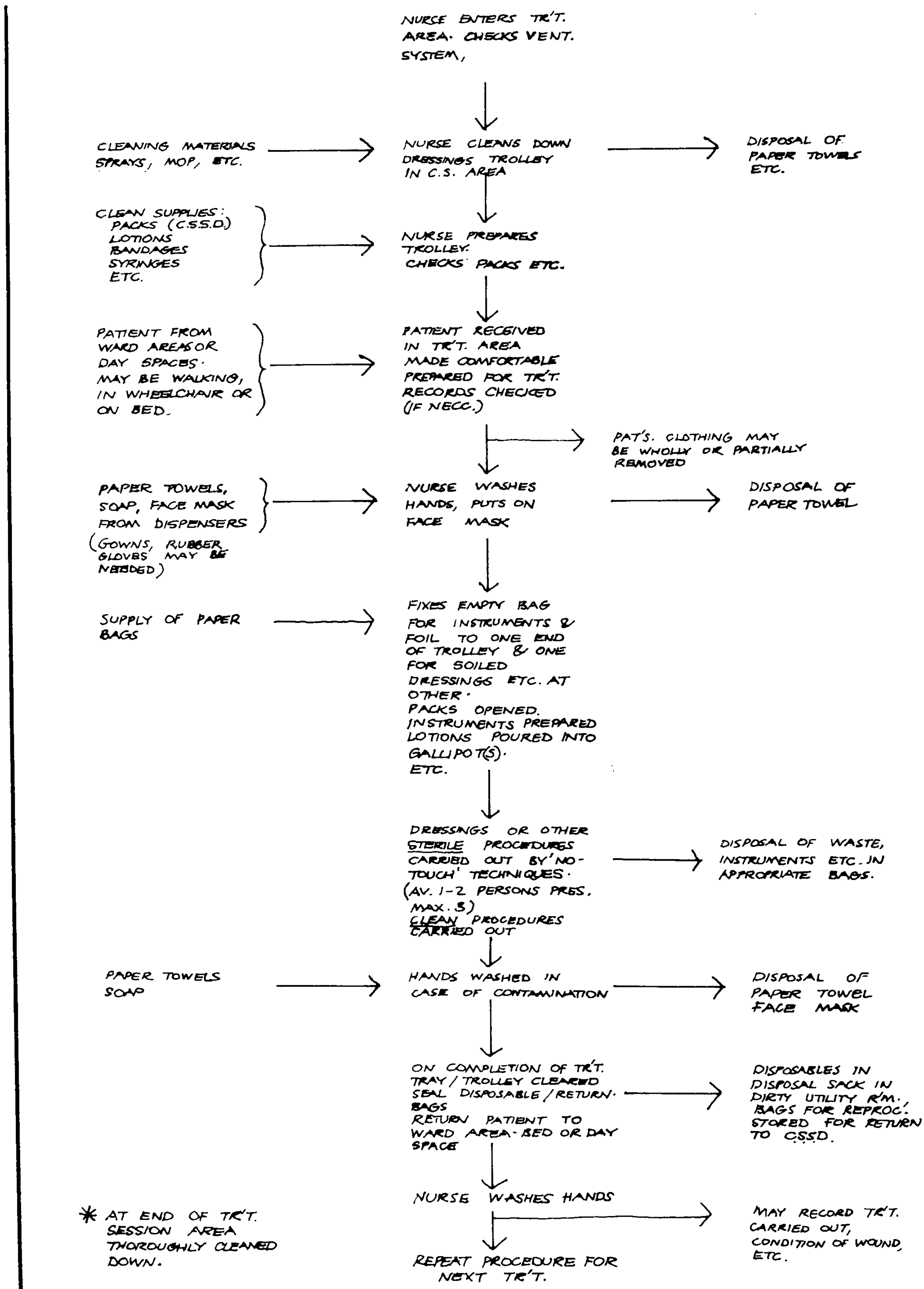
7.7 DETAILED DESIGN PROBLEMS AND SOLUTIONS The next stage in providing the design team with the detailed information they required was to produce an $\frac{1}{8}$ in to 1 ft (1 : 96) sketch layout of a typical ward, and a key plan of the whole floor showing each bedroom at a scale of 1 : 500. This was essential to establish where the phasing boundaries came, and that the floor as a whole made sense in terms of the location of each nursing unit and the relation of rooms to structure and other departments.

Work was proceeding simultaneously on the design of the individual rooms, using data from a number of published and draft sources, visits to see functioning units, models and mock-ups. These data were synthesised by the research architect into a document called *Planning Brief* which, together with the operational policies and other general data, was handed to the production design architects, as well as to other members of the Inpatient Investigating Sub-group and the Project Team. This document included descriptions of individual rooms together with layout diagrams to show positions of equipment and so on. Only twenty copies of this fairly bulky document were produced originally, as it was intended simply as a draft for comment. The functional diagrams and operational policies had already been circulated and were accepted as the agreed basis against which the design proposals would be judged. It was agreed that if the design proposals were shown to reflect adequately the policies then the design should be accepted also.

It was not always easy, however, to establish that the design proposals did, in fact, adequately reflect the policy intentions. In some cases further information or investigation was called for – a case in point was the proposal for a speech call system for patients' use in wards.

Studies conducted by the Department's central O & M unit had indicated that the speech facility, where provided, was relatively little used and that it did not justify the extra money spent on it. Nursing opinion at Greenwich was that if the speech facility was not provided to enable one nurse to talk to another if necessary, an additional 50 nurses might be needed to maintain an adequate standard of care. This was held to be particularly important at night with the type of ward layout proposed – that is, multi-bed rooms with doors, compared with the open Nightingale-type that the nursing staff were used to.

This was a difficult argument to refute in the absence of field trials and a study group was formed to investigate the problem. As a result of its findings, the Project Team approved the installation of a simple 'talk-back' system within a cost limit that the Department engineers considered reasonable. Events have yet to prove that the decision taken was the right one, and even so it will mean careful comparisons between wards which are similar in



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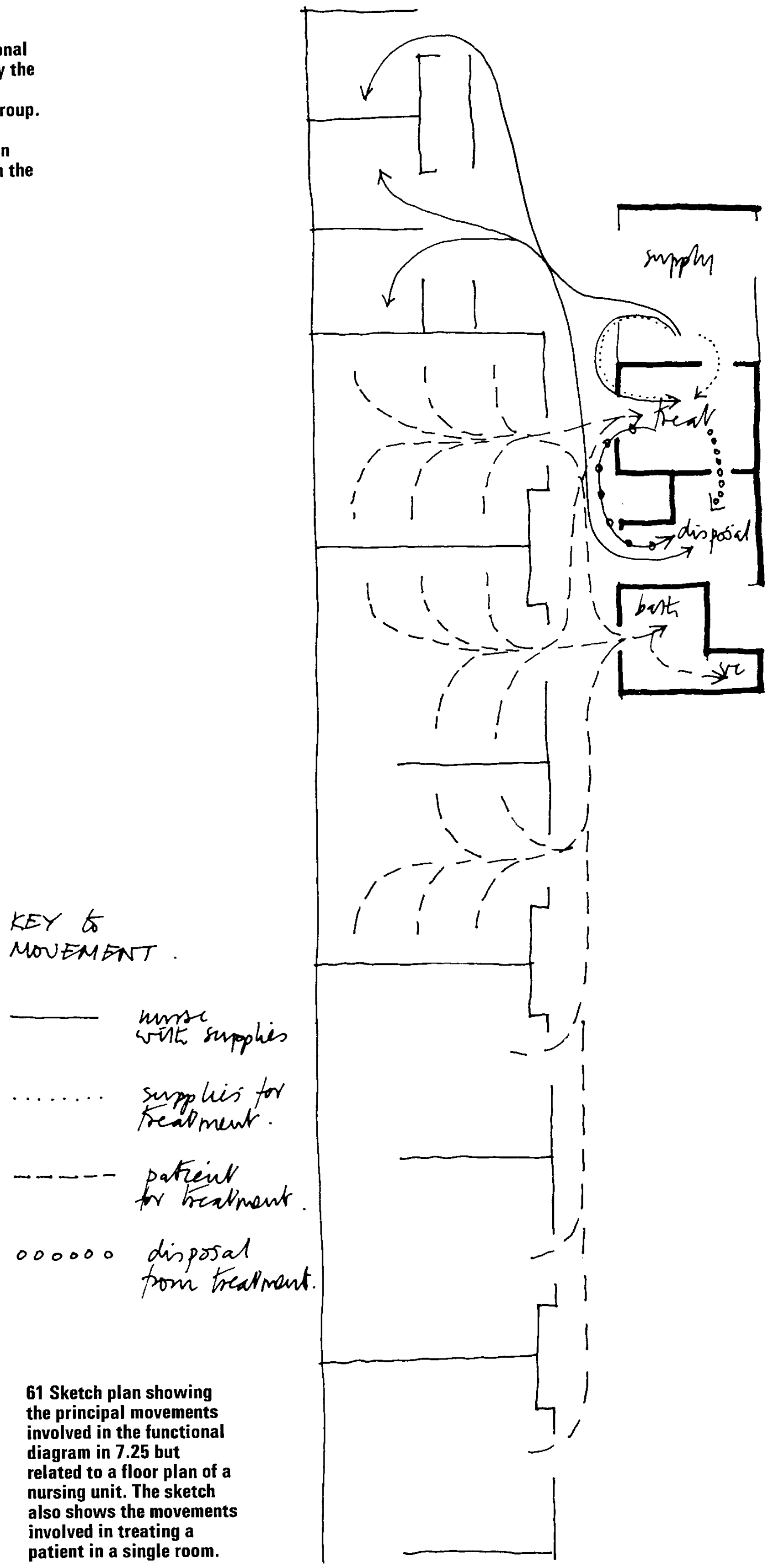
TREATMENT OF PAT'S. GENERAL PROCEDURE		

60 Greenwich—an example of a functional diagram prepared by the in-patient care Investigating Sub-group. It deals with the activities involved in treating a patient in the treatment area.



61 Sketch plan showing the principal movements involved in the functional diagram in 7.25 but related to a floor plan of a nursing unit. The sketch also shows the movements involved in treating a patient in a single room.

62

62 Greenwich—linen being delivered to the ward unit.

63 Greenwich—trolley with linen, bedpan liners and urinals which is kept in a small bay off the corridor between each pair of multi-bed rooms.

63

every way other than the presence or absence of the 'talk-back' facility.

A related area of controversy concerned the presence and form of doors to the multi-bed rooms. It was maintained by the Department engineers that they could not exercise control over air movement patterns between adjoining multi-bed rooms, unless doors to the corridor were provided and the majority kept closed except for occasions when somebody wished to go in or out of the room. The nursing staff argued that a direct and permanent air path between the patients' bedrooms and the staff base was desirable as an additional means of ensuring that a nurse could detect anything wrong. Also, it was argued that even if instructions were given that the doors were to be kept closed whenever possible, they would be propped open if this was more convenient.

The doors involved form part of a glazed partition between the corridor and the multi-bed rooms and as built they are, for reasons of economy, solid rather than partly glazed. This design proposal led to further doubts, on this occasion about the adequacy of visual supervision of patients in multi-bed rooms from the corridor; and about the possibility of collisions between people on each side of the doors both trying to go through them at the same time. Later evaluation studies should throw light on the wisdom or otherwise of the decision to have solid doors.

A number of interrelated problems arose concerning the supply and disposal system and the way it affected nursing policy and ward design. The hospital supply, disposal and catering aspects are described in *Hospital Traffic and Supply Problems*, but it is necessary to repeat here the particular aspects concerned with the ward. All supplies are delivered to a supply centre on each floor by vertical conveyor from the stores and food preparation area on the lower ground floor. From the floor centre food is either sent through to the floor kitchen for cooking before being delivered by tray service to the patients in the wards, or served to staff or ambulant patients in the dining areas adjoining the floor kitchen. Other items such as linen, surgical supplies, stationery, cleaning materials, and so on are delivered by a topping-up round from the floor supply centre to the clean supply room in each nursing unit. All supplies except pharmacy items are delivered by means of the vertical conveyor in a standard 2 ft × 1 ft × 1 ft container, and they may either remain in this container until placed on shelves in the clean supply rooms by the topping-up porter or, as in the case of wrapped bundles of sheets, may be removed from the container before being placed on the topping-up trolley in the floor supply centre.

When the linen and other supplies reach the ward they are stored on shelves or trolleys in the clean supply room until needed. A proportion of items such as bed linen and disposable bedpan liners and urinals, are stored on trolleys which are normally kept in small bays off the ward corridor between each pair of multi-bed rooms. Here they are conveniently placed for nursing or domestic staff when they need to make a bed or replace a patient's bedpan liner. The trolley itself can be wheeled into the clean supply room once or twice a day to be

64

64 Greenwich—the dirty linen hatch with rounder in position.

65 Greenwich—the nurses' station. The DDA cupboard is immediately behind the desk lamp in the photograph and the pharmacy trolley recess is below it.

*A cupboard complying with the requirements of the Dangerous Drugs Act.

topped up from the main storage shelves.

One suggestion was that dirty linen removed from beds should be disposed of, not by fetching a linen rounder from the disposal room as was usual, but by putting it through a lift-up hatch which discharged into a linen rounder in a cupboard adjoining the clean linen trolley bay. This was put into practice and saves the nurse going to the disposal room each time dirty linen is disposed of and does away with the somewhat unpleasant presence of the linen rounder in the bed area. The dirty linen rounders are collected several times a day by domestic staff, and taken to the disposal room for collection by porters.

Pharmacy items are delivered separately from the general supply items and, for security reasons, are stored in a pharmacy trolley in a recess behind the staff base or in a DDA cupboard* over the recess. Many of the details of trolley design, storage space requirements and the dirty linen hatch were worked out with the help of mock-ups, but even this was no guarantee, either that the right solution was found, or that it would be carried out as agreed on the mock-up. For example, a standard DDA cupboard unit was shown on the mock-up over the medicine area sink and work top. Comments made at a meeting at the mock-up indicated that a larger, double width DDA cupboard was called for and the fact duly noted on a drawing of the agreed mock-up and in notes of the meeting. However, the requirements were translated into a small, single width DDA cupboard above the medicine sink. The hospital matron – a successor to the matron who had been involved in the Sub-group meetings and the mock-up meeting – on seeing the DDA cupboard installed rightly queried its size and also its position.

It was then agreed that it would be better placed over the pharmacy trolley recess and should be larger.

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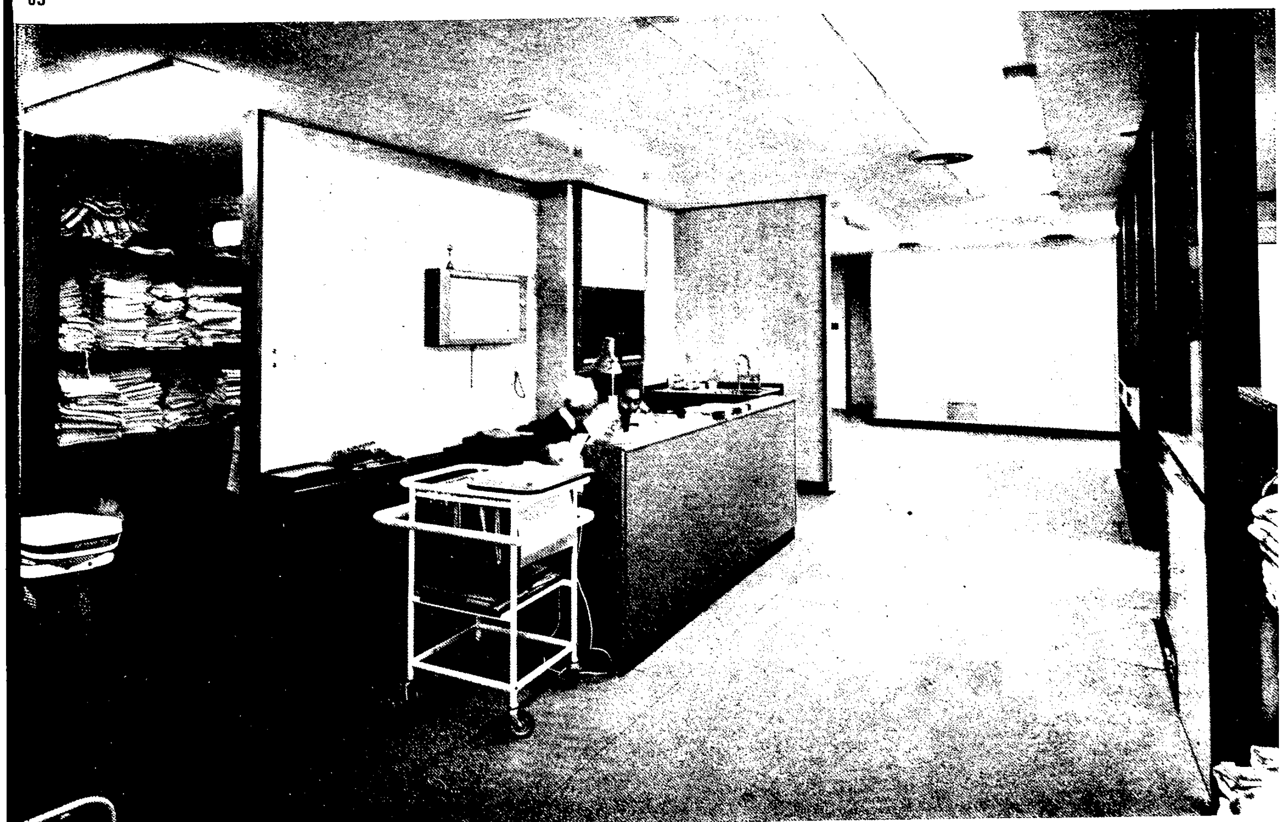

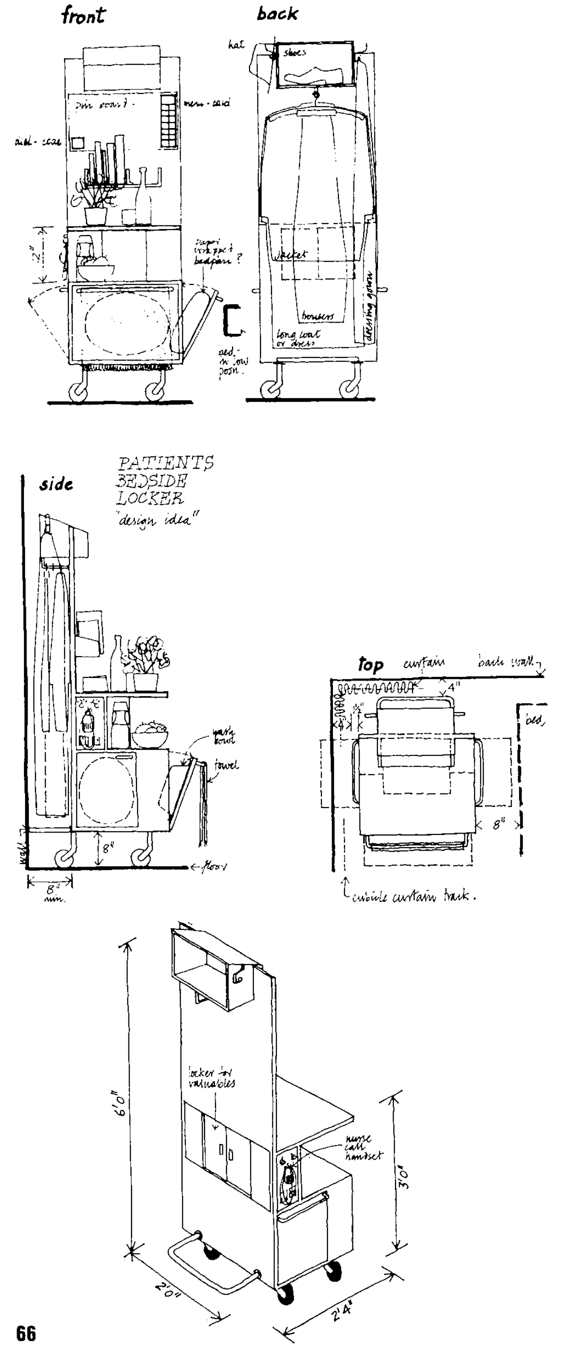

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Fortunately, it was not too difficult to effect the change, but, even so, it demonstrates the problem of continuity and communication and also the need to be able to make changes at both design and construction stages as well as in use.

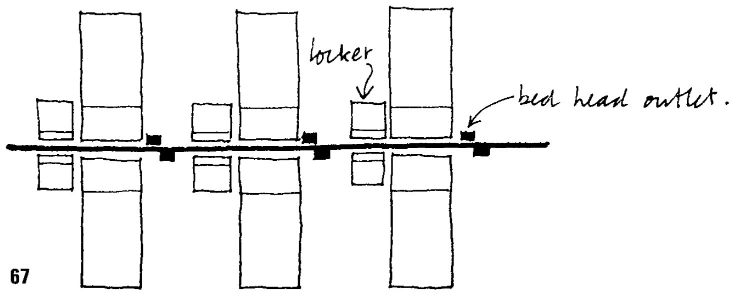
7.8 SPACE AND EQUIPMENT ROUND THE BED

In view of the considerable amount of thought and effort that has gone into the design of 'space round the bed' it is surprising that there are so many unsolved problems still remaining. This is probably due to the great variety of activities and types of patient that have to be provided for and the relatively small space within which the activities occur. In the Greenwich project, attempts to simulate nursing activities round the bed proved to be of limited value in arriving at workable layouts and dimensions, although it was possible to substantiate the view that the 8 ft 10 in depth of bed space was justified to accommodate a King's Fund specification bed[5] with bed stripper extended.

Associated with the bed space size and arrangement problem was the design of the equipment in the bed space and the positioning of the service outlets for call systems, medical gases – where provided – and overbed light and socket outlet.

The bedside locker was the first item of equipment to come under scrutiny. Conventional lockers clearly did not provide adequately for the needs of the patient, particularly where progressive patient care was to be practised. Nor did they provide space for all the patient's belongings where he most needed them – right beside the bed. It was additionally argued that it would be an advantage if the patient's washbowl and bedpan support, plus new liner in a paper bag, were kept beside the bed. Existing types of locker were also considered to be too small for the items which patients usually wanted to keep in them, especially as far as open shelf and surface space were concerned.

To establish a clear definition of policy a design for a combined wardrobe and bedside locker was produced in the form of a sketch which was approved in principle some time before the ward design was finalised. This design idea was looked at again when equipment was being selected for the ward areas and a mock-up and prototype constructed prior to the locker being put into production.



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66 'Design idea' sketches for the Greenwich bedside locker.

67 Greenwich—positioning of bedhead outlets on opposite sides of patients who are back to back in adjoining rooms.

68

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68 Greenwich— the locker as built and in use.

69 Greenwich— post-natal bed with baby's cot at the foot.

However, the new locker, having a higher back than normal, presented a new series of problems. It was thought that it might cause a visual obstruction, so that a patient could be hidden behind it out of nurses' view. It also obscured anything on the wall behind it lower than 4 ft 10 in.

There were also discussions as to which side of the patient's bed the locker should be, and which side the call system and electrical outlet panel ought to be. If the lockers were on the corridor side of the bed, it was likely that they would obstruct the nurses' view, so it was proposed that lockers would normally be on the window side. They would thus be on the right hand side for the patients on one side of the room and on the left for those on the opposite side of the room.

For reasons of economy, call system outlet boxes in adjoining bedrooms should, where possible, be back-to-back to save on wiring and conduits. This meant that bed-head outlets would be on opposite sides of patients who were back-to-back in adjoining bedrooms. For geriatric and paediatric wards, the nursing and medical staff insisted that glazed partitions should be provided between adjoining multi-bed rooms for these wards. This meant that the call system outlet boxes had to be positioned on a wide mullion between adjoining panels of glass.

As no definite information had been provided by the research architect regarding gas outlet positions, the production architect was obliged to make enquiries regarding the recommended height and found no fewer than eight different recommendations. In the end, in Phase One at least, the lockers were placed on the window side of the patient and the electrical services outlet panel on the corridor side. Any variations to this arrangement in later phases will help to show up the advantages and disadvantages of the possible solutions.

The post-natal bed areas in the maternity ward presented, of course, an additional piece of equipment to deal with: the baby's cot. In theory, this could have been placed at the foot of the bed, but the mother could see the baby more easily if it were beside her. In this position it needed a certain minimum amount of space which was partly governed by the fact that the items required for toilet purposes were to be kept in a cupboard beneath the cot. Access to these was provided by side hinged doors of the type preferred by the senior consultant.

Mock-up trials with a 3 ft wide King's Fund specification bed, and a cot of the approved type, revealed that the bed space width of 7 ft 9 in, with the 1 ft 10 in wide wardrobe locker, was not wide enough by 4 in. The locker could not be reduced in width without limiting its capacity considerably. The cot needed a minimum amount of space if it were to be of the type specified and used in the way intended. The decision was made, therefore, to use 2 ft 6 in wide beds for post-natal patients in order to obtain the extra width needed in these wards to accommodate the cot between the beds.

The correctness of this solution will not be easy to establish without experimenting with a reduced width locker or a modified cot – say, with sliding doors in place of hinged – in the same size bed space.

8 Outpatient Services

8.1 BACKGROUND AND AIMS Some 10 per cent of the British public attend hospital as outpatients each year. This represents a large number of employed people and hence anything that can be done to make their visits more convenient, efficient and quicker will be to the advantage of the nation and of the patient. Also, the area of hospital buildings devoted to outpatients is considerable so that savings in space can produce dividends over the whole building programme.

These two thoughts provided the main guide lines for the outpatient investigation at Greenwich, but interwoven with them was the desire to consider organisation and operation in such a way that the efficient use of trained staff was never lost sight of.

In the early days of the National Health Service complaints about the outpatient services tended to centre on inadequate and outdated accommodation. But, over the last ten or fifteen years, many new departments have been built and the complaints now tend to focus on excessive waiting times. The problem has undergone considerable examination recently and one report[6] concluded that newly designed departments had very little effect on patients' waiting times. However, the report continued that '. . . this could be interpreted as confirmation of the theory that punctuality, an even spread of appointments and, of course, an adequately staffed department are the main constituents necessary for an efficient appointments system. But it could also be because very often the old mistakes in design are repeated.'

To try to establish the facts a number of visits were made to recently built departments. The visits tended to confirm the view that many of the old mistakes were being repeated. Often the relationships between the different elements of the department were not satisfactory and the design of the individual spaces was not considered from the viewpoint of encouraging their multi-use. It was realised that better planning alone would not reduce patients' waiting time but the hope was that a better balanced approach to the total problem would be achieved by considering organisation, operation and design together, rather than separately.

As a start, the team made a special study, based on surveys, of the existing outpatient facilities and an Investigating Sub-group was set up to consider outpatient care. From the outset the Sub-group agreed that if previous mistakes were to be identified then the surveys should be backed up by a study of functions and activities rather than spaces, and the investigation proceeded along the lines described in Part One of this book.

The SEMRHB 'Green Book' pointed out that the estimated population of the outpatient clinic catchment area at Greenwich was 166,000.
In addition, the annual reports published by the GDHMC gave details of past attendances for each specialty at consultative outpatient clinics. These figures proved an excellent basis from which to start looking for other similar situations and as trend indicators, but for planning purposes more specific and detailed data were required.

8.2 OUTPATIENT SURVEY Parallel to the examination of outpatient activities, the SEMRHB statistical officer and the research architects discussed what survey information was required and how it could best be presented for direct application in the planning process. The number of patients actually attending had to be determined and, if the location of the different elements of the department was to be based on fact rather than opinion, then what the patients did during the course of their visit to the department was of great importance. It was agreed that the survey should cover the following categories of use.

1 The number of patients per session at each clinic.

2 The number of patients per session receiving minor treatments in a treatment room.

3 The number of adult escorts.

4 The number of child escorts.

The number of patients and escorts was important to assist in determining the location and size of waiting spaces, and the number of treatments carried out had important implications, particularly in the area of relationship of treatment and consulting rooms, and the possible effect on internal traffic, supervision and nursing management.

The survey was carried out over six months and both the existing hospitals, St Alfege's and the Miller General, were covered as eventually they were to be combined. The survey results were then extrapolated and compared, specialty by specialty, with the regional and national averages and predicted population trends. The results of these studies indicated either an acceptable number of patients per session, or, where the sessional figures were greater than the regional average, a case for a new specialty or an additional session.

Many of the consultants held clinics in other hospitals, so this had to be allowed for in any proposed rearrangement of the clinic timetable. Eventually, a new timetable was drafted which gave the numbers of patients likely to attend together with details of the medical and supporting staff who would be involved. This is shown in Diagrams 70 and 71.

Each box represents a consulting/examination suite, that is, two combined rooms. In the top section of the box is the name of the specialty together with details of consultant and other medical staff. In the lower section, from left to right, are the number of patients per session, the number receiving minor treatments in a treatment room, the number of adult escorts and the number of child escorts. Where suites are required to work together, this is indicated by an arrow.

The half days of the week are shown horizontally, and down the right hand side of the sheets are the totals of the different categories of user for the clinic session indicated. Along the bottom of the sheets are details of the largest clinic held in that particular clinic suite during the week. This additional information was of value when the demand for waiting space and treatment accommodation was being considered, and when the work of particular individual clinics and movement of people within the department were being discussed.

70 and 71 Greenwich— the draft outpatient clinic timetable, giving the numbers of patients likely to attend together with details of the medical and supporting staff who would be involved.

Monday a…				
Monday p…	General Medi… Consultant.	22	2	2
Tuesday …	General Medi… Consultant.	10	1	3
Tuesday p…	General Medi… Consultant.	29	-	5
Wednesday…				
Wednesday…	General Medi… Consultant.	54	-	11
Thursday …	General Medi… Consultant.	9	-	3
Thursday…	General Medi… Consultant	10	-	2
Friday a…	General Medi… Consultant + H…	29	-	3
Friday p…	Dermatologi… Cons.+ Cl. As.+…	72	11	14
Saturday…	General Medi… H.O.	2	2	1
		72	11	14

Greenwich Group. St. Alfege's Hospi…

Session				
Monday am.	Chest Diseases Consultant. 20 | 8 | 3 | 2	Chest Diseases Registrar. ←	Chest Diseases Consultant 33 | 12 | 12 | 4.	Gynaecology. Consultant. 15 | 1 | 4 | 1.
Monday pm.	Chest Diseases Consultant. 29 | 16 | 4 | 2			
Tuesday am.	Chest Diseases Consultant. 27 | 2 | 2 | —	Chest Diseases Cl. Asst. ←	General Surgery Consultant. 35 | 15 | 15 | 5.	General Surgery Registrar + H.O. ←
Tuesday pm.				
Wednesday am	Chest Diseases Consultant. 27 | 4 | 9 | 2.		General Medicine Consultant. 13 | - | 3 | -	
Wednesday pm	Chest Diseases Consultant. 31 | 4 | 4 | 1		Gynaecology. Consultant + H.O. 33 | 3 | 8 | 5.	Gynaecology. Registrar + 2 H.O. ←
Thursday am	Chest Diseases Consultant. 32 | - | 8 | 2	Chest Diseases Cl. Asst. ←	Chest Diseases Consultant. 27 | - | 2 | -	Chest Diseases Registrar. ←
Thursday pm.	Chest Diseases Consultant. 34 | 4 | 5 | 1	Chest Diseases Consultant. 26 | 11 | 4 | 6		
Friday am.	General Surgery Consultant + H.O. 25 | 6 | 5 | 1		General Surgery Consultant. 33 | 7 | 11 | 3	General Surgery Registrar + H.O. ←
Friday pm.				
Saturday am.				
	34 | 4 | 5 | 1.	26 | 11 | 4 | 6.	35 | 15 | 15 | 5.	15 | 1 | 4 | 1.

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sents a consulting/examination suite,
bined rooms. In the top section of the
e of the specialty together with details
d other medical staff. In the lower
ft to right, are the number of patients
e number receiving minor treatments
room, the number of adult escorts and
hild escorts. Where suites are required
er, this is indicated by an arrow.

of the week are shown horizontally,
right hand side of the sheets are
different categories of user for the
ndicated. Along the bottom of the
ails of the largest clinic held in that
c suite during the week. This additional
s of value when the demand for waiting
tment accommodation was being
nd when the work of particular
ics and movement of people within
t were being discussed.

Greenwich Group. St. Alfege's Hospita

Monday am.			E.N.T. Consultant. 21 | 6 | 8 | 2	E.N.T. H.O. ←
Monday pm.	General Medicine Consultant. 22 | 2 | 2 | –	General Medicine H.O. ←		+ Special Accom Ophthalmic. Consultant. 90 | 20 | 33 | 8
Tuesday am	General Medicine Consultant. 10 | 1 | 3 | 1			Ophthalmic Consultant 18 | – | 13 | 2
Tuesday pm.	General Medicine Consultant. 29 | – | 5 | –		E.N.T. Consultant + H.O. 84 | 36 | 35 | 9	E.N.T. 3. Cl. Asst's. ←
Wednesday am.			E.N.T. Consultant 29 | 2 | 14 | 7	E.N.T. Cl. Asst + H.O. ←
Wednesday pm.	General Medicine Consultant. 54 | – | 11 | 2	General Medicine Registrar + H.O. ←		E.N.T. Consultant. 11 | 3 | 8 | 4.
Thursday am.	General Medicine Consultant. 9 | – | 3 | 1	General Medicine Registrar ←		+ Special Accou Ophthalmic Consultant + Cl. As 34 | 7 | 10 | 2
Thursday pm.	General Medicine Consultant. 10 | – | 2 | 1			+ Special Accou Ophthalmic. Consultant. 17 | – | 13 | 2.
Friday am.	General Medicine Consultant + H.O. 29 | – | 3 | 1			
Friday pm.	Dermatology Cons. + Cl. Ast. + H.O. 72 | 11 | 14 | 9			+ Special Accou Ophthalmic Consultant. 14 | – | 7 | 2
Saturday am.	General Medicine H.O. 2 | 2 | 1 | –			
	72 | 11 | 14 | 9	←	84 | 36 | 35 | 9	90 | 20 | 33 | 8

Session									Total
…y am.			E.N.T. Consultant. 21 6 8 2	E.N.T. H.O. ←	Dermatology Consultant 46 14 12 5	Dermatology H.O. ←	Paediatrics Consultant 24 1 23 4	Paediatrics H.O. ←	91 21 43 11
…y pm.	…edicine …nt. … 2 -	General Medicine H.O. ←		+ Special Accomm. Ophthalmic. Consultant. 90 20 33 8	Ophthalmic 4 Cl. Asst's. ←	Psychiatry. Consultant. 24 - 7 1	Psychiatry H.O. ←	Psychiatry. H.O. ←	136 22 42 9
…ay am	…edicine …nt. … 3 1			Ophthalmic Consultant 18 - 13 2		Child Guidance Consultant. 12 - 9 1	Child Guidance Registrar ←	Child Guidance Registrar ←	40 1 25 4
…y pm	…edicine …nt. … 5 -		E.N.T. Consultant + H.O. 84 36 35 9	E.N.T. 3. Cl. Asst's. ←	Dermatology Consultant 77 16 15 7	Dermatology H.O. + Cl. Asst. ←	Psychiatry Consultant 9 - 2 -	Psychiatry Registrar ←	199 52 57 16
…sday am.			E.N.T. Consultant 29 2 14 7	E.N.T. Cl. Asst + H.O. ←	Paediatrics Consultant 5 - 6 3		Psychiatry Consultant. 11 - 4 1	Psychiatry Registrar ←	45 2 24 11
…sday pm.	…edicine …nt, … 11 2	General Medicine Registrar + H.O. ←		E.N.T. Consultant. 11 3 8 4.	Paediatrics Consultant 7 - 9 -	General Medicine Consultant. 13 - 6 -	Psychiatry. Consultant 9 - 6 1	Psychiatry Registrar ←	94 3 40 7
…ay am.	…edicine …nt. … 3 1	General Medicine Registrar ←		+ Special Accomm. Ophthalmic Consultant + Cl. As. 34 7 10 2	Paediatrics Consultant + H.O. 20 3 18 7		General Medicine Consultant 10 - 1 -		73 10 32 10
…day pm.	…edicine …nt. … 2 1			+ Special Accomm. Ophthalmic. Consultant. 17 - 13 2.	Psychiatry Consultant 9 - - -	Psychiatry Registrar ←	Psychiatry Consultant 20 - 4 1	Psychiatry Registrar + H.O. ←	56 - 19 4
…y am.	…edicine …t + H.O. … 3 1						General Medicine Consultant 47 - 8 -	General Medicine Registrar ←	76 - 11 1
…y pm.	…ology …As. + H.O. … 14 9			+ Special Accomm. Ophthalmic Consultant. 14 - 7 2	General Medicine Consultant + H.O. 34 2 6 -		General Medicine Consultant 60 - 14 4	General Medicine Registrar + H.O. ←	180 13 41 15
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Greenwich Group. St. Alfege's Hospital

Session					
Monday am.	Chest Diseases Consultant. 20 8 3 2	Chest Diseases Registrar. ←	Chest Diseases Consultant 33 12 12 4.	Gynaecology. Consultant. 15 1 4 1.	General Surgery Consultant. 35 7 7 3
Monday pm.	Chest Diseases Consultant. 29 14 4 2				General Surgery Consultant. 48 5 8 3
Tuesday am.	Chest Diseases Consultant. 27 2 2 –	Chest Diseases Cl. Asst. ←	General Surgery Consultant. 35 15 15 5.	General Surgery Registrar + H.O. ←	General Surgery Consultant. 14 - 3 2
Tuesday pm.					
Wednesday am	Chest Diseases Consultant. 27 4 9 2.		General Medicine Consultant. 13 - 3 -		
Wednesday pm	Chest Diseases Consultant. 31 4 4 1		Gynaecology. Consultant + H.O. 33 3 8 5.	Gynaecology. Registrar + 2 H.O. ←	General Surgery Consultant. 37 7 12 4
Thursday am	Chest Diseases Consultant. 32 - 8 2	Chest Diseases Cl. Asst. ←	Chest Diseases Consultant. 27 - 2 -	Chest Diseases Registrar. ←	General Surgery Consultant. 30 12 8 2
Thursday pm.	Chest Diseases Consultant. 34 4 5 1	Chest Diseases Consultant. 26 11 4 6			General Surgery Consultant 17 - 6 3
Friday am.	General Surgery Consultant + H.O. 25 6 5 1		General Surgery Consultant. 33 7 11 3	General Surgery Registrar + H.O. ←	
Friday pm.					
Saturday am.					
	34 4 5 1.	26 11 4 6.	35 15 15 5.	15 1 4 1.	48 5 8 3

Monday am.	Chest Diseases Consultant. 20 8 3 2	Chest Diseases Registrar. ←	Chest Diseases Consultant 33 12 12 4.	Gynaecology. Consultant. 15 1 4 1.	General Surgery Consultant. 35 7 7 3.	General Surgery Registrar + H.O. ←	Neurology. Consultant. 27 3 5 2	Neurology. Registrar ←	130 31 31 12
Monday pm.	Chest Diseases Consultant. 29 14 4 2				General Surgery Consultant. 48 5 8 3.	General Surgery Registrar + H.O. ←	General Medicine Consultant. 51 5 9 2	General Medicine Registrar + H.O. ←	128 26 21 7
Tuesday am.	Chest Diseases Consultant 27 2 2 –	Chest Diseases Cl. Asst. ←	General Surgery Consultant. 35 15 15 5.	General Surgery Registrar + H.O. ←	General Surgery Consultant. 14 – 3 2	General Surgery 2 H.O.s. ←	General Medicine Consultant. 30 – 7 3	General Medicine Registrar + H.O. ←	106 17 27 10
Tuesday pm.								Neurology. Consultant + H.O. 15 – 6 –	15 – 6 –
Wednesday am	Chest Diseases Consultant. 27 4 9 2.		General Medicine Consultant. 13 – 3 –				General Medicine Consultant. 42 3 11 3	General Medicine Registrar + H.O. ←	82 7 23 5
Wednesday pm	Chest Diseases Consultant. 31 4 4 1		Gynaecology. Consultant + H.O 33 3 8 5.	Gynaecology. Registrar + 2 H.O. ←	General Surgery Consultant. 37 7 12 4.	General Surgery. Registrar + 2. H.O. ←	Urology. Consultant. 36 15 10 3	Urology. Reg. + H.O. + Cl. As. ←	137 29 34 13
Thursday am	Chest Diseases Consultant. 32 – 8 2	Chest Diseases Cl. Asst. ←	Chest Diseases Consultant. 27 – 2 –	Chest Diseases Registrar. ←	General Surgery Consultant. 30 12 8 2.	General Surgery Registrar + 2. H.O. ←	Gynaecology Consultant. 19 – 5 2.	Gynaecology. Registrar + H.O. ←	108 12 23 6
Thursday pm.	Chest Diseases Consultant. 34 4 5 1	Chest Diseases Consultant. 26 11 4 6			General Surgery Consultant 17 – 6 3		General Medicine Consultant. 53 7 17 2.	General Medicine Registrar + H.O. ←	130 22 32 12
Friday am.	General Surgery Consultant + H.O. 25 6 5 1		General Surgery Consultant. 33 7 11 3	General Surgery Registrar + H.O. ←			Urology. Consultant. 18 4 5 2.	Urology. Registrar + H.O. ←	76 17 21 6
Friday pm.							Gynaecology. Consultant. 24 1 6 2.	Gynaecology. Cl. Asst. ←	24 1 6 2
Saturday am.									

tal

General Surgery Consultant. 35 7 7 3.	General Surgery Registrar + H.O. ←	Neurology. Consultant. 27 3 5 2	Neurology. Registrar ←	130 31 31 12
General Surgery Consultant. 48 5 8 3.	General Surgery Registrar + H.O ←	General Medicine Consultant. 51 5 9 2	General Medicine Registrar + H.O. ←	128 26 21 7
General Surgery Consultant. 14 - 3 2	General Surgery 2 H.O.s. ←	General Medicine Consultant. 30 – 7 3	General Medicine Registrar + H.O. ←	106 17 27 10
			Neurology. Consultant + H.O. 15 - 6 -	15 - 6 -
		General Medicine Consultant. 42 3 11 3	General Medicine Registrar + H.O. ←	82 7 23 5
General Surgery Consultant. 37 7 12 4.	General Surgery Registrar + 2.H.O. ←	Urology. Consultant. 36 15 10 3	Urology. Reg. + H.O + Cl.As. ←	137 29 34 13
General Surgery Consultant. 30 12 8 2.	General Surgery Registrar + 2.H.O. ←	Gynaecology Consultant. 19 - 5 2.	Gynaecology. Registrar + H.O. ←	108 12 23 6
General Surgery Consultant 17 - 6 3		General Medicine Consultant. 53 7 17 2.	General Medicine Registrar + H.O. ←	130 22 32 12
		Urology. Consultant. 18 4 5 2.	Urology. Registrar + H.O. ←	76 17 21 6
		Gynaecology. Consultant. 24 1 6 2.	Gynaecology. Cl. Asst. ←	24 1 6 2
48 5 8 3.	←	53 7 17 2	15 - 6 -	

8.3 THE INVESTIGATING SUB-GROUP The Investigating Sub-group held thirty meetings in all, and most of the clinic consultants attended at some time together with representatives of the nursing staff supporting professions, for example, social workers, dieticians, medical records officer and so on. The Sub-group examined all the functions involved in offering a comprehensive outpatient and day hospital service and the survey data just described were fed into these meetings. From the Sub-group notes a number of provisional operational policy decisions were derived in respect of both outpatient and day surgery services and some of these are listed below.

1 Whenever possible, outpatients should be pre-registered.

2 Documentation should be mechanised and centralised.

3 The outpatient superintendent will be in administrative control of the department and directly responsible to the matron for nursing aspects. The superintendent will be responsible for the day beds, but not the theatres.

4 The day theatres will be under the control of the theatre superintendent.

5 Either a sister or a staff nurse will be responsible for each clinic, under the control of the outpatient superintendent.

6 Nursing involvement in non-nursing duties, for example, ushering, chaperoning and so on should be kept to a minimum.

7 Except in certain special cases a standard range of consulting and examination spaces should be available to all clinics on a programmed basis.

8 To ensure interchangeability, urine testing, weighing and measuring should be regarded as 'routine' and all clinics should have equal access to these facilities.

9 Local control of patients is made easier and more personal by the employment of clinic receptionists in decentralised waiting spaces.

10 Provision should be made for patients who arrive early or escorts who do not wish to accompany patients to the clinic area, and for patients who have to wait for buses and so on before going home.

11 Treatment provision should be located and planned so as to make the most effective use of trained nursing staff.

12 Non-resident nurses will change in a central cloakroom and arrive at the department in full uniform.

The duties of nurses and clinic receptionists were described in detail in an attempt to achieve a correct balance of duties and considerable discussion was devoted to the supply and disposal arrangements within the department. The detailed descriptions of activities in the various specialties and of the duties and responsibilities of individuals, gave what appeared to be a reasonably comprehensive picture. But, as a check on the completeness of the information and to make sure that each member of the Sub-group accurately understood what had been discussed, functional diagrams were prepared as a basis for the detailed operational policy statements. An example of an outpatient functional diagram is given in Diagram 32.

8.4 OPERATIONAL POLICIES AND DESIGN IMPLICATIONS It is not proposed here to go into the design implications of all the operational decisions. However, a discussion of some of them will give a flavour of the degree of detail appropriate for an operational policy statement at the stage of the briefing process when design has to be considered.

If the nursing involvement in non-nursing duties such as ushering and chaperoning was to be kept to a minimum, and if receptionists were to be employed for individual clinics, then from a management viewpoint the duties of the nurse and receptionist had to be considered together. The aim was to eliminate unnecessary tasks and to allocate the essential ones so as to allow each member of staff to make the greatest use of his skill. The duties of the clinic receptionist might include the following.

1 Looking after one large clinic, or perhaps two smaller ones.

2 Reception of patients.

3 Checking appointments list.

4 Producing the medical records.

5 Checking the completeness of the records – results of tests including weighing, measuring and urine testing, before the patient sees the doctor.

6 Seeing that patient and records get to the right doctor in the right room at the right time.

7 Arranging referral appointments.

8 Making return appointments.

9 Arranging transport.

10 Filtering incoming telephone calls.

The methods of transfer of patients and case notes from waiting space to consulting room generated a good deal of discussion, particularly concerning the degree of nursing involvement. Diagrams were developed to show seven suggested ways in which this particular activity might be carried out and these are shown in Diagrams 72–78. All the methods shown assume that the clinic receptionist is working to one clinic only, or to two clinics which, in terms of total work load, are equivalent to one clinic. The seven methods outlined in the diagrams are not comprehensive since there are several other possible permutations of the many steps involved nor is it always necessary that a clinic should use one method only. There could be a change partway through a session or, alternatively, the work of the clinic might

72 **The diagrams show the alternative methods that were considered by the Sub-group for transferring patients and case notes from the waiting spaces to the consulting rooms.**
72 Method 1—for a clinic with a slow turnover of patients and a compact plan of 2–4 rooms.
73 Method 2—for a clinic with a medium turnover of patients and an extended plan of more than 4 rooms.
74 Method 3—for a clinic with a quick turnover of patients and an extended plan of more than 4 rooms.

METHOD 1

Patient enters sub-waiting space.
▼
C.R. identifies patient and confirms appointment.
▼
C.R. checks case-notes for completeness.
▼
Light signals for next patient.
▼
C.R. selects next patient and takes patient and case-notes to C/E room.
▼
C.R. places case-notes on Doctor's desk and cancels light.
▼
C.R. returns to reception desk.

METHOD 2

Patient enters sub-waiting space.
▼
C.R. identifies patient and confirms appointment.
▼
C.R. checks case-notes for completeness.
▼
Inside nurse comes to reception desk for next patient.
▼
(C.R. or) inside nurse collects next patient and takes patient and case-notes to C/E room.
▼
Inside nurse places case-notes on doctor's desk.

METHOD 3

Patient enters sub-waiting space.
▼
C.R. identifies patient and confirms appointment.
▼
C.R. checks case-notes for completeness.
▼
Light signals for next patient.
▼
C.R. selects next patient. Outside nurse takes patient and case-notes to C/E room.
▼
Outside nurse places case-notes on doctor's desk and cancels light.

METHOD 4

C.R. checks case-notes for completeness and places in C/E room at start of session.
▼
Patient enters sub-waiting space.
▼
C.R. identifies patient and confirms appointment.
▼
Light signals for next patient.
▼
C.R. selects next patient.
▼
C.R. directs patient to C/E room.
▼
Inside nurse identifies patient and places case-notes on doctor's desk.
▼
Inside nurse cancels light.

METHOD 5

C.R. checks case-notes for completeness and places in C/E room(s) at start of session.
▼
Patient enters sub-waiting space.
▼
C.R. identifies patient and confirms appointment.
▼
Light signals for next patient.
▼
C.R. selects patient from room list.
▼
C.R. directs patient to C/E room.
▼
Inside nurse cancels light.

METHOD 6

C.R. checks case-notes for completeness and places in C/E room at start of session.
▼
Patient enters sub-waiting space.
▼
C.R. identifies patient and confirms appointment.
▼
Inside nurse uses telephone to:-

a) inform C.R. of identity of next patient

b) (optional) ask for next patient (now/later)
▼
If later (b above) light used as signal for next patient.
▼
C.R. directs patient to C/E room.
▼
Inside nurse cancels light, if used.

METHOD 7

C.R. checks case-notes for completeness and places in C/E room at start of session.
▼
Patient enters sub-waiting space.
▼
C.R. identifies patient and confirms appointment.
▼
Inside nurse opens C/E room-door and indicates readiness for next patient.
▼
C.R. directs next selected patient to C/E room.
▼
Inside nurse identifies patient and places case-notes on doctor's desk.

75 Method 4—for a clinic with a medium turnover of patients and a compact plan of 2–4 rooms.

76 Method 5—for a clinic with a quick turnover of patients and a fairly compact plan.

77 Method 6—for a clinic with a medium turnover of patients and a compact plan of 2–4 rooms.

78 Method 7—for a clinic with a quick turnover of patients and a compact plan of 2–4 rooms.

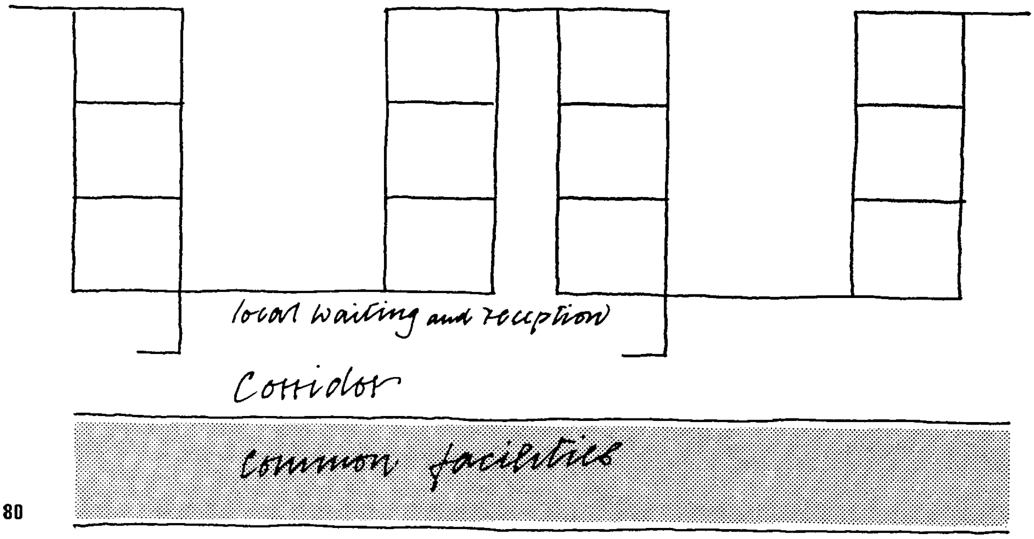
be split into two, for example, old and new patients, and the two halves use different methods. It will be seen from the diagrams that each method has been identified with a particular clinic type, for example, No 7 – quick turnover, compact plan, say 2–4 rooms. It is suggested that each method will operate most efficiently with the given clinic type, but obviously those methods which can cope with a busy clinic could also be used for less busy clinics if such a course was felt to be justifiable for any reason.

The main differences in the seven methods are as follows.

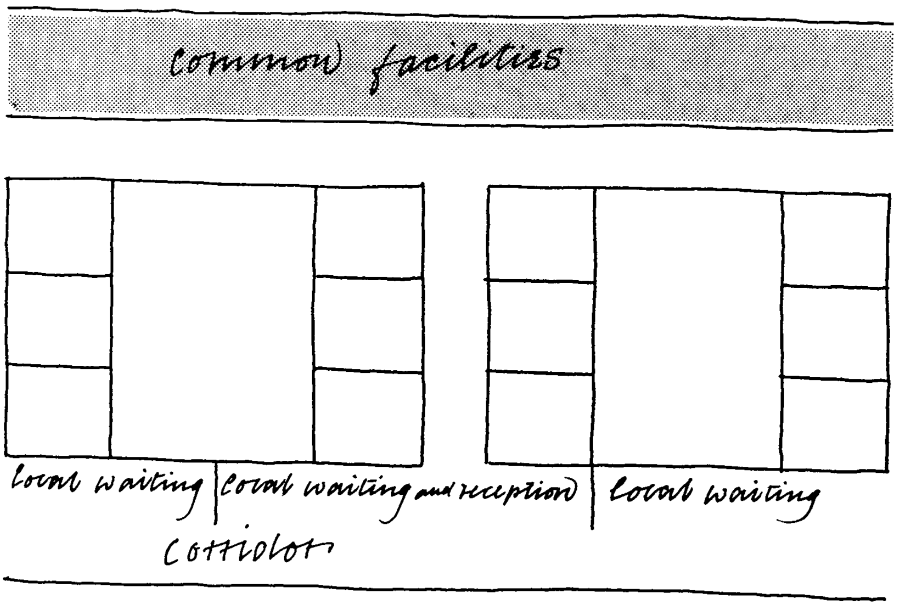
> In methods 1–3 (72–74) the patient is escorted from the waiting space to the consulting room; in methods 4–7 (75–78) he is directed, but not escorted.
>
> In methods 1–3 (72–74) the case notes remain with the clinic receptionist until the patient goes into the consulting room; in methods 4–7 (75–78) all case notes for the clinic are placed in the consulting room(s) at the start of the session.
>
> Because of the single pile of case notes in methods 4, 6 and 7 (75, 77 and 78) the number of rooms used should be limited so that the pile is not too far away from any room: in method 5 (76) case notes are placed in each room at the start of the session, enabling the number of rooms in use to be somewhat greater.
>
> In methods 4 and 7 (75 and 78) the 'inside nurse' must establish the patient's identity since this is not communicated in any way by the clinic receptionist: in all the other methods the patient's identity needs to be established only once, by the clinic receptionist, although the doctor or inside nurse may choose to check it.

In one sense this degree of detail reduces the possible planning alternatives or, put another way, it simplifies the designers' decision-making by clarifying the planning implications. For example, in order to see that weighing, measuring and urine testing are carried out and the results recorded before the patient sees the doctor, it is necessary for the clinic receptionist to be close to these facilities. Further, if the clinic receptionist is to have complete control over a number of consulting rooms she has to be in direct visual and aural contact with them. To these requirements two further ones can be added. First, the equal availability of weighing, measuring and urine testing and second, the allocation of a number of different specialties to arrange for common consulting rooms on a programmed basis. To give the clinic receptionist the necessary degree of control over a varying number of rooms needing access to certain common facilities, some kind of grouping was indicated. This grouping was possible with either the 'linear' or 'finger' plans as shown in Diagrams 79–82 (overleaf).

Both these solutions and some variations had to be compared, but before doing so it was necessary to discover whether any other operational requirements indicated a preference for a particular layout. One such requirement proved to be the multi-purpose consulting and examination room.

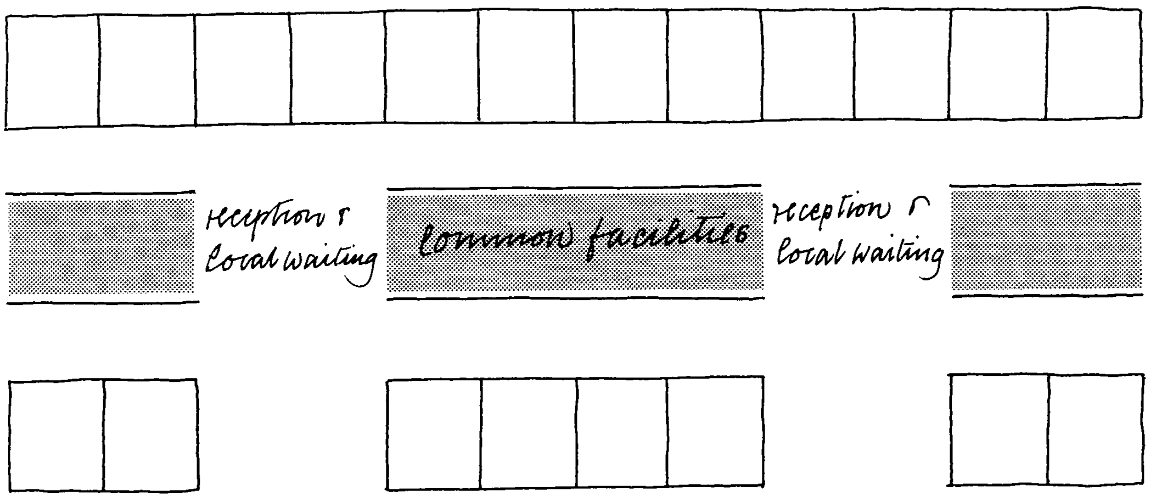

local waiting and reception
Corridor
common facilities

80


common facilities
local waiting
local waiting and reception
local waiting
Corridor

79

The operational policies stated that a standard range of consulting and examination spaces should be available to all clinics on a programmed basis, but what was the standard range to be? In the interests of flexibility and economy, the minimum reasonable number of rooms with the greatest interchangeability had to be sought and then they had to be arranged in such a way as to make the greatest use of the grouped facilities described earlier.



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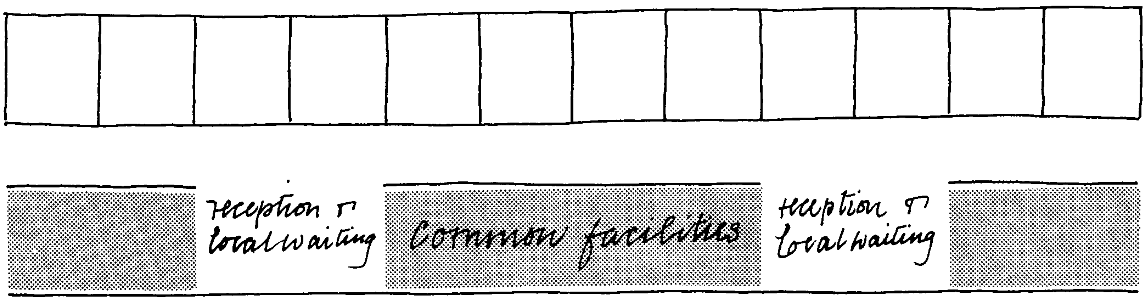
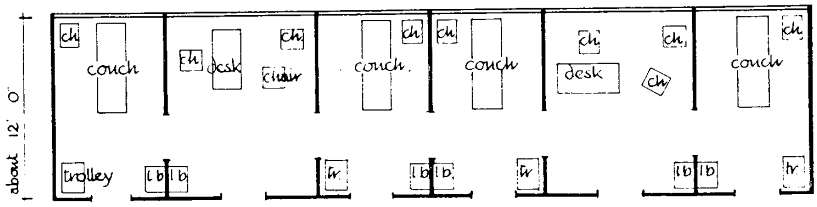
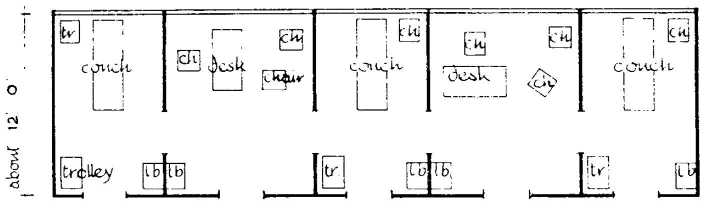


82

79-82 Alternative layouts for the outpatient department, each of which would give the clinic receptionist the necessary degree of control over consulting/examination rooms and common facilities. 79 and 80 are 'finger' plans; 81 and 82 are 'linear' plans.



83



84

83 and 84 Plans showing separate consulting and examination rooms. (Reprinted from Hospital Building Note No 12 Out-Patient Department, 1961, by courtesy of HMSO. Crown Copyright.)

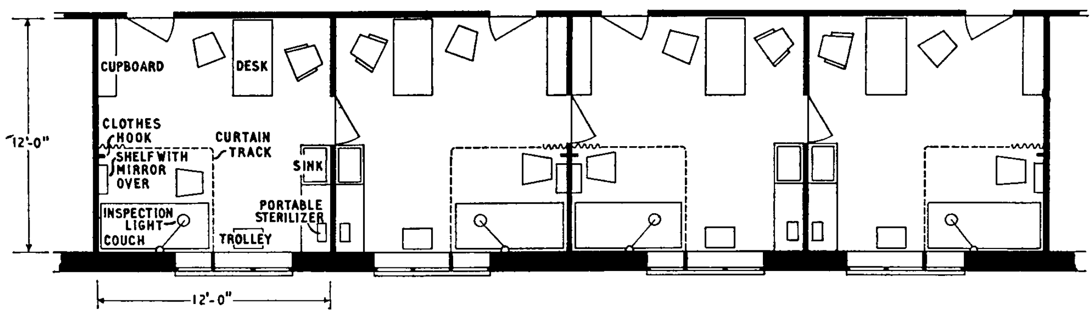
Until 1952 the accepted method of providing consulting and examination rooms was basically as shown in Diagrams 83 and 84, with a number of variations. It was considered important that a consulting room should be supported by a number of examination rooms and sometimes also by changing cubicles. In 1952 a new outpatient department was opened at the West Middlesex Hospital and in that building the consulting and examination spaces were combined into one room. This design was based on the conviction of the medical staff that at most consultative clinics the patients would benefit from unbroken consultation and examination. A doctor could use either one or two rooms and a 'firm' could divide a group of rooms between them. The approach of the West Middlesex team showed on the plans as a series of identically designed and furnished rooms.

In 1955, and quite independently of the West Middlesex work, the Nuffield Provincial Hospitals Trust published its report[7], part of which was devoted to a study of outpatient departments. The Nuffield study was based on very detailed time studies of clinics in progress, and in general there was good deal of agreement in the conclusions of both studies. For example, they both recommended the grouping of suites, the abolition of the changing cubicle and, in principle, they both supported unbroken consultation and examination, see Diagram 85.

In 1961 the Ministry of Health published *Building Note No 12* and here, for the first time, the combined consulting/examination room was officially recognised and strongly advocated. But the more traditional type of suite comprising separate examination and consulting rooms was also included, see Diagrams 83, 84 and 86. During the progress of the Greenwich investigation there was support for both types of

85 Plan showing a four-roomed consultation suite of combined consulting/examination rooms. (Reprinted from Studies in the Function and Design of Hospitals, 1955, by courtesy of the Nuffield Provincial Hospitals Trust. Published by Oxford University Press.)

85



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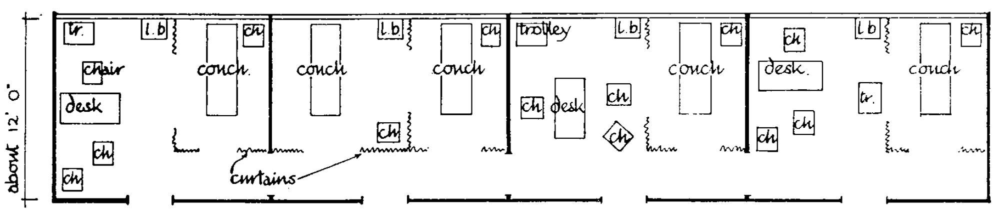


86 Plan showing a four-roomed consultation suite of combined consulting/examination rooms. (Reprinted from Hospital Building Note No 12 Out-Patient Department, 1961, by courtesy HMSO. Crown Copyright.)

provision. Doctors who had been used to working in separate rooms feared that a change to a combined room might impede their efficiency, while others, who were familiar with the combined room supported it as did the architects. The Sub-group set about resolving this conflict by visiting hospitals with combined rooms, observing clinics in session and talking to doctors and nurses. In addition, a full-size mock-up was built which enabled the Sub-group to simulate certain activities while at the same time discussing problems with fellow users and designers. The support for the combined room by the architects was based largely on their experience of and success in providing this type of accommodation in the previous development project, an outpatient department and accident and emergency unit at Walton Hospital, Liverpool.

In 1967 the Scottish Home and Health Department published *Hospital Planning Note No 6* and further data became available to the Greenwich team. Each aspect of the department's organisation was examined by the Scots, and the planning proposals were made with great care. A standard suite of interconnecting, combined examination and consulting rooms was recommended. The combination of visits, mock-ups and other data persuaded the Sub-group to agree to the department being planned with combined rooms and the Project Team agreed to the proposal.

The next problem was to test various room and department layouts in order to discover the minimum reasonable number of rooms, and which layout would allow for the desired interchangeability. Here, again, the Walton experience was of great value.

Within the general constraints of the Greenwich design idea, and having considered a number of alternatives, the layout which appeared to offer the most flexibility was one which incorporated comparatively long strings of rooms. This idea was developed, a draft planning layout produced and then tested using a visual simulation technique which fitted the different timetabling requirements into a number of plans to see which gave the greatest freedom.

8.5 SIMULATION EXERCISES In addition to the operational policies, the Sub-group stated certain planning preferences and these are listed below.

1 Each firm to have the same suite of rooms as often as possible.

2 The location needs of certain special classes of patients, for example, paediatric and psychiatric, would need to be specially considered.

3 Where required there should be a convenient relationship between consulting and treatment rooms.

The aim of the final simulation exercise was to accommodate satisfactorily the constructed timetable and yet leave sufficient space either for the growth of an existing clinic or the introduction of a new one.

The chest clinic, as originally proposed, is accommodated in that group of consulting rooms which is nearest the entrance. It is under the direct control of a clinic receptionist who, in time, will get to know the patients and the course of treatment they are undergoing, and control the appointments accordingly. Similarly, general surgery has the use of a self-contained suite of six rooms which is closely related to the endoscopy room and day surgery unit, and the paediatric and psychiatric clinics have been indicated at the end of the main corridors, avoiding through traffic and providing an external view. Other specialties are programmed into the suites depending on size and in an attempt to make the best use of the space and at the same time provide the correct supporting facilities. The same clinic receptionist will always act for the same firm although sometimes she will control a single clinic, and at other times she will control two.

The original brief for the new hospital set out a case of need which showed that the outpatient department could expect to deal with a load of 228 doctor sessions per week. From this total number certain specialties were deducted on the grounds that they required purpose-built accommodation and these clinics were VD (now omitted altogether), orthopaedic and fracture, ophthalmic, dental and ante-natal. When the final adjustments were made a claim to 34 general purpose rooms was established.

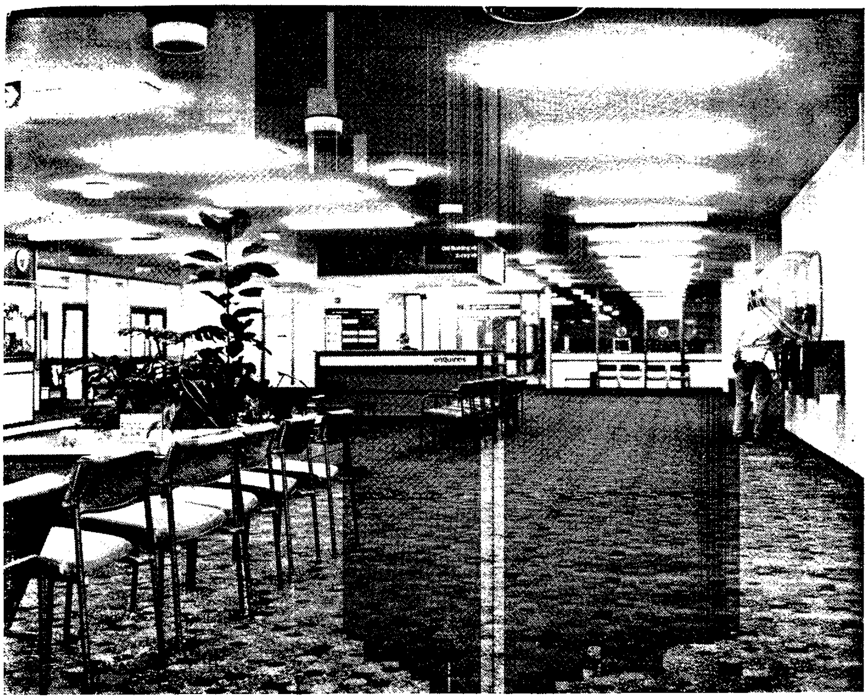
However, during the investigation period it had been stated and provisionally accepted that 40–44 rooms would be a more reasonable number. It was proposed that a further general medical clinic be introduced and that this clinic would involve consultant, registrar, house officer, dietitian and medical social worker. A new geriatric clinic was to be started and some firms were likely to grow.

Possible future changes in the field of medical practice were also cited in support of the higher level of provision, for example, the need to provide space for additional sessions, the growing demands of medical teaching and increasing number of supporting staff who require space in the outpatient department – psychologists, psychiatric social workers, health visitors, dietitians, social workers and appliance fitters. So far as the known new clinics were concerned, these were added to the timetable and further simulations were carried out. The result of these studies was that the Sub-group and finally the Project Team approved the plan shown in Diagram 8.20 which held the number of combined examination and consulting rooms at the original number of 34.

8.6 THE OUTPATIENT DEPARTMENT LAYOUT The finally adopted design, which has now been built, merits description in some detail, so that the building and the way it is intended to work may be more fully understood. Diagrams 87–90 show the finished department.

The ante-natal clinic and the outpatient department are separate, but connected by the pathology outstation waiting space. Both units are located to the left of the main hospital entrance doors and have access to opposite ends of the central records reception area.

An ante-natal patient proceeds from the main concourse, through the ante-natal clinic doors, and the appointment is confirmed and the notes checked



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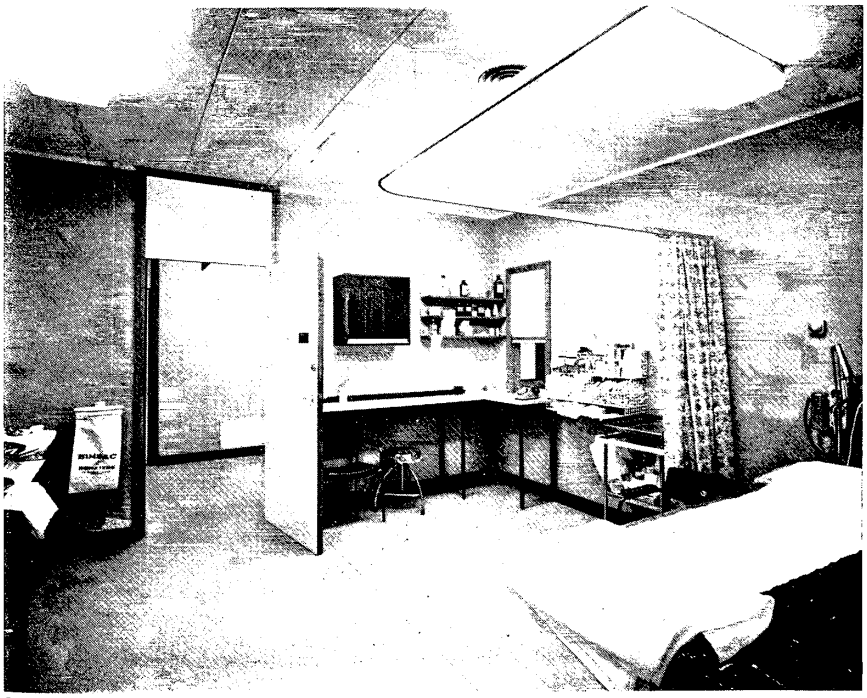


88

87 Greenwich—A view across the main entrance hall to the entrance of the outpatient department.

88 Greenwich—a treatment room in the outpatient department.

as the patient enters. Weighing, measuring, urine testing, dirty utility and clean supply are centralised on one side of the waiting area and around the other three sides are the combined consulting and examination rooms.

A patient can conveniently have routine weighing, measuring and urine testing and the results can be recorded before she enters the consulting room and if further tests are required, which do not necessitate a visit to the main laboratory, she can visit the pathology outstation on the way out of the hospital.

Clean supplies will be brought by the floor delivery service and used material will be removed from the dirty utility room.

One group of eight combined examination and consulting rooms has been provided with a rear service corridor to facilitate the movement of staff between rooms and the curtain arrangement has been modified accordingly.

The main outpatient department is in the form of an inverted T and is entered through the doors marked B in Diagram 89. First attenders call at the main records reception area A and are directed to the appropriate sub-waiting area. On arrival, the appointment is confirmed and the records are checked by the clinic receptionist. Patients making return visits proceed directly to the sub-waiting area.

The records reception area is designed so that the clerk can supervise the ambulance waiting area and the outpatient department superintendent has a room just inside the entrance doors.

In essence, the plan consists of two strips of inter-connecting, combined examination and consulting rooms on either side of a central strip of supporting accommodation. The cross-bar of the inverted T contains identical consulting rooms which are programmed for multi-use throughout the week and the centre service strip contains waiting, treatment, clean supply, dirty utility, testing, toilet and ECG facilities. There are four sub-waiting areas, three of which have weighing, measuring and urine testing accommodation.

The fourth waiting space, at the closed end of the corridor, has not been provided with these facilities. Firstly, it was argued that one quiet waiting area with an outside view and no through traffic was required, around which could be built up paediatric and psychiatric clinics, and secondly, it was argued that even for multi-purpose clinics it would not be necessary to centralise weighing, measuring and urine testing at all waiting areas.

The clinic receptionists bring the records from the main record store on trolleys and take up a position at one or other end of the waiting space – whichever provides the better view of the clinic suite. Telephone jacks are provided at either end of the waiting areas and the clinic receptionist filters all calls before putting them through to the consultant.

Two treatment rooms are provided in the central area, complete with clean supply and dirty utility rooms. Spaces are provided for carrying out audiometry tests at the quiet end of the department.

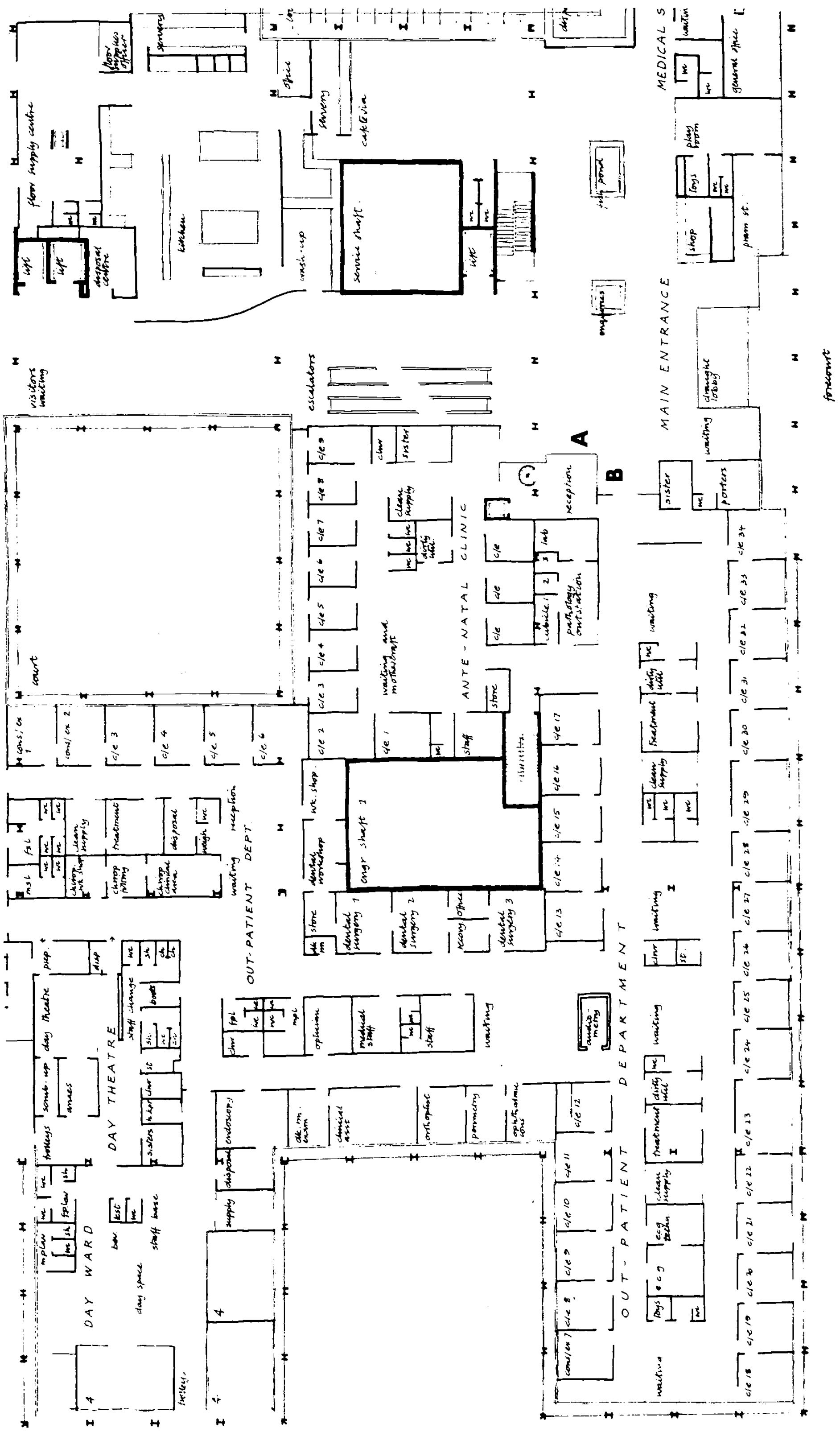
The pathology outstation provides a service to the outpatient department and is equipped with three 'bleeding' rooms. Sample tests such as haemoglobins and glucose tolerance will be carried out here, and it is hoped that this provision will not only cut down patient traffic within the hospital but will also help to speed up the process of getting the results back to the clinician concerned.

The cafeteria and waiting area in the main concourse are available to outpatients and their escorts.

The first section of the leg of the T is given over to ophthalmology and dentistry and a medical staff room is provided. The second section is for general surgery.

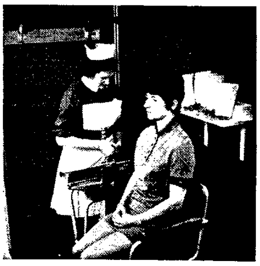
Throughout the investigation one aspect of the work which intrigued the Sub-group was the flexibility potential of different string lengths of consulting rooms. It has now been agreed that another research project 8, mathematically based, should build on this early work.

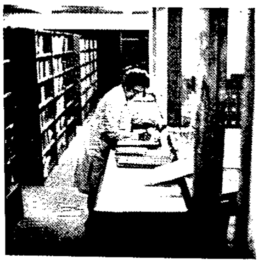
89 Greenwich—layout of the outpatient department showing its relation to the main entrance and cafeteria.


DAY WARD
DAY THEATRE
OUT-PATIENT DEPT
OUT-PATIENT DEPARTMENT
ANTE-NATAL CLINIC
MAIN ENTRANCE
MEDICAL S
A
B
court
escalators
kitchen
cafeteria
service shaft
forecourt
reception
waiting
porters
sister
lift

1

90 This sequence of photographs follows the course of a typical patient through the outpatient department. The five photographs on the far left show the cycle of activities involved in handling the case notes: they are batched with others for the same clinic and brought from the store to the sub-waiting area by trolley.



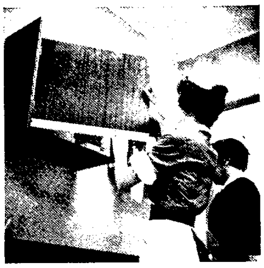


The patient enters the hospital through the main entrance, enquires at the desk and, if attending for the first time, goes to the records reception (A in Diagram 89). If attending subsequently the patient goes straight to the clinic receptionist in the sub-waiting area. The remainder of the sequence shows routine weighing and urine testing, seeing the doctor in one of the combined consulting/examination rooms and a subsequent treatment in the treatment room.



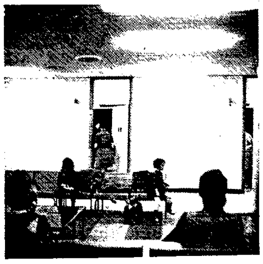










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9 Operating Department

9.1 BACKGROUND AND AIMS The basic problem was to provide an efficient, safe, comfortable and convenient environment in which surgery could be carried out, bearing in mind the needs of both staff and patients. A solution was required which was not related to one method of working or a rigid set of procedures but which kept the options open for changes in theatre discipline and techniques. The effective control of environment was considered essential in order to contribute to the control of infection.

9.2 DESIGN OBJECTIVES The basic requirements were set out as follows.

1 The use of aseptic techniques.

2 The sterilisation of instruments.

3 Ventilation to control air movement, with a progression of air pressures from areas requiring the maximum degree of cleanliness to the clean and less clean zones.

4 A layout which encouraged the movement of patients and staff through an appropriate sequence on entering or leaving the department.

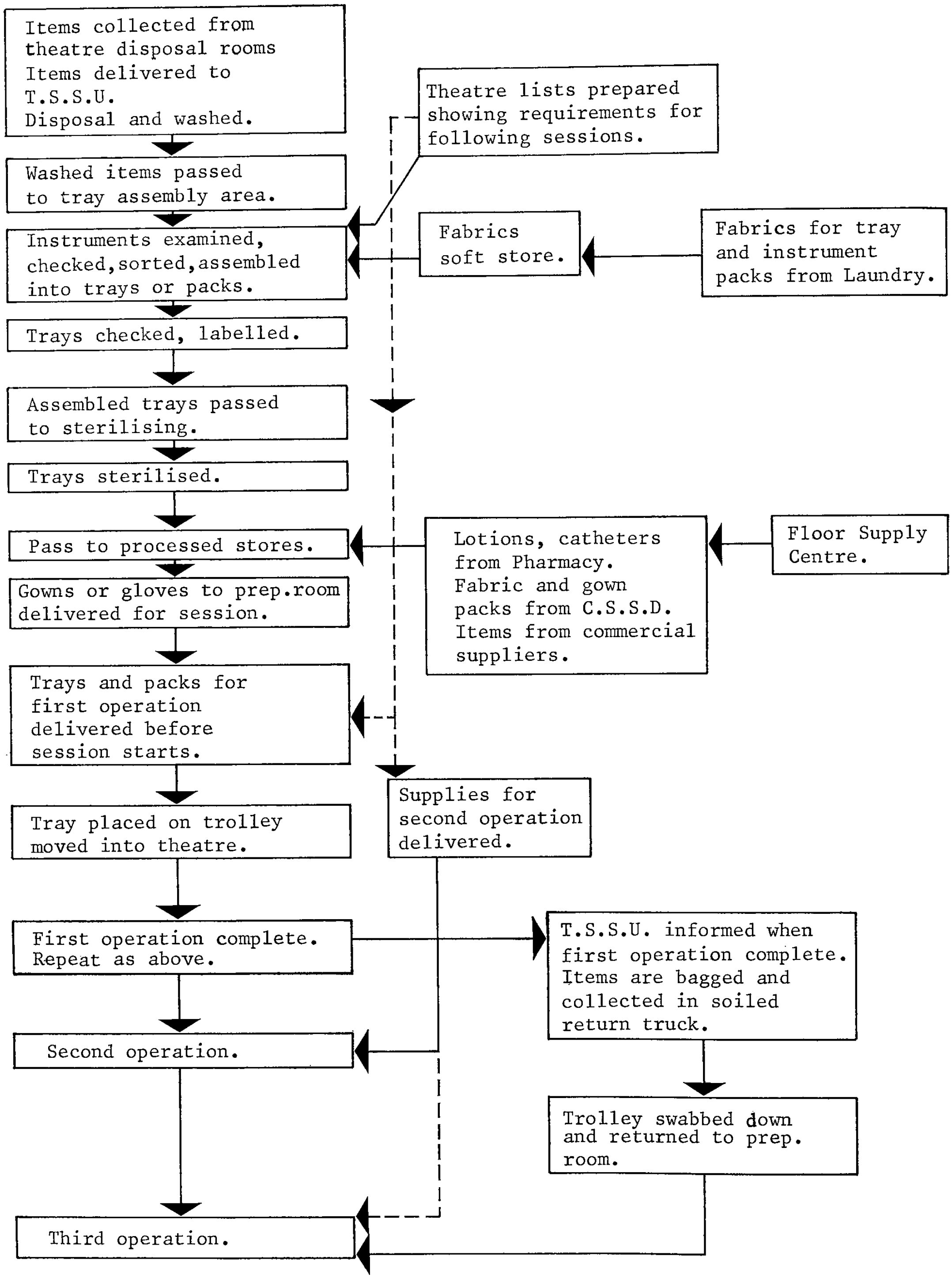
5 The reduction of unnecessary movement by staff in the operating theatre and the allowance of adequate time between operations in order to disperse particles. A major factor in the latter was an adequate number of rooms in relation to the work load.

6 The elimination of direct air and staff movement between each operating theatre suite.

7 The successful integration of layout, environmental services, structure and equipment.

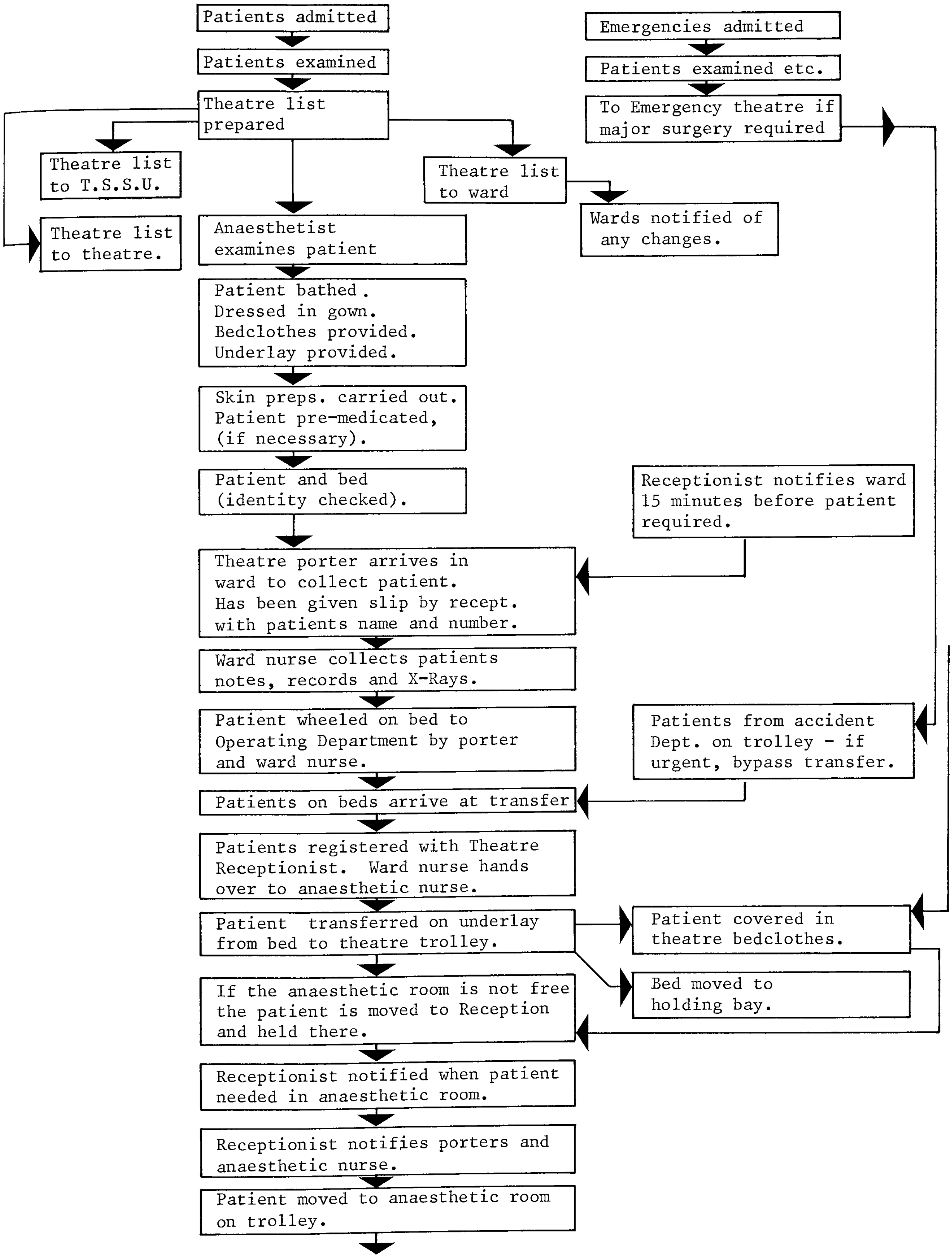
9.3 BRIEFING AND DESIGN METHODS USED FOR THE OPERATING THEATRES The briefing methods adopted were similar to those used in the other clinical areas of the hospital. After a preliminary investigation of the subject and an extensive literature search, a questionnaire was used to establish the range of functions to be accommodated and their relationship to the whole hospital. Operational data on the existing and proposed requirements for surgery and the activities to be carried out in the operating theatres were obtained at a series of fifteen Investigating Sub-group meetings. From these data draft functional diagrams were produced dealing with most of the activities related to surgery. Data were cross-referenced to other Sub-groups and the cross references to operating theatres which were made in other Sub-groups were picked up.

Parallel to the briefing process a series of hypothetical alternative layouts were drawn in order to identify problem areas, and to test design ideas in relation to the functional diagrams. In this way ideas could be checked against the emerging pattern of operation and the design possibilities kept open. It was obvious that several assumptions fundamental to design had to be evaluated. These were as follows (on page 108).

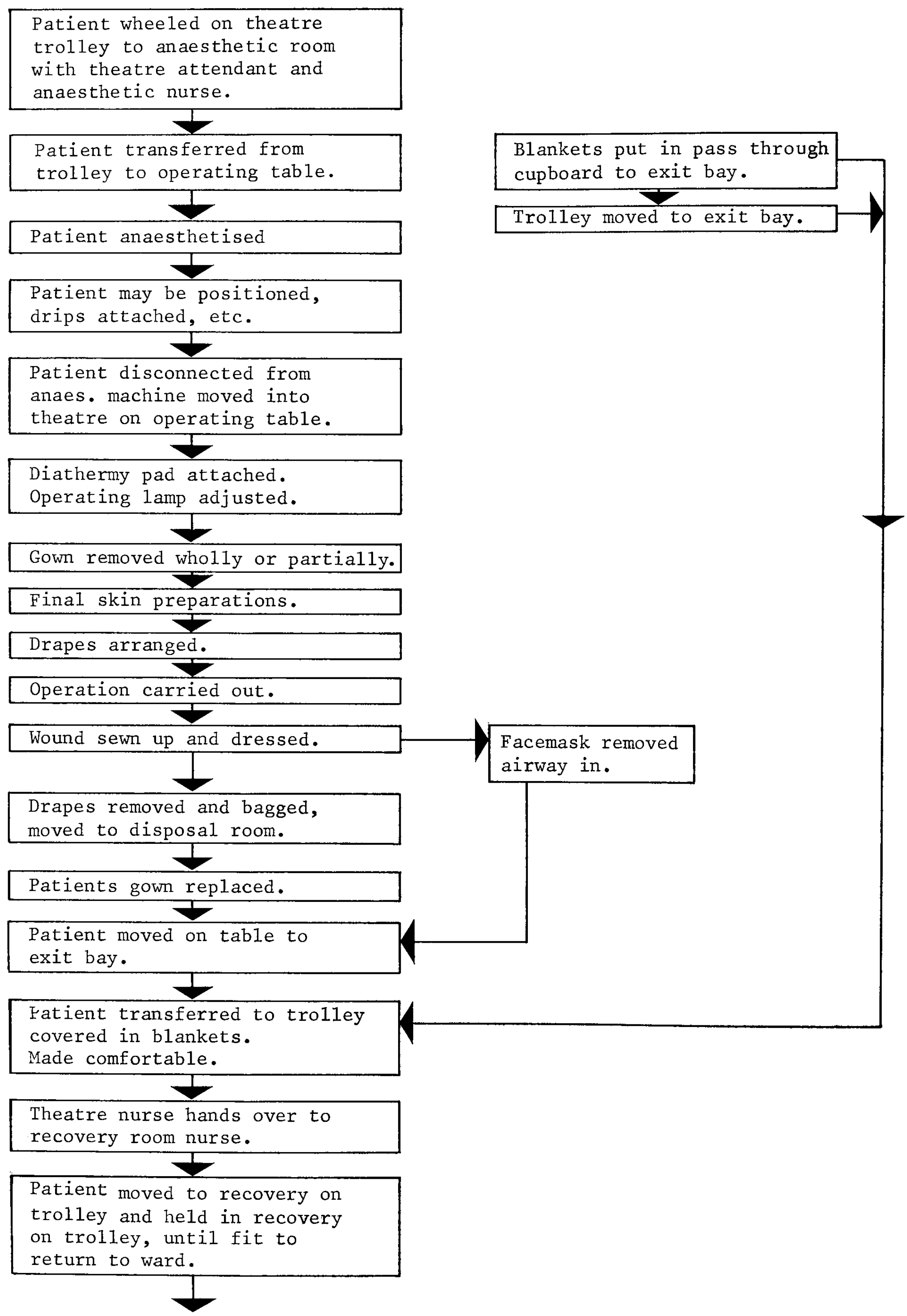


91–94 Greenwich—examples of the draft functional diagrams that were prepared by the Sub-group investigating operating theatres.

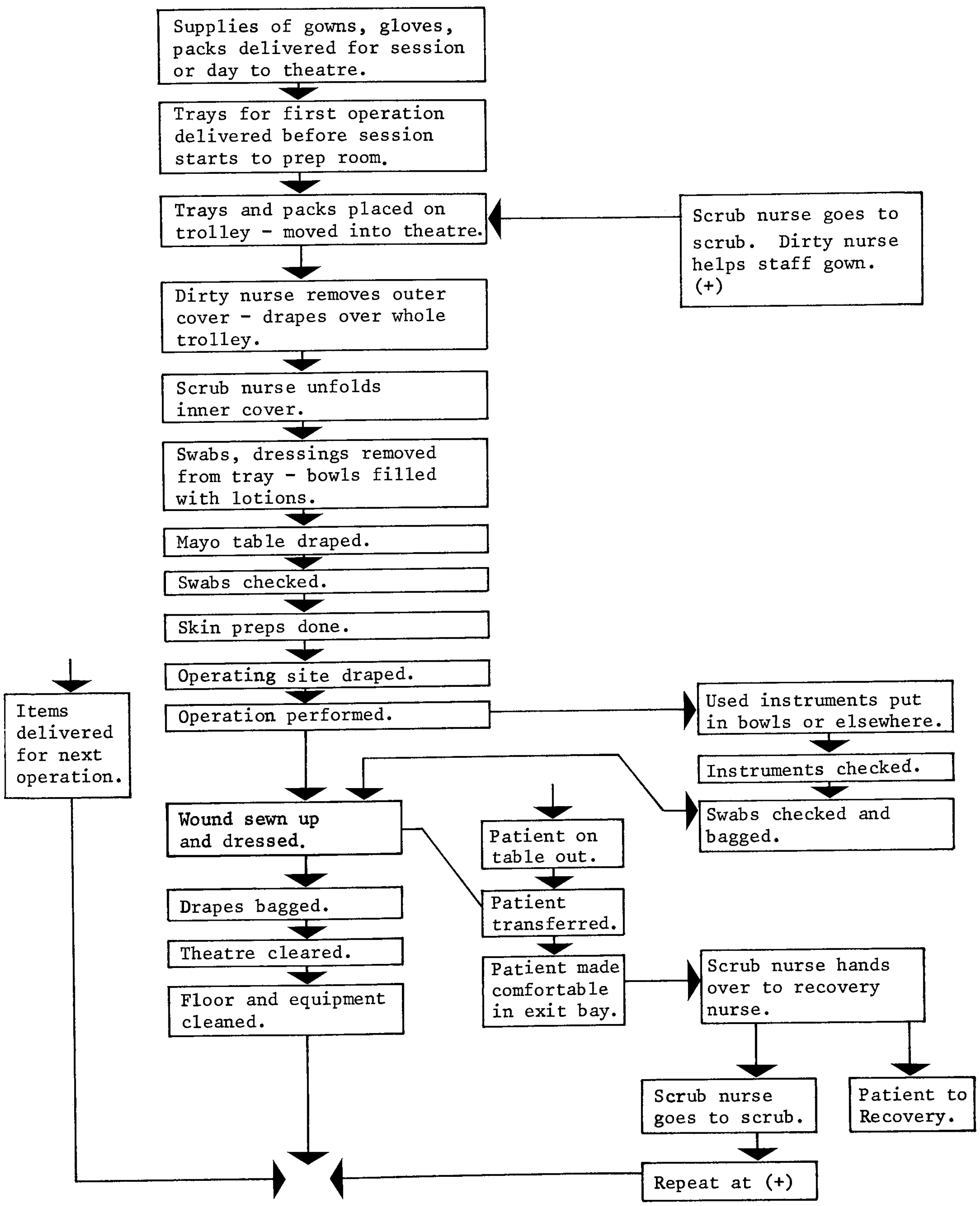
91 Supply cycle.



92 Preparation of a patient in a ward and reception in the theatre.



93 Movement of a patient during anaesthetic and operation.



94 Activities in the theatre.

1 The number of theatres required.

2 The type of corridor system.

3 The type of supply system.

When the results of these exercises were available it was possible to produce the first layouts. These $\frac{1}{8}$ in to 1 ft layouts were developed by discussion with the Sub-group, and coordinated with other whole hospital and department planning and design aspects, such as phasing and communications.

Subsequently, a planning brief was produced which developed the design ideas in more detail and enabled alternative space layouts and equipment arrangements to be considered. The brief was used as a basis for mock-up studies, for which a typical theatre suite was erected including all the ancillary rooms. The detailed requirements for the space, fittings and equipment were then considered, several of the activities involved being simulated to check dimensions and equipment arrangements.

Similar methods of working continued through the stages of designing the engineering services and equipment, particularly in terms of the theatre lighting, and the communication systems in the department.

9.4 EXISTING CONDITIONS Local attitudes to requirements were inevitably influenced by existing problems and conditions.

For example, there were 231 surgical beds in the hospital group in two separate hospitals – 120 beds at the Miller Hospital and 111 at St Alfege's. There were two main theatres in each hospital, the work of the surgeons being split between the two pairs of theatres and two groups of beds. Each pair of theatres was inadequate in some respect. The theatres at St Alfege's were separated from each other at some distance by a main hospital corridor, one theatre was too small and had an inadequate operating lamp. At the Miller Hospital one of the theatres had better access to the ancillary rooms than the other and, consequently, had a heavier use for both elective and emergency work. The effect of these conditions on the utilisation of the existing theatres is shown in Diagrams 95–98.

Facilities for a consultant and his registrar to work simultaneously in adjacent theatres were only available at the Miller Hospital where the theatres were contiguous. Emergencies which occurred during normal session times tended to interrupt the elective lists and to make them run late into the evening. The timetable in the preferred theatres was crowded and left no time for additional lists for the busiest specialties. There was no separate plaster room, day theatre or endoscopy room.

9.5 DEVELOPMENT CONTROL PLAN In the development control plan wards were shown on the perimeter of the building and the operating department in the centre with total artificial ventilation and lighting. As far as possible, surgical and gynaecological beds were located close to and on the same level as the operating department, although some beds, such as paediatric and ENT, were on the

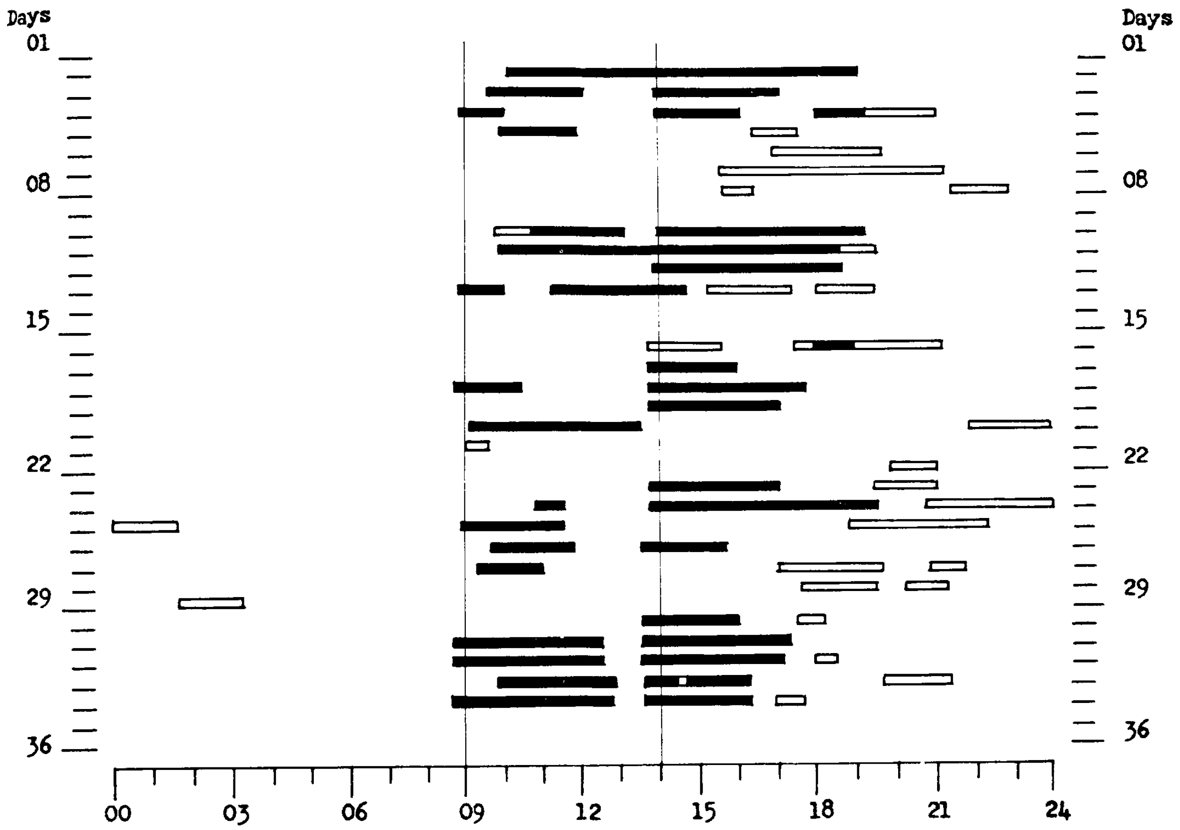
95–98 The charts show the utilisation of the theatres existing at the Miller Hospital and St Alfege's Hospital at the time of the Sub-group's survey.

95 Theatre A, the Miller Hospital.

96 Theatre B, the Miller Hospital.

Elective Sessions

Emergency Work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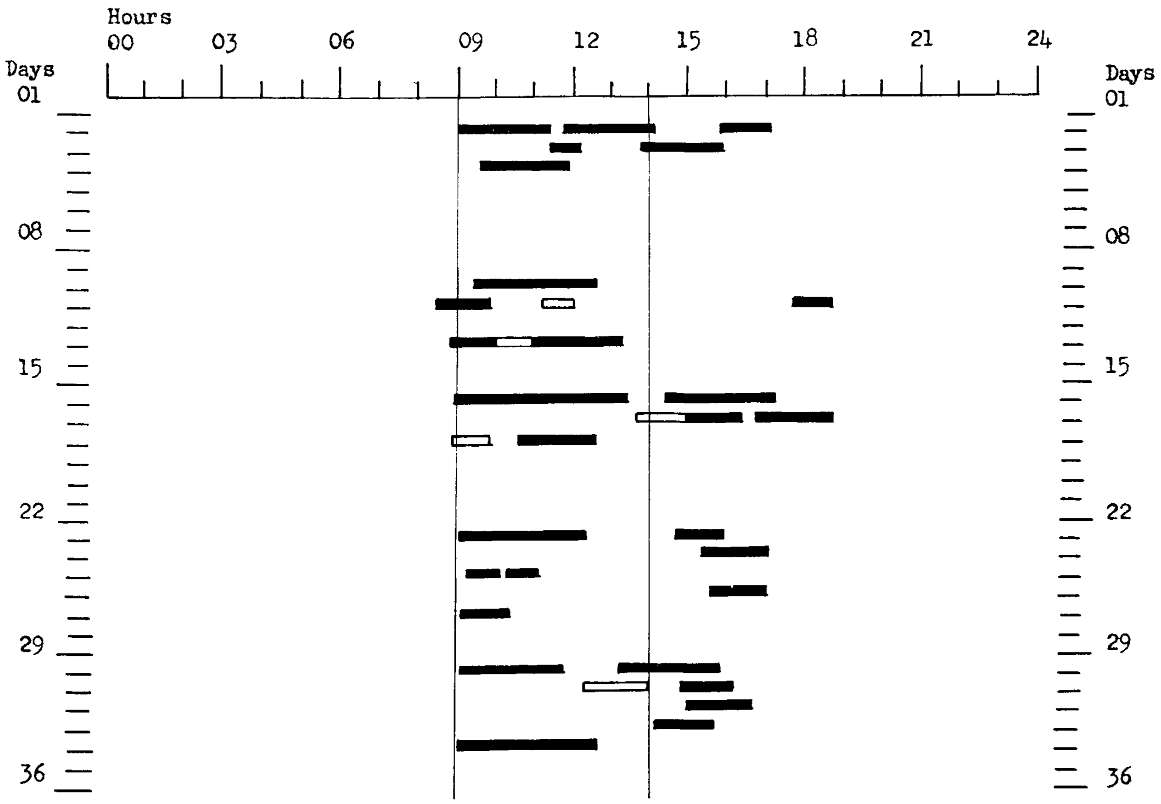
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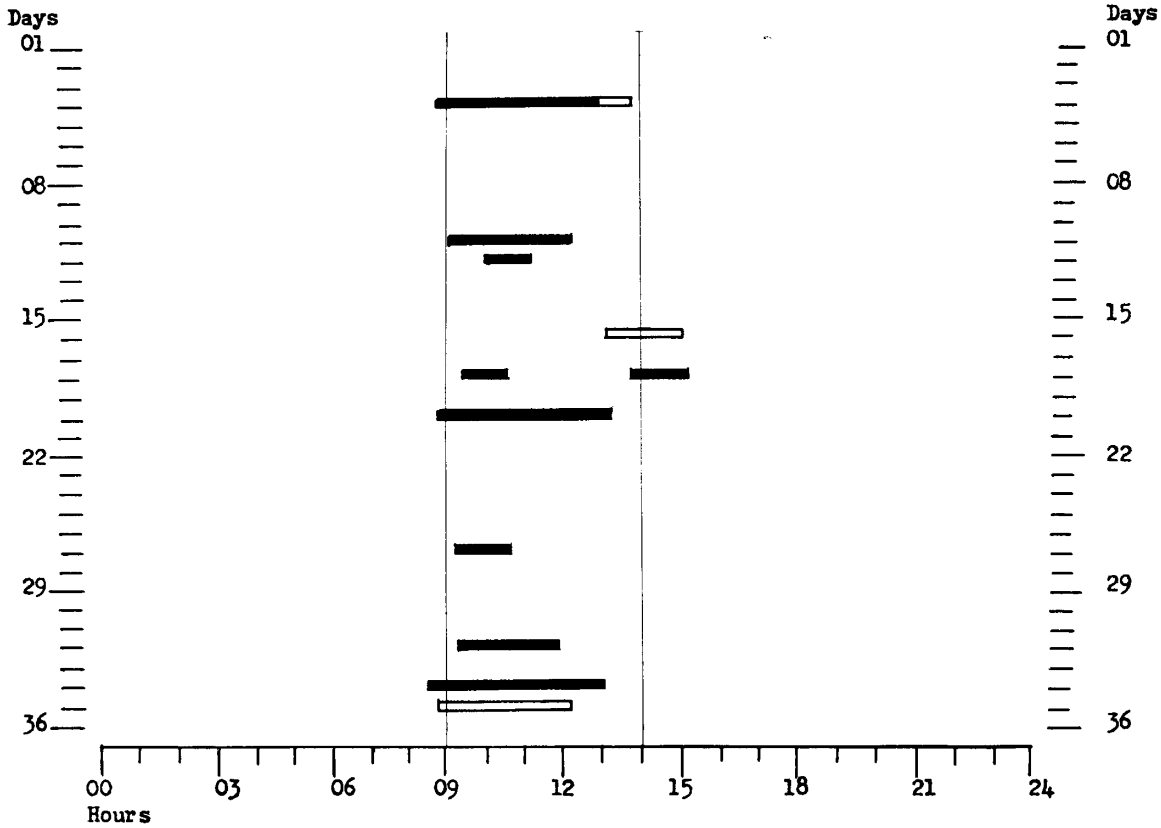

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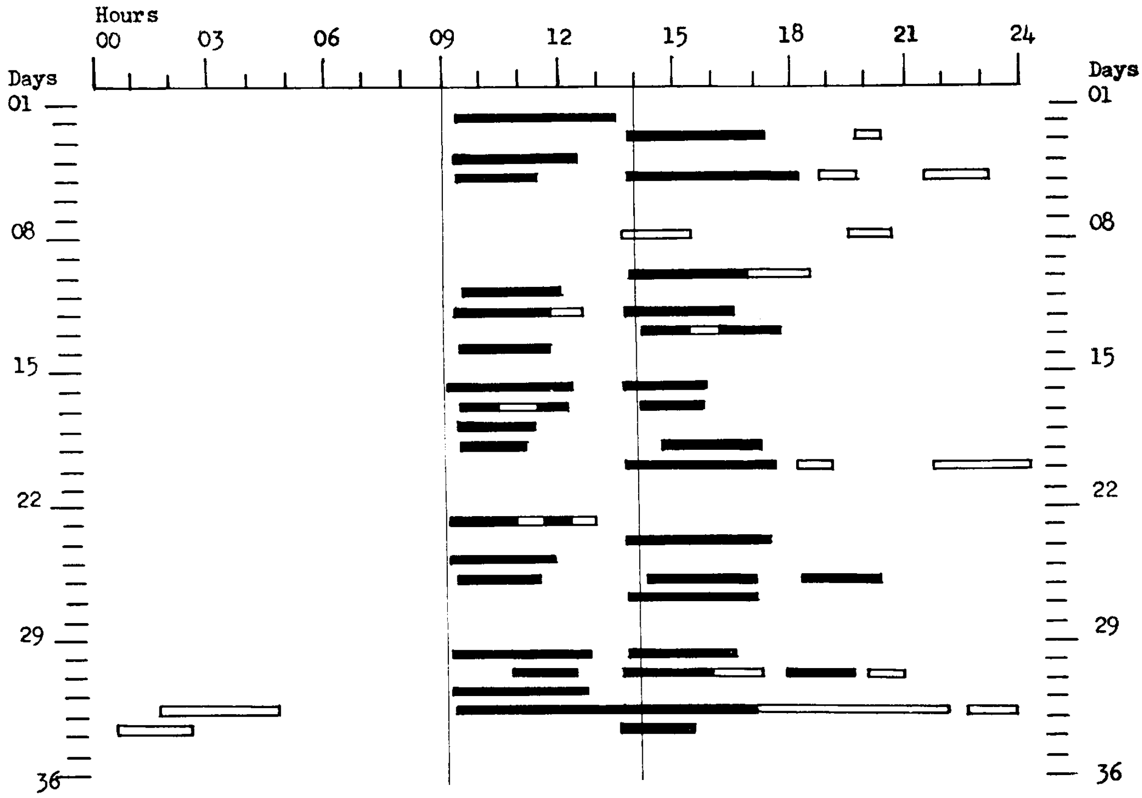

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second floor. The intensive therapy unit and the maternity unit – which includes delivery rooms and a theatre for urgent Caesarean operations – were also shown on the same floor as the operating department.

The day theatre, day ward and endoscopy room were shown on the ground floor in the outpatient department, adjacent those rooms allocated mainly as surgical clinics. Thus, despite the movement towards almost total centralisation of surgical facilities in hospitals in the interests of economy, the principle had to be modified at Greenwich due to phasing and other limitations. Accident cases requiring major surgery will be sent to the central operating department only when the accident centre is established in Phase Three. Alternative solutions were considered for the sterilising of instruments, a theatre sterile supply unit (TSSU) linked to the operating department; or an area sterilising service linked to the industrial zone at Hither Green. At the time, it was thought that the most economic and feasible solution was a TSSU adjacent the main theatres.

Three of the main operating theatres were shown as being built in Phase Two, together with the day theatres. The remaining three theatres and a plaster room were to be built in Phase Three. Some temporary arrangements were involved in the interim period for such functions as staff changing and TSSU storage, but it was agreed that the final layout should not be compromised by interim requirements.

9.6 NUMBER OF THEATRES It was intended that the number of surgical beds in the new hospital should remain at 235 together with additional facilities for day surgery. It was considered that the centralisation of theatres and beds in one hospital should give the opportunity for more efficient working and with it the possibility of a better and more flexible utilisation of theatres than occurred under the existing conditions. It was foreseen that facilities for simple minor cases, such as day patients, would need to develop in the future parallel to an improvement in domiciliary care and general practice.

Work has been done elsewhere on methods for estimating the number of operating theatres required. The methods used at Greenwich were as follows.

The proposed pattern of working indicated that the lists of most specialties should have two theatres allocated to each. This was to enable a consultant and his registrar to work in conjunction or, alternatively, for two theatres to be used intermittently with the surgeon moving from one theatre to the next. This was particularly the case in such specialties as gynaecology or ENT which have a high proportion of short cases.

One theatre in the hospital would always be reserved for emergency work. On the occasions when all the theatres were in use – as three twin suites – then the most readily available of the theatres would be given up for emergency work. The pattern of working would vary according to the type of case, the type of specialty and the availability of staff. It was not thought justifiable to reserve a theatre solely for dirty cases.

97 Theatre 1, St Alfege's Hospital.

98 Theatre 2, St Alfege's Hospital.

Elective Sessions

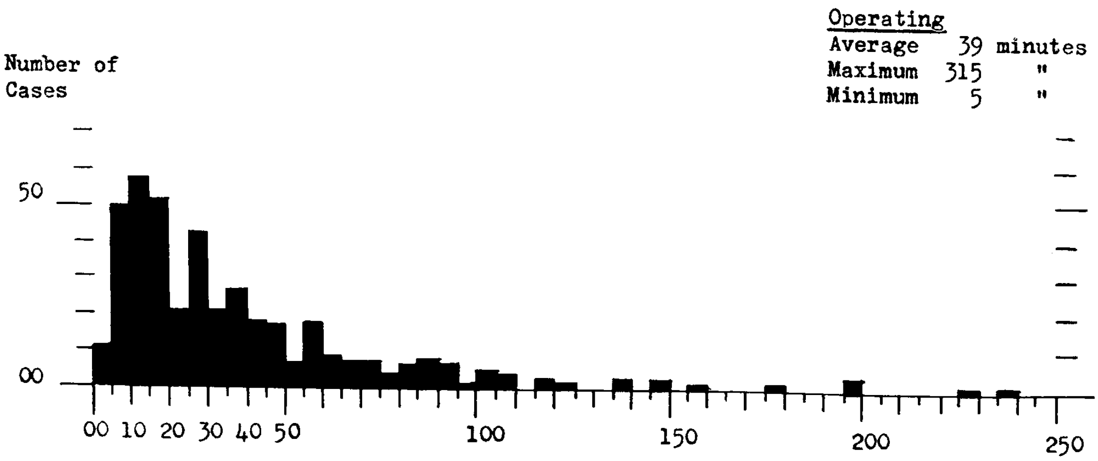
Emergency Work

General. 2pm - 6pm TUES. THEATRE No. II St. Alfege's.

DATE	OPERATION	MAJOR	MINOR	EMERGENCY	ROUTINE	ANAESTHETIC ROOM Time		OPERATING THEATRE Time		EXIT BAY Time		No. of Doctors in Theatre Scrubbing
						From	To	From	To	From	To	
5.4.66.	Incisional hernia repair.	Gen ✓	—	—	✓	1.40pm	1.50pm	1.55pm	2.20pm	2.20pm	2.30pm	3.
5.4.66.	Removal. lump from breast.	Gen —	✓	—	✓	2.25pm	2.30pm	2.35pm	2.50pm	2.50pm	3.00pm	3.
5.4.66	Amputation below (R) knee.	Gen ✓	—	—	✓	2.45pm.	2.55pm.	3.00pm.	3.20pm	3.20pm.		3.
5.4.66.	Circumcision.	Gen —	✓	—	✓	3.20pm.	3.30pm.	3.35pm.	3.45pm	3.45pm.	3.55pm	2
5.4.66.	Repair R.I.H. & hydrocele.	Gen ✓	—	—	✓	3.40pm.	3.50pm	3.55pm.	4.45pm	4.50pm.	4.55pm.	2
5.4.66.	Haemorrhoidectomy	Gen.	✓	—	✓	4.40pm.	4.45pm	4.45pm.	5.10pm	5.10pm.		2
5.4.66.	Insertion Denham Pin.	Orth —	✓	✓	—	7.45.pm. ——— 8.20pm. (Operation performed in Anaesthetic Room)						1.

99 Greenwich—a typical entry in the survey to determine the work load of the four theatres existing at the Miller Hospital and St Alfege's Hospital.

100 The charts show the distribution of times for anaesthetising, operating and the recovery of the patient at the time of the Sub-group's survey.



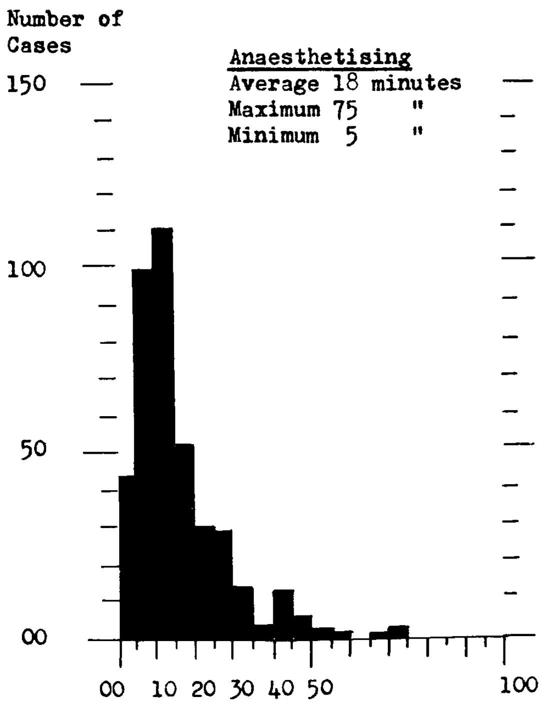
As part of a survey to determine the existing work load, the theatre staff at St Alfege's and the Miller recorded for each day and session, over a typical five-week period, the number and type of operation, together with the time required for anaesthetising, for operating, and for recovery of each case. This information was used as a basis for deciding the best number of theatres in the new hospital and understanding the present and proposed pattern of working. A typical survey entry is shown in Diagram 99.

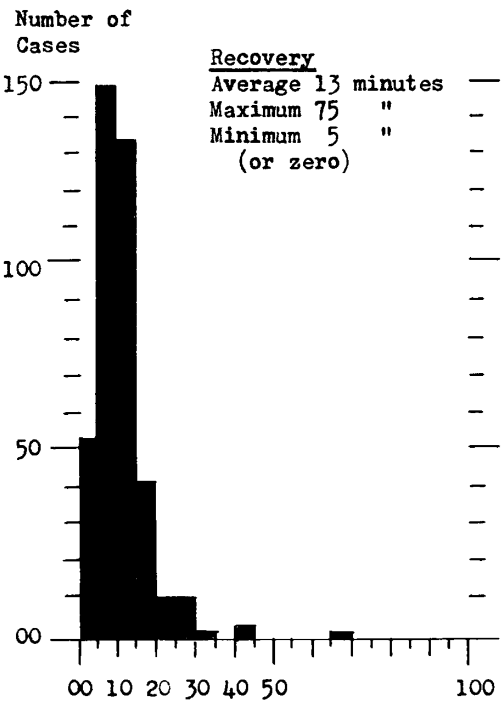
Typical results, giving the present utilisation of the four existing theatres, are shown in Diagrams 95–98.

The distribution of times for anaesthetising, operating and recovery are shown in Diagram 100.

The daily variation in elective and emergency work is shown in Diagram 101.

The operating theatre timetable was examined together with the results of the survey. The claim that two theatres were needed for the lists of all specialties was not borne out by an examination of the existing and proposed bed numbers and the existing and proposed work load. In the new hospital situation there will be a number of surgical beds similar to the existing number, although obviously in the future there will be changes in the type of work, the work load, the length of stay and staffing. Seven or eight sessions per theatre per week were suggested as a maximum in order to allow adequate time for cleaning and maintenance.

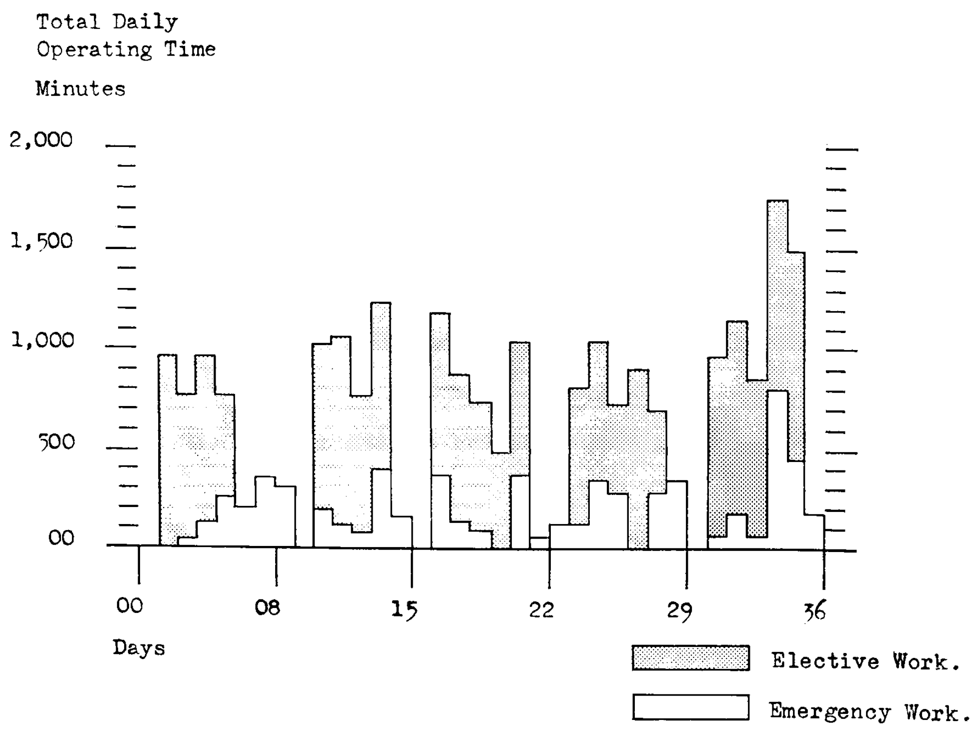




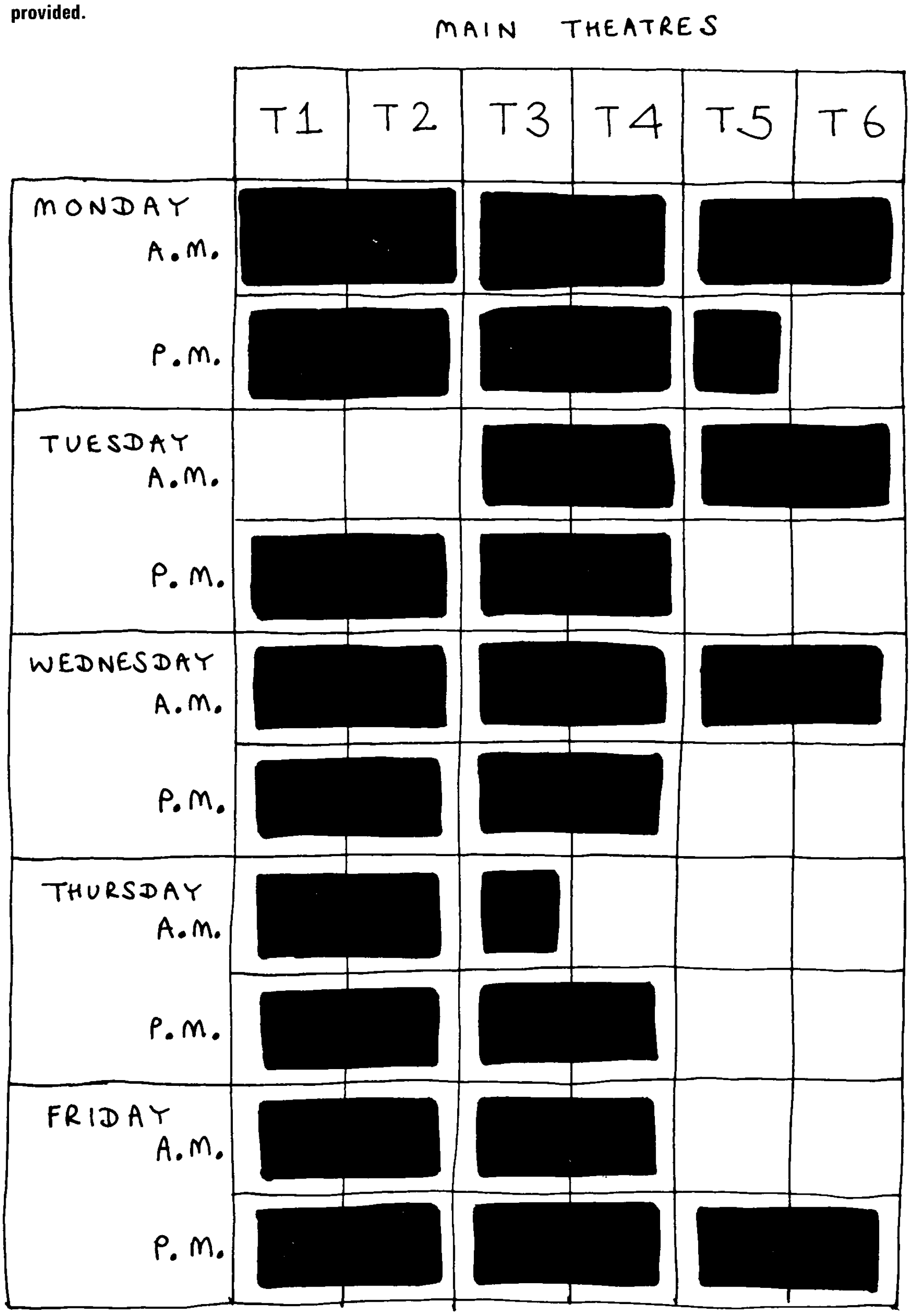
101 The chart shows the daily variation in elective and emergency work at the time of the Sub-group's survey.

It was argued locally that the critical factor influencing the number of theatres was the demand for three specialties to operate simultaneously. It was claimed that each specialty required a pair of theatres.
On examination it was apparent that this produced a maximum demand for elective work on only three occasions per week, see Diagram 102. Only a limited number of sessions (three to four morning sessions) were predicted for the day theatre per week. The provision of the day theatre and endoscopy room in the outpatient department, and the plaster room in the main operating department, was also anticipated to have some impact in reducing the load on the main operating theatres. The extent of this reduction could not be predicted as the Investigating Sub-group maintained that the selection of a patient for day surgery would depend on the clinical opinion in each case.

Initially, the 'Green Book' had suggested seven main theatres and one plaster room. If the peak demand had been realistic, seven theatres would have been required in order to provide six theatres for elective work (utilised fully on only three occasions) and one allocated solely for emergency work. The Sub-group and Project Team eventually agreed that there was some scope for rearrangement of the operating theatre timetable in order to achieve a more effective utilisation of theatres. Six rather than seven elective theatres were thought to be the maximum number which could be supported by the hospital owing to the acute shortage of anaesthetists and theatre nurses. A smaller number of theatres would also enable a simpler and more compact layout to be achieved.



102 The chart demonstrates the Sub-group's prediction of a maximum demand for elective work on only three occasions per week if six theatres were to be provided.



In the light of the available data it was agreed to provide:

in the main operating department: 6 theatres for elective work; 1 plaster room

in the outpatient department: 1 day theatre related to the day ward; 1 endoscopy room

One theatre would always be made available for emergency work, but a particular theatre would not be designated for emergency work all the time.

9.7 THE OPERATING DEPARTMENT LAYOUT
The development control plan showed access to departments in the core area for patients, staff and supplies being provided from the main hospital street. Patients were to be transferred from their beds to a theatre trolley in a transfer bay, entry of patients and staff being controlled by a receptionist. Reception and recovery beds were in the clean area.

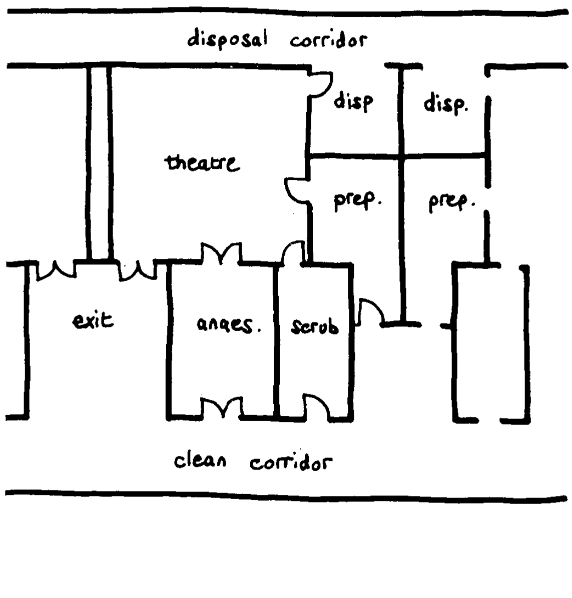
The Medical Research Council's Operating Theatre Hygiene Sub-Committee Report (1962) explained the basic requirements for control of infection and comfort, together with the principles of zoning and air movement. These principles were subsequently incorporated in a Royal College of Surgeons' report (1964) and the Department's *Building Note No 26* (1967). Advice was also sought from the Department's medical advisers and Professor Williams of the Wright Fleming Institute. As the proposed layout differs from the Medical Research Council and Department recommendations, a quotation is included here from the second edition of Professor Williams' book *Hospital Infection*[9] to record the opinions on which the layout was based.

> There is little doubt that if every precaution is to be taken against even the remotest risk of infection, operating departments with full zoning will have to be provided. These departments will be very costly to build and to run and some of the most expensive principles in the plan are yet unproven. We do not condemn attempts to prevent infection by a full zoning system but believe that costly provision of untried and unpromising precautions should be made only if they do not take space and funds from others that may do more good. Evaluation of the whole idea of zoning and the separate elements of it have not yet been made and will be very difficult. Meanwhile we can only offer an opinion on which elements of the system seem more likely than others to be useful.
>
> We believe there is real merit in designing the department so that its clean corridor is independent of general hospital traffic and so that staff who are not wearing special operating-room clothes do not enter the same areas as those who are. Therefore the demarcation of clean, aseptic and disposal zones seems necessary. It could be arranged, however, that access from the hospital to the clean zone is possible only through staff-changing rooms and patient transfer areas but without separate provision of an outer protective corridor; there seems no great bacteriological advantage in separating this from the general hospital traffic. Sink (sluice) rooms must be regarded as part of a disposal zone, we are less certain of the need for a separate disposal corridor which has been proposed so that used materials can be removed without passing through a clean area. Most used materials from an operating room are not bacterially contaminated and even if they are, can be carried in covered containers so there is no risk of contaminating properly protected sterile articles being taken along the same corridor. It is sometimes assured that bacteria have the will and the ability to jump from dirty to clean objects, in fact, they are detached only by contact or shaking. If, therefore, cost or other reasons prevent application of the full zoning system we suggest that the protective and disposal corridors be omitted and that priority be given to design features and ventilation intended to control infection from humans rather than from things.

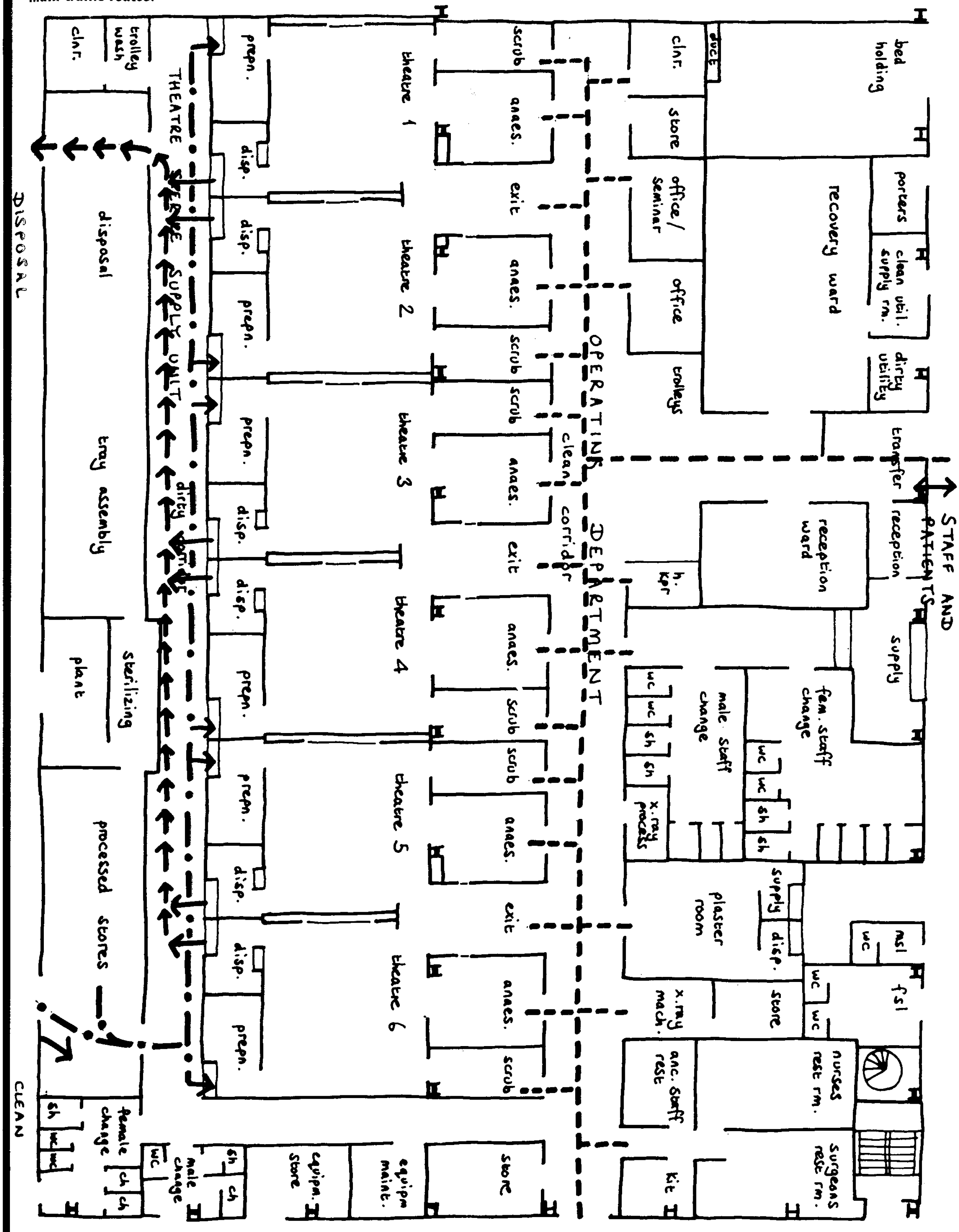
The operating department was designed with an in-line arrangement of theatres. The main activity zones, grouped in relation to adjoining departments, as shown in Diagram 103, were also subject to the constraints of phasing so that sufficient changing accommodation, reception, recovery and TSSU had to be provided to serve Phase Two. The entrance, together with the reception and recovery area, was placed central to the department to shorten the walking distances and to provide easy access in emergencies.

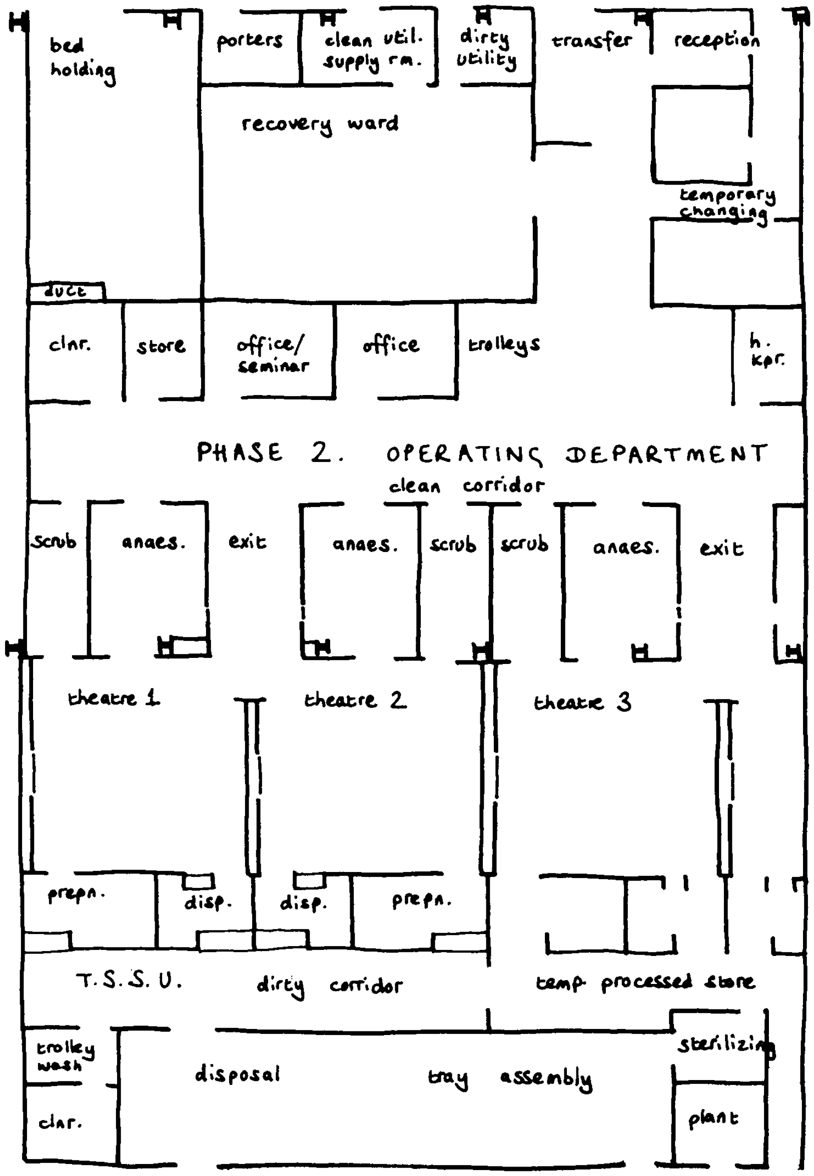
Changed staff and transferred patients circulate in a clean corridor with an exit to the intensive therapy unit (ITU). Wrapped supplies from the TSSU, and bagged or wrapped items for disposal circulate in a common corridor between the TSSU and the supply and disposal rooms of each theatre. The decision to adopt this layout was made on the basis of the opinions quoted above, and a study carried out by the design team. It was agreed that the layout offered advantages such as saving of space, a more convenient plan, and simpler circulation with direct access from the TSSU to the supply and disposal units. The space saved in the overall layout was used as working space in the operating theatres.

104 The diagram shows the layout of a theatre suite with a separate disposal corridor.



103 Greenwich—layout of the operating department showing main traffic routes.

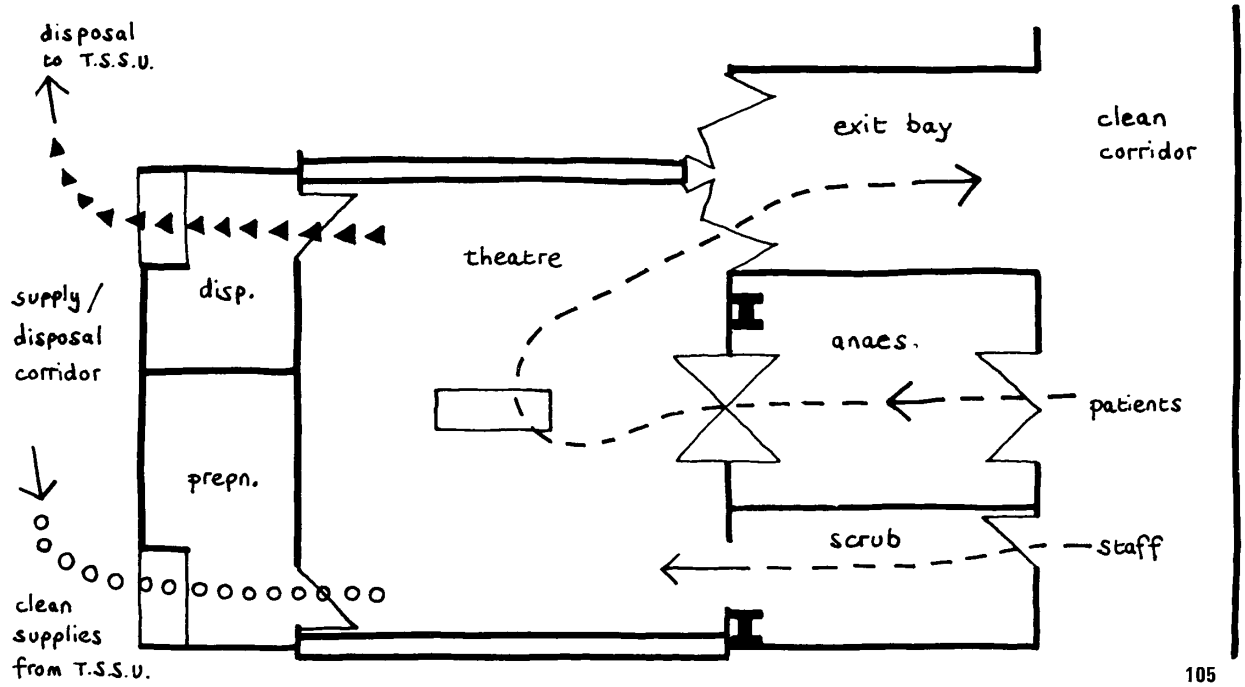




104

104 Greenwich—layout of the operating department for Phase Two, the first part to be built.

105 Greenwich—layout of a theatre suite showing traffic routes.



105

The users' reservations about the arrangement were answered by the following recommendations from the design team's study.

1 Packed clean supplies would be physically separated from items for disposal by wrapping or bagging the disposal items.

2 The staff in the common supply/disposal corridor would be kept physically separate from the clean area. All supplies would be put into, or disposal taken out of, 'pass-through' storage units between the corridor and the theatres.

3 The TSSU would be organised so that separate staff dealt with disposal and clean supplies.

4 The air movement between the corridor and the supply/disposal rooms would be arranged so that the supply room was at a higher pressure than the corridor, and the corridor exhausted into the disposal rooms.

9.8 THE OPERATING SUITES LAYOUT Standards of operating theatre hygiene and utilisation of rooms in the United Kingdom suggested that each operating theatre should have its own ancillary rooms, that is, clean supply room, disposal room, scrub-up room and anaesthetic rooms, and that these should be independent of the other theatre suites. However, it was considered possible to share the exit bay with an adjoining theatre as the patient's wound is dressed by the time that point is reached. This decision involved mirroring room layouts for each pair of theatres.

Having agreed in principle that clean and dirty items could circulate in a corridor common to both, a layout was tested in which the separation was between people on one hand, and supply and disposal traffic on the other. An in-line arrangement of six theatres was adopted with supply and disposal rooms on one side and anaesthetic room, scrub-up room, and exit bay on the other. The 24 ft width (to partition centre lines representing 21 ft 8 in clear) was required to accommodate anaesthetic room (12 ft wide), scrub-up room (7 ft wide), and half the exit bay (5 ft, total width 10 ft) on one side. Typical operating suite plans where a separate disposal corridor is provided have the ancillary rooms arranged in an L shape around the theatre. In the case of Greenwich the object was to provide a simpler circulation system and theatres large enough to be interchangeable in order to accommodate all the specialties, as well as future developments in surgery.

At Greenwich the specialties which use the theatres are:

- general surgery
- orthopaedic surgery
- gynaecology
- genito-urinary
- ENT
- dental
- emergency work

The proposed size of theatre (22 ft 8 in × 21 ft 8 in or 490 sq ft) was tested by layout and mock-up studies. The six theatres are all of the standard size and, as far as possible, fitted with standard equipment. The fact that they are interchangeable will provide flexibility in arranging lists and organising maintenance.

The day theatre was designed to be 20 ft 8 in × 19 ft 8 in or 400 sq ft.

Mirroring the plans of alternate theatres was not considered important so long as equipment was standard and in the same relative position in each theatre. As far as possible equipment was built in, for example, diathermy, suction and control panels. Oxygen and suction were piped and service outlets were integrated in the base of the operating table. Integration of equipment in this way provided more working space.

The plaster room is not located between a pair of theatres but is placed opposite the exit bay of the pair of theatres most likely to be used for orthopaedic work. The room is used for immediate post-operative plasters and not for routine changes of plasters.

9.9 EQUIPMENT

Lighting

Alternative solutions to the operating theatre lighting were considered, as follows.

1 A standard operating lamp.

2 Multiple spotlight sources.

3 A 'Blin' system (a battery of lamps which rotate over a dome).

4 Light sources reflected from a parabolic surface.

Alternative 1 was thought to be the simplest and most manoeuvrable solution. All the available operating lamps of this type were evaluated by the surgeons and the design team. The preferences of the surgeons and their different requirements led to two types of lamp being installed. The two theatres which are most likely to be used for orthopaedic work have a lamp installed which is thought to be more manoeuvrable. A satellite lamp is provided for use in two-site operations, when two surgeons are operating simultaneously, or for concentrating one beam. It was decided that these should not clutter the floor and, for reasons of economy, one satellite mounted on the operating lamp suspension is provided in alternate theatres, with provision for installation in the other theatres at a future date if necessary. Owing to the standard structural ceiling height of 9 ft adopted throughout the building the lamps have had to be accommodated within a floor-to-ceiling height of 9 ft, and a small recess is provided in a special ceiling slab to accommodate the fixing boss.

Alternative 2 was considered to be unduly expensive. Alternative 3 was considered expensive and difficult to adjust remotely. In one situation observed the table was moved rather than the light.
Alternative 4 was not considered to be adequate by the surgeons.

Several alternative types and layouts of general lighting were considered with the Sub-group as the standard structural system made surface-mounted (rather than recessed) fittings the more feasible and economic solution.

Service Outlets and Operating Table
Alternative solutions were considered for the operating table and service outlets as follows.

1 Mobile table – with fixed or telescopic service pendants, telescopic or swinging booms, or wall-mounted services.

2 Mobile table – with fixed base incorporating services plus some wall-mounted services.

3 Fixed table – with fixed base incorporating services plus some wall-mounted services.

Alternative 1 was rejected by the surgeons as either being inconvenient or dust collecting.

Alternative 2 would have restricted the possibility of transferring in the anaesthetic room.

Alternative 3 was adopted by the surgeons. Services in the base were preferred for their convenience in use. Reservations were expressed by the designers as the conventional mobile table leaves the floor space free and would be more likely to accommodate future changes in practice, increased demands of equipment and developing types of surgery. A mobile table, even with a fixed base, is likely to place some limits on transfer policies.

	Year	Bacter-iology	Bio-chem.	Haemat-ology	Histol.	Total
St. Alfege's) Miller))	1959	14914	10280	22249	2786	50274
	1960	17124	11600	20458	2746	51928
	1961	16636	10460	22200	2504	51800
Dreadnought	1959	5182	1795	17169		24146
	1960	5982	2350	17837		26169
	1961	5823	2188	21480		29491
Total	1959	20096	12075	39463	2786	74420
	1960	23106	13950	38295	2746	78097
I.P.R. by speciality	1961	22495	12648	43680	2504	81291
% workload		27.5%	15.6%	53.8%	3.1%	100%

106

	Bacteriology	Biochemistry	Haematology	Histology	Total
1960	414.179	281.027	600.490	59.209	1327950
1961	429.720	254.072	640.726	61.032	1412505
	30%	20%	46%	4%	100%

107

106 The chart shows the clinical pathology work load at the Miller, St Alfege's and Dreadnought Hospitals, and the total for all three hospitals together with the percentage of the total work load for each specialty in 1961.

107 The chart shows the clinical pathology work load for the whole of the South East Metropolitan Region for 1960 and 1961.

10 Clinical Pathology Department

101. BACKGROUND AND AIMS The SEMRHB 'Green Book' stated that the service to be offered by the new department of clinical pathology at Greenwich should consist of the following disciplines: microbiology; biochemistry; haematology; and morbid anatomy. The Pathology Services Investigating Sub-group was set up to investigate the detailed requirements, to describe the new organisation and to make design proposals. In doing so the problem of the absent user was encountered as, although a consultant morbid anatomist and a consultant haematologist were in post and available for advice, there was no consultant in the rapidly developing specialty of biochemistry.

In his absence certain planning decisions had to be taken on his behalf. Consequently, a number of visits were made to biochemistry laboratories and discussions held with biochemists, but the Sub-group agreed at a very early stage that certain principles had to be observed in order to allow maximum freedom to the incoming consultant. These were as follows.

1 The laboratory layout should not inhibit any change of emphasis between the disciplines.

2 A laboratory benching system should be employed which could meet the likely range of needs of all users.

These requirements indicated minimum differentiation between laboratory spaces and this, coupled with a steadily increasing work load, pointed to adaptability within the department itself. Its boundaries were, to a large extent, predetermined by the location of the department within the hospital. This is shown on the plans in the pocket at the end of the book.

One section of the 'Green Book' was devoted to a study of the pathology department work load for the years 1959–61, and these data were taken as the starting point in assessing the scale of the problem, see Diagram 106.

Traditionally, the pathology service in the area had been provided on an inter-group basis involving laboratories at St Alfege's Hospital, the Miller Hospital and the Dreadnought Seamen's Hospital. Each unit tended to concentrate on one particular specialty. It was proposed to concentrate the new service into a single laboratory and it was therefore necessary to establish reliable work load figures. As additional comparative data the 'Green Book' gave details for the SEMRHB as a whole for the years 1960–61, see Diagram 107.

In order to provide a basis for comparison a number of existing laboratories having similar work loads were examined. These examinations took special note of staff numbers, spaces and equipment and an attempt was made to discover the possible rate of growth in work load and the resulting space demands.

During the very early Sub-group meetings two main sources of information were examined in connection with work load growth rate over the whole country. *Hospital Building Note No 15* points out that new specialties may develop which will require space in

	Bacteriology	Biochemistry	Haematology	Histology	Total
Greenwich District Hospital (St. Alfege's & Miller)	17,785	19,289	28,344	11,136	76554
Dreadnought Hospital	6,185	4,474	20,564	369	31565
Total 1968	23,970	23,763	48,908	11,505	
Total 1961	22,495	12,648	43,680	2,504	

108 The chart compares the clinical pathology work load for 1968 with that for 1961.

the future, but that in the existing specialties there is a gradual increase in the amount of work done and that this, too, should receive consideration in the design and siting of new departments. In many quarters, however, dissatisfaction was expressed with the provisions in the Building Note and a joint committee was set up between the Department and the users to suggest amendments to the Note.

On the subject of expanding work load, this committee said, 'More recent publications (that is, more recent than 1958–59) have indicated an increase of some 15 per cent per annum in relation to biochemistry. The increase in laboratory space and staff which will be required for 100 per cent increase in work load has been variously estimated from 30 per cent to 75 per cent. It is clear that 100 per cent increase of work for different kinds of space and grades of staff does not need 100 per cent extra space and staff. Certainly in some disciplines the lesser figure would be adequate, whereas in others a full 75 per cent will be needed. We therefore think an overall expansion of about 60 per cent will meet most eventualities in the next ten years.'

More recent figures collected at Greenwich are given, together with the 1961 totals, in Diagram 108.

The Sub-group also considered the space demands likely to be generated by the development of screening services in the community, the possibility of new sub-specialities, of teaching being carried out within the department, and the natural tendency of clinicians in the area to make greater use of a new and improved service. However, against this was set the possible influence of locating certain pathology specialties on a sub-regional basis and the increased use and possible reduction in size of automated equipment.

10.2 AREA AND COST CONSIDERATIONS
Although guide lines as to the size of the department were available in the form of Building Note areas and cost limits, one of the general objectives of the project was to investigate ways of saving space, for example, by compact planning. In the Greenwich project the cost of one aspect of flexibility, that is, the wide span structure and inter-floor service zone, and the cost of air-conditioning, meant that the Building Note space allowance had to be reduced by 10 per cent overall in order that the cost targets could be met.

The new department of pathology and the mortuary together had an allowable area of 23,500 sq ft based on the then current Building Notes. But, in order to meet the 10 per cent saving in area, the allowable figure for both departments was 21,150 sq ft. With this area as a starting point the Sub-group considered the requirements, not in terms of a schedule of accommodation, but as a range of managerial, technical and supporting activities. In the event, the overall area for both departments as built is 20,207 sq ft.

10.3 INVESTIGATING SUB-GROUP DISCUSSIONS
From approved copies of the notes of Sub-group meetings it was possible to determine certain design implications. These were as follows.

1 The requirement that laboratory technicians should not be disturbed in their work by the outside world, or by the movement of other people within the laboratories suggested: a cut-off between the laboratory area and the public area; and that some bay or spur layout was preferred to long runs of benches with people passing between them.

2 Consultants and chief technicians should be closely related to their particular laboratory areas and preferably with visual contact.

3 The museum should be housed in the education centre, but the pathology technical library should be in the laboratory.

4 A laboratory area was required for housemen in pathology to carry out investigations.

5 A conference or seminar space was necessary.

6 Workshop space was required for the repair and servicing of complicated electronic equipment.

7 Wash-up and sterilising facilities should be centralised within the department.

8 Accommodation for night staff on call should be provided centrally in the hospital.

9 An animal house was not required on site as facilities are available at a nearby laboratory.

10 The mortuary should be an extension of the laboratory area.

11 The laboratory should be capable of being locked at night, but the blood bank should always be accessible in emergencies.

12 Laboratory records were to be mechanically documented, only minimal numbers of reports being typed in the department.

13 Reception and sorting of specimens to take place as near to the entrance as possible but not in sight of waiting patients.

14 Consideration should be given to the possible introduction of automated and computer techniques.

15 A pathology outstation should be as near to the outpatient entrance as possible.

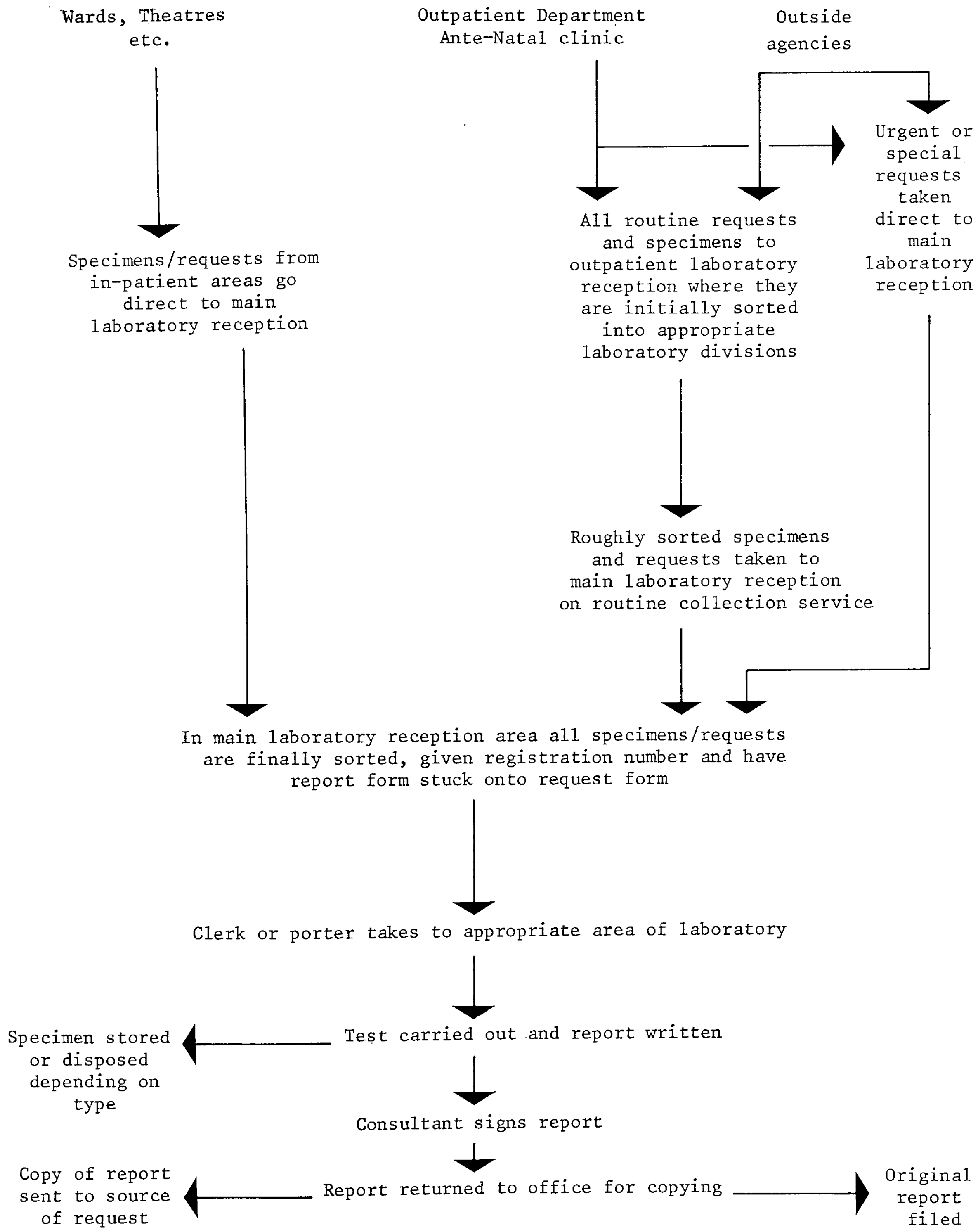
16 Supply, storage distribution and disposal arrangements should confirm to policies agreed at whole hospital level.

17 As a result of the comparative studies discussed earlier, accommodation should be provided for the following staff:

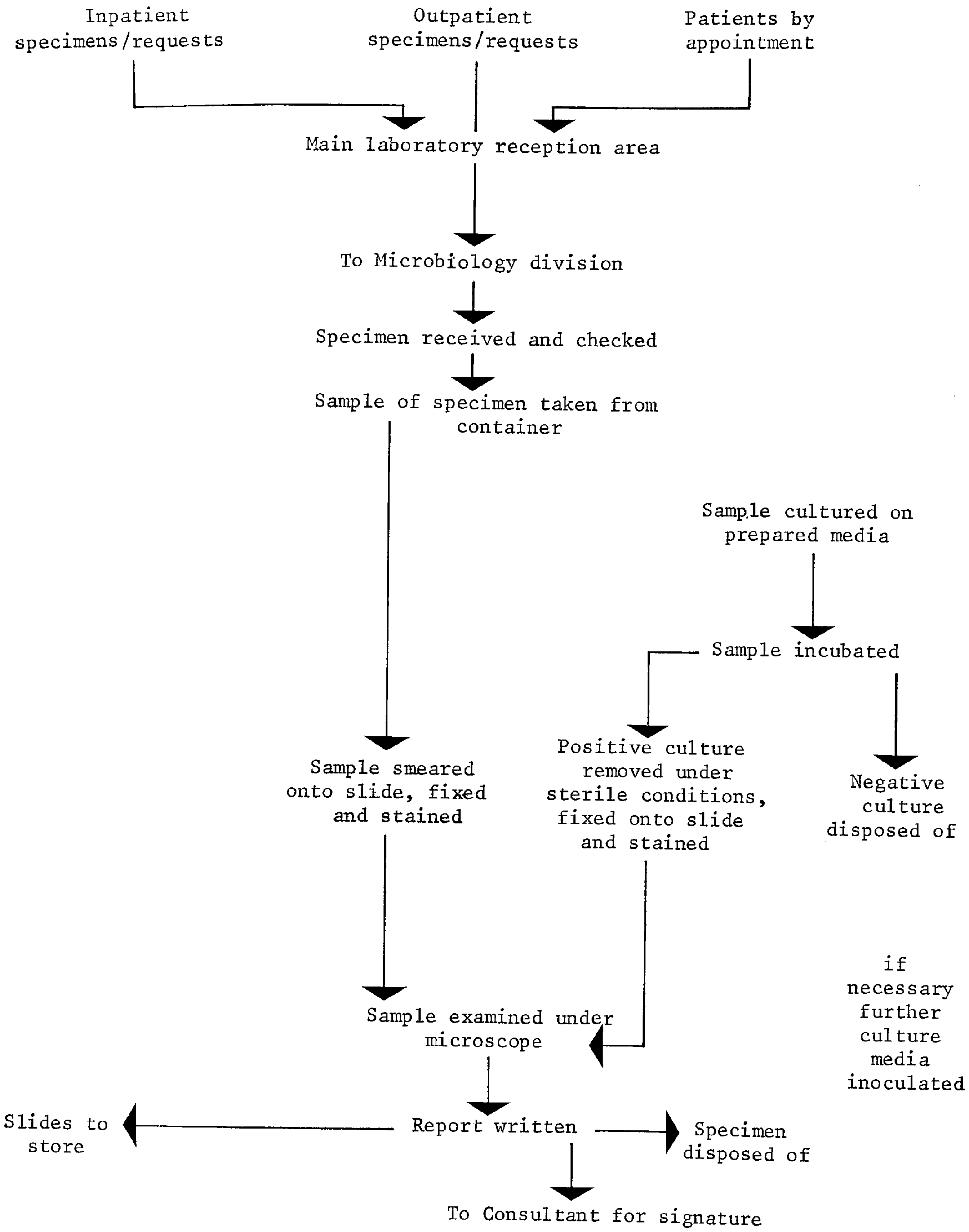
4 consultants (one in each major discipline)
2 house officers
5 technicians in microbiology
7 technicians in biochemistry
2 technicians in haematology (OPD)
5 technicians in routine haematology
2 technicians in serology
2 technicians in transfusions
4 technicians in morbid anatomy and cytology
1 secretary/administrator

109–112 Greenwich—examples of functional diagrams prepared by the Investigating Sub-group for the clinical pathology department.

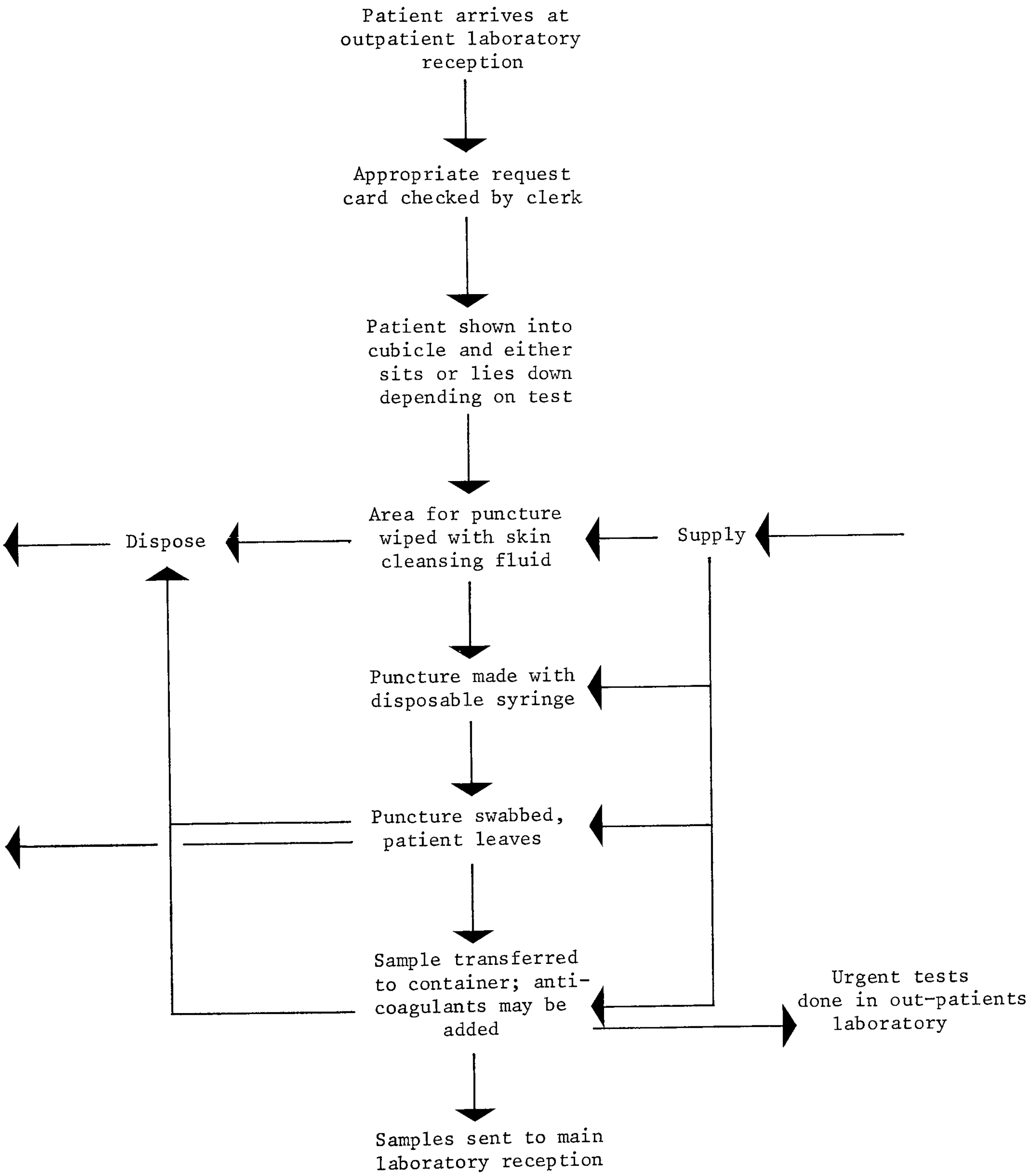
109 Circulation through the department of a specimen accompanied by a request form.



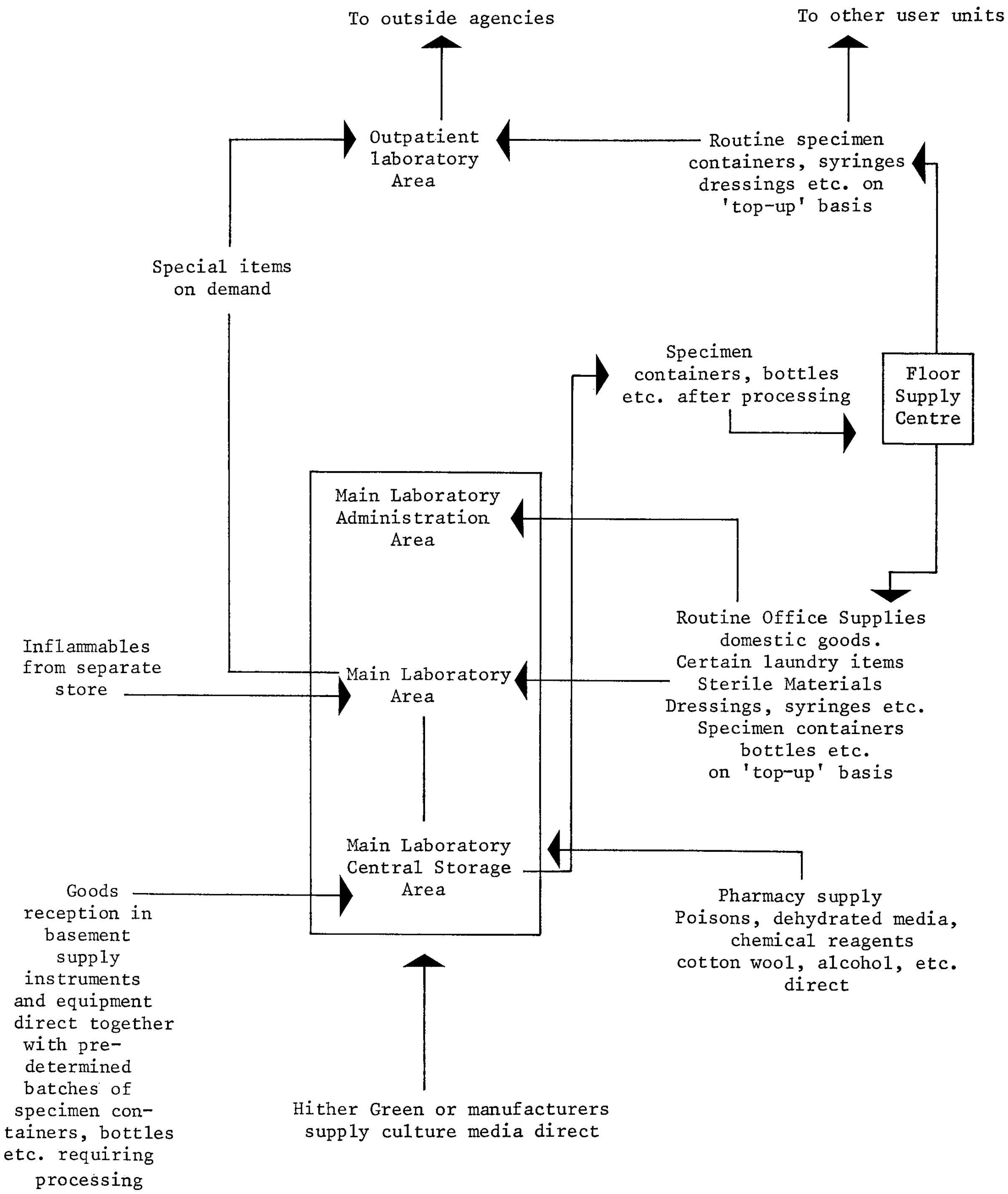
Requests/specimens: Circulation through Department



110 Routine work in microbiology.



111 Taking a haematology sample in the outpatient laboratory.



112 Laboratory supply pattern.

4 clerical staff (1 in OPD)
5 laboratory aides
2/3 cleaners
2 mortuary attendants

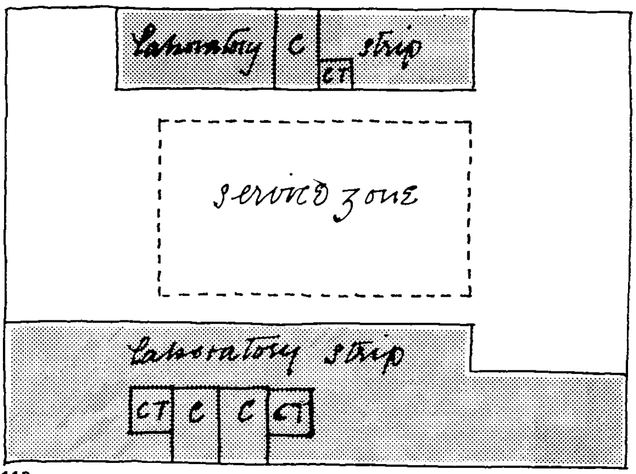
The completed Sub-group notes described the range of individual tests in detail as well as the organisation of people and supplies to support them. From this information it was possible to draw functional diagrams for approval by the users. As examples of these data Diagrams 109–112 show the circulation through the department of a specimen accompanied by a request form; routine work in microbiology; haematology sample-taking in the outpatient laboratory; and the general laboratory supply pattern. Final approval of the notes and the diagrams allowed the information to be formalised into an operational policy document for wider circulation among other Sub-groups and for the approval of the Project Team.

Three stages of pathology work were identified: requests; tests; and reports. Each was considered in detail and attempts made to quantify the work load, having particular regard to the supply and disposal aspects and the effect on storage space, both centrally and at technicians' work places. Each specialty was considered in turn and, as well as describing the processes, the operational policy statement suggested ways of coordinating and carrying out activities common to all divisions of the laboratory, for example, reception, sorting, batching and distribution of requests and specimens, recording results and signing, copying, filing and distribution of reports.

Under *Administrative Aspects*, the work and location of the clerical staff was described together with procedures for accepting, sorting, distributing and despatching patients' specimens, requests and reports. The proposed mechanical documentation system was also described in detail and cross-referenced to medical records. One unusual proposal within the clerical staffing structure stated that, in addition to the clerical staff working in the department, there was a need for a laboratory secretary/administrator. This person would be responsible for the management and control of clerical staff while in the department, undertake secretarial work for the consultants, prepare statistical returns, and be responsible for ordering all supplies, in liaison with the chief technician.

Training, Education and Research were discussed and it was noted that the centralised education area within the hospital would be available on a programmed basis shared with other departments. Nevertheless, certain aspects would have to be department-based, the main groups concerned being technicians; housemen and other medical personnel; laboratory aides; clerical staff; nurses; cleaners and porters. In this connection, one aspect which has design implications referred to visits by groups, for example, nurses who would come to see the laboratory at work.

Discussion of *Supply and Disposal* procedures tended to come under two headings – long-life and short-life items. Under the first category were considered such things as instruments, furniture and equipment. Short-life items were taken as including the following:

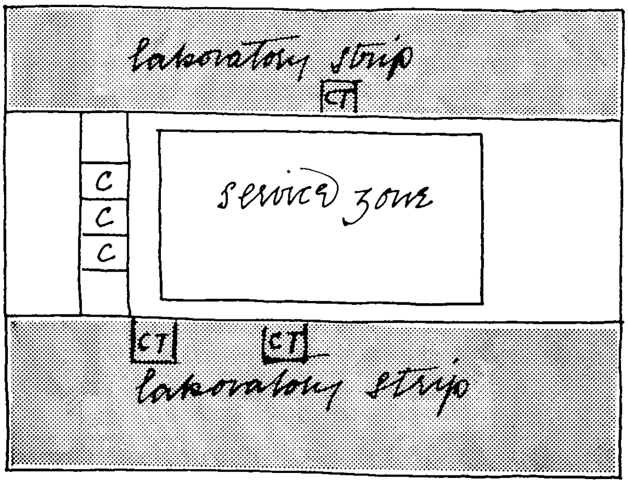


113

113 and 114 The diagrams show the alternative layouts for the laboratories which the Sub-group considered. In both, the laboratory areas are in continuous strips but the location changes for the offices of the consultants and the chief technician. The layout selected was 113.

C = consultant
CT = chief technician

114



documents, small packets and routine office supplies
culture media
dehydrated media
poisons
chemical reagents
alcohol
cotton wool, etc
distilled water and sterile fluids
glassware
specimen containers and bottles
sterile materials (dressings, syringes, etc)
inflammable substances
liquid waste, infectious
solid and semi-solid waste, infectious and non-infectious
domestic goods
laundry items

Specimen containers and bottles are used in many other departments as well as the pathology department and it was agreed, as a matter of policy, that bulk supplies of these items, many of which would be disposable, should be kept in the main hospital store. It was also decided that these items should be issued to the user departments, including the laboratory, by means of the floor supply centres on a top-up basis. Containers needing preparation would come to the laboratory in predetermined batches and, after preparation, would be returned to the floor supply centre for issue.

Control of Infection, both inside and outside the laboratory, and from responsibility at whole hospital level down to matters of personal cleanliness, was considered by the Sub-group.

The mortuary merits special mention here, as it was quite clearly stated at an early stage that from an operational viewpoint this unit need not be near to the laboratories but should have easy access from the wards. In a compact building such as Greenwich the placing of this facility raised special planning considerations but finally, on grounds of convenience, supervision and access, the mortuary was located at the south end of the laboratory.

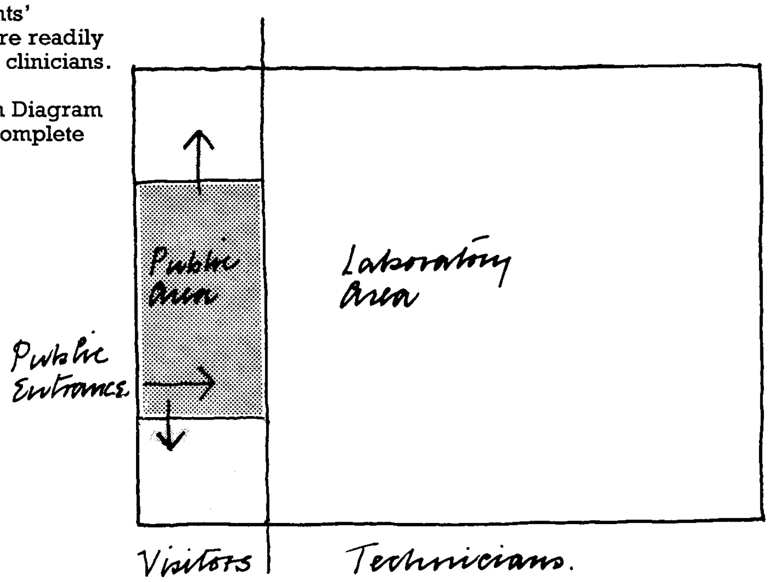
10.4 LAYOUT AND FLEXIBILITY In the development control plan the clinical pathology department comes in Phases Two and Three. This location raised an immediate problem: should the part coming in Phase Two be built in its final form or should it be planned for the interim service and altered to its final form during the construction of Phase Three? Apart from anything else, it was considered that the organisation should be run in at the earliest possible opportunity and, this being so, the Sub-group recommended that the first phase of the laboratory should be planned in its final form, the benching system being capable of modification later, if required. Two alternative layouts were considered, both providing the basic stated requirements. These are shown in Diagrams 113 and 114.

In Diagram 113 the layout of the laboratory areas is arranged in continuous strips down either side of a centre service zone and the offices for consultants and chief technicians are placed within the laboratory strips connecting directly with their general laboratory areas.

The placing of the public spaces protects the laboratories; the continuous laboratory strips allow for ebb and flow between disciplines; the provision of special small spaces does not impede the laboratory strip idea as it conforms to laboratory bay dimensions; a simple ring main supply service is possible; and a peninsula type benching layout can be adopted as recommended by the Nuffield investigation.

In Diagram 114 the layout conforms to the same general principles, except that the consultants' offices are grouped together so as to be more readily accessible both to each other and to visiting clinicians.

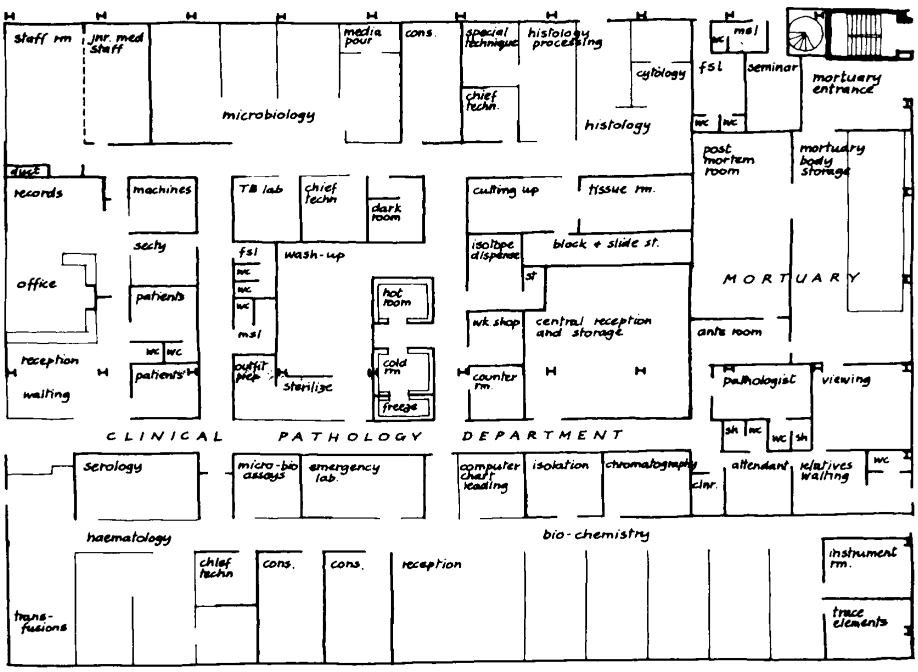
After discussions with the users the layout in Diagram 113 was chosen and this, in the form of the complete proposal, is shown in Diagram 116.



115

115 The diagram shows the public entrance and area of the department in relation to the laboratory area.

116



116 Greenwich—layout of the clinical pathology department.

10.5 BENCHING SYSTEM Parallel to the development of the laboratory layout a special study was undertaken to determine the design of a benching system which would meet a variety of requirements. As a starting point it was stated that a laboratory work space requires the following physical characteristics.

1 A working surface at which the laboratory worker can sit or stand, and on which he can carry out certain routines, conduct experiments, construct laboratory rigs and stand equipment.

2 Availability of all or some of the following services: various gases; suction; compressed air; electricity; hot and cold water; distilled water; de-ionised water; fume cupboards.

3 Easily accessible space for storage of chemicals and equipment.

4 A system which is easy to clean, free from vibration and unnecessary noise and of robust construction and finish.

Such existing systems as could be found were examined to see how these problems had been solved in the past. The problems themselves were not new, and it might have been thought that they had already been solved so perfectly as to make unnecessary any further attempts at improvement. No such solution was discovered. The systems examined all fell short in some respect. So it was decided to attempt to design a new system. The particular requirements were listed as follows: simplicity; maximum flexibility; minimum number of components; use of standard components where possible; ease of cleaning; ease of access to engineering services.

These considerations led towards the development of a system which depended on a rigid central spine which was both a service zone and a screen between adjoining work areas. It could also support a variety of elements in the way of benching, shelving and equipment. A number of the design problems involved are discussed below.

Provision of free floor space It was desirable to provide floor space under and around the benching system which was free from fixed objects such as supporting legs, cupboards and stacks of drawers. This could be achieved either by suspending the bench from above or by supporting it on brackets from the central spine. The first solution was considered but was unsatisfactory because the suspension members would have interfered with the working surface. This left the alternative of cantilevered supports which, when combined with movable storage trolleys, gave the required conditions.

Deflection Because of the long floor spans at Greenwich there can be up to $\frac{3}{4}$ in deflection in the centre of the spans. It was undesirable that this should be transferred to the supporting members of the benching system and for this reason a simple sliding joint was required at the top of each vertical support. This would give rigid lateral support and enable the deflection to be taken up.

Vibration A condition of minimum vibration only was acceptable for reading sensitive recording equipment and using microscopes. The decision to use benches supported on cantilever brackets which were themselves supported on uprights seemed to aggravate the problem of vibration. However, after tests on the mock-up, including trials with various forms of anti-vibration mounting with damper pads, it was agreed that the introduction of short diagonal braces between the uprights and the cantilever brackets provided an acceptable solution.

Servicing The services required at the bench were relatively simple: hot and cold water; gas, electricity and drainage. Because of the need for alternative heights for the work top, it was decided that the service outlets would be best sited on a vertical panel at the back of the bench. The actual positions of each outlet in the vertical plane were dictated largely by the level at which the pipe runs could be most conveniently accommodated, bearing in mind the need for accessibility.

It was agreed that no service outlets would be required at closer intervals than 4 ft and when they were required they would always be provided in the same position on the panel. Once services have been introduced into the system they run horizontally and it is a simple matter to provide additional outlets. There is nothing to prevent the system being adapted to a variety of distribution systems.

The problem of drainage in relation to adjustable benches was overcome by using flexible hose for wastes. These connect directly into a short vertical pipe taken directly down into the service floor below. The infrequency of sink positions led to a decision against long horizontal drainage runs.

Storage In traditional systems storage for chemicals and equipment is provided largely in cupboards and drawer units under the benches and in cupboards and shelves over them. Because central storage is usually inadequate, the laboratory work areas have tended to be used as dumping grounds, and the backs of the cupboards (which are largely inaccessible anyway) frequently get filled up with pieces of equipment that will never be used again. At Greenwich the aim was to avoid these problems by the following means.

1 The provision of adequate central storage.

2 The provision of under-bench storage trolleys designed to accommodate the particular goods, bottles and instruments that would be required in the laboratories. Because they were to be movable the floor space underneath could be easily cleaned, and they would provide also an additional surface on which to write notes.

3 The provision of a shelf integral with the service outlet panel.

4 The use of a 'Unistrut' section as the supporting member would mean that other shelves or cupboard units could be added if required.

A series of full-size mock-up trials was carried out in the new hospital, with ventilation plant and escalators running, and the pathologists and technicians testing working conditions at each stage. Finally, a system was produced which appears to fulfil the requirements set out and which comes within the cost allowances. Photographs of the final mock-up are shown in Diagram 40. It is intended that further details of the system, including a full technical description and evaluation report will be made available following the installation and use of the benching in the first phase of the laboratory.

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Appendices

APPENDIX A

INVESTIGATION PROCEDURE HEADINGS FOR HOSPITAL BUILDING PROJECTS

Stage A

PRELIMINARIES TO INVESTIGATION

0.1 determine SUBJECTS to be investigated – eg building, equipment, function

0.2 determine PURPOSE of investigation

1 REASON for making investigation – eg relief of suffering, increased efficiency . . .

2 OBJECTIVES of investigation – acquisition of data, development of design type . . .

0.3 determine SCOPE of investigation

1 FORM of investigation – eg survey, design, assessment
2 SUBDIVISIONS of work – eg administration, production, research
3 STAGES of work – eg collect data, develop solutions
4 EXTENT of work – eg type, complexity, work content
5 RESOURCES available – eg labour, time, information, finance
6 PRESENTATION of results – eg contents, distribution, form
7 FEASIBILITY of investigation – yes? no?
8 ALTERNATIVE methods – increase resources, diminish work

0.4 determine ORGANISATION of investigation

1 AUTHORITY for investigation – department, office, person
2 COMPOSITION of team – chairman, secretary, members
3 RESPONSIBILITIES of members – aspects of work
4 COORDINATION of work – central direction, meetings, reports
5 PROGRAMME for investigation – work content, times, dates
6 METHODS of conducting – interview, survey, records examination
7 FACILITIES for investigation – visits, reading, trials
8 EVALUATION of investigation – objectives, opportunities, timing
9 PROCEDURES at meetings – agenda, recording, questions
10 RECORDING methods – notes, stenographer, memory
11 DATA PROCESSING methods – pro formas, punched cards, charts
12 MEETING times and places – room, location, times
13 SECURITY aspects – secrecy, loss

Stage B

GENERAL INFORMATION on subject of investigation

1 SUBJECT of investigation

1 define subject
2 subject classification
3 sources of information

2 PURPOSE of subject

1 historical background
2 existing situation
3 objectives of subject
4 future trends

3 SCOPE of subject

1 range of functions included
2 validity in other situations

4 ORGANISATION of subject

1 authorities responsible for subject
2 chain of command
3 duties of individuals
4 coordination with other subjects
5 economic aspects of organisation of subject
6 operational aspects – eg centralisation, mechanisation
7 control methods – eg supervision, instruction
8 facilities involved – eg transport, amenities

Stage C

SITUATION of subject

5 LOCATION of subject
- 1 extent of region – area, population, travel time
- 2 physical influences – climate, topography
- 3 social influences – population, transport, work, amenities
- 4 effect of surroundings on site – physical, social aspects

6 SITE of subject
- 1 site characteristics
- 2 restrictions on use of site
- 3 possible positions and arrangements – LAYOUT SKETCH

Stage D

USE/OPERATION of subject

7 FUNCTIONS of subject – WORK, FACILITIES, MANAGEMENT
- 1 what used for
- 2 who uses
- 3 how used
- 4 when used
- 5 sequence of use
- 6 where used
- 7 movements involved
- 8 quantities involved
- 9 duration of use
- 10 frequency of use
- 11 services used
- 12 equipment used
- 13 relation to other functions
- 14 degree of permanence
- 15 reliability of informant

8 POPULATION involved in subject
- 1 description of persons
- 2 distribution of persons
- 3 physical characteristics

9 ACCOMMODATION for subject
- 1 possible layouts – sequence of functions, access, traffic, etc
- 2 space forms – size, shape, peripheral length
- 3 relation to external factors – view, sun, wind, noise, etc
- 4 relation to structure
- 5 relation to engineering services
- 6 relation to equipment and supplies

Stage E

CONDITIONS required for use/operation

10 PERCEPTION involved in use, operation
impression required, senses involved, sources of stimulus
causes, locations, intensity of stimulus
duration of perception, quality of stimulus

11 PROTECTION required for use
standard of safety, type of use, type of user, risks involved, method of control

12 ENVIRONMENT CONTROL
existing conditions, required conditions, control methods

Stage F

FACILITIES involved in use/operation

13 SUPPLIES required for use
categories, method of use, specification

14 EQUIPMENT required for use
categories, method of use, specification

15 SERVICES required for use
types, availability, performance, means of control,
means of operation, distribution methods, conditions for operation

Stage G

LIMITATIONS affecting use/operation

16 LEGAL, statutory, social limitations and obligations,
type, authorities, notification,
form of submission, conditions for approval, penalties

17 ECONOMIC limitations, restrictions
type, controlling factors, forms of expenditure
dividend, practicability

Stage H

PROPOSALS concerning subject

18 RECOMMENDATIONS on proposed form of subject
organisation of subject
procedure, methods of use
form, arrangement for use

19 EXECUTION of recommendations
methods of implementing proposals
programme for implementation
contract administration procedure

Stage I

FABRICATION and design proposals for subject

20 STRUCTURAL design
forms, materials, loading, stresses, environmental and accommodation factors, statutory limitations, structural member design, cost, erection, alterations, joints

21 CONSTRUCTIONAL design
element, use, performance, materials, form, environment, accommodation, statutory requirements, fabrication and assembly method, erection method, specification and details, cost, maintenance

22 ENGINEERING SERVICES design and selection
type, use, performance, energy sources, media, distribution, control method, statutory requirements, plant and equipment, installation costs, maintenance, specification

23 EQUIPMENT – design and selection
types, use, performance, environment, accommodation statutory requirements, installation, specification, costs, maintenance

Stage J

ASSESSMENT

Purpose, principles, stages at which made, factors affecting basis of assessment, methods of evaluation, process of design, rating of success

APPENDIX B

SUBJECTS FOR EVALUATION IN THE GREENWICH PROJECT

1 DESIGN METHODS
Effectiveness of methods used from collection of user data through the production process to the completed building. In particular, the means of identifying and reconciling varying types of needs and the methods for getting decisions made and implemented.

2 ENVIRONMENT
Benefits obtained by total mechanical ventilation in terms of control of infection, comfort, noise control, etc.
Lighting, especially in internal rooms or deep rooms, using permanent supplementary artificial lighting.
Colour, especially in totally internal areas.

3 FLEXIBILITY
The extent to which the long span structure and engineering void has made planning easier, reduced space needed and allowed changes to be made in room or departmental layouts after the building is completed.

4 TRAFFIC
The benefits obtained from the ring main circulation system, escalator and vertical/horizontal conveyor system compared with other possible layouts and systems. What conclusions can be drawn for general application regarding layout and traffic systems?

5 COST
To what extent is it possible to measure the benefits obtained by the low, compact building compared with the Best Buy type (with its large number of courts, short span, reduced space standards and largely natural environment) – bearing in mind the limitations imposed by the Greenwich site?

6 OUTPATIENT DEPARTMENT
The advantages obtained by long strings of rooms in securing better utilisation of space and greater flexibility in clinic time-tabling. Also, the benefits of a close link between the ante-natal clinic and the main OPD – and the use made of the outpatient theatres and day ward (Phase Two).

7 WARDS
The benefits obtained by peripheral banding of bedrooms – ie, ability to modify the size and arrangement of nursing units.
Supervision of patients as affected by glazed screens to bedrooms, solid doors, call system, etc.
The suitability of the wardrobe/locker in providing a greater amount of storage space for the patient adjoining the bed, in facilitating movement of patients, and in cleaning.
Benefits of the linen disposal hatch in the partition between the bed areas and corridor. Also, the suitability of the supply and catering systems in general compared with alternative methods.

8 OPERATING DEPARTMENT
The suitability of the combined corridor arrangement for clean and dirty supplies.

9 PATHOLOGY LABORATORIES
The use made of the flexibility of the laboratory benching system and the 'open bay' principle.

APPENDIX C

COSTS IN THE GREENWICH PROJECT

Broad Summary of Cost Distribution, Phase One

General Information

Ground floor area	46,190 sq ft
Total floor area	189,600 sq ft

[Floor area excludes area of storey-height inter-floor engineering voids and peripheral balconies]

Type of contract	RIBA local authorities edition (1963) with fluctuations
Tender date (priced schedule)	June 1966
Phase One negotiated 'measured cost' date	October 1966
Work began	October 1966
Work finished	August 1969
'Measured cost' of foundations, superstructure installation and finishes including drainage to collecting manhole	£2,095,545
'Measured cost' of external works and ancillary buildings including drainage beyond collecting manhole	42,527
Total	**£2,138,072**

Cost Comment

The redevelopment of the old St Alfege's Hospital was selected as a research and development project as it was representative of the difficult problem of redeveloping an old and cramped general hospital on a restricted urban site. It called for the construction of some 15 acres of new hospital floor area on a 7-acre site and the replacement of the old hospital by the new in a speedy and continuous progression without reduction in the hospital's function during the redevelopment process.

It was thus recognised from the outset that **any** solution of these problems would inevitably attract additional costs and that the project could not be a cheap hospital in total terms. Nevertheless, the aim has been one of building for economy and the project is being designed, cost-planned and built well within normal departmental cost allowances. Substantial cost reductions have also been made, by means of careful integration of design, on the major engineering 'on-costs' which are inevitable in a design concept with complete artificial internal environment.

Cost reductions have been achieved by the following means.

1 Ensuring that the potential economies offered by the compact deep plan were exploited to the full.

2 The successful implementation of radical planning solutions, leading to major reductions in normal space standards, possible within an artificial internal environment free from the usual planning dependency on natural lighting and ventilation. In the aggregate, current departmental area recommendations have been reduced by about 18 per cent without loss of function.

3 Standardisation of structural design leading to the cost advantages of a severely restricted range of industrialised structural components allied to a quick and simple erection technique.

4 Strict enforcement of variety reduction coupled with extensive

use of standardised factory-produced components in the fitting-out elements; elimination of traditional plastering and substitution of plastic wallpaper or spray finishes direct to walls.

5 Maximising the advantages offered by the inter-floor voids for economical routing of service distribution and disposal systems, and the virtual elimination of the extensive extract ductwork that would normally be required in a fully air-conditioned building by using these voids as giant ducts (negative plenum).

6 The economies attainable during the construction process due to the physical separation of engineering services in the voids from the fitting-out trades on the clinical floors, reduction of trade on trade attendances and resultant reductions in construction time and contractors' supervisory and overhead charges.

The broad cost distribution given at the beginning of this appendix is for Phase One only. A cost analysis of the total building will not be available until negotiations of the 'measured costs' for all phases have been completed. As Phase One is part of one cohesive building its analysis can be misleading when viewed in isolation from the remainder of the building. Certain elements in Phase One are disproportionately heavy in relation to the eventual cost distribution of the complete building. For example, the economic plan shape of the eventual building is not fully realised in this first phase so the structural costs per square foot for the complete building will be less than for Phase One. Similarly, service costs for Phase One include refrigeration plant for the air-conditioning system, kitchen equipment and conveyor systems, lifts and escalators that are to serve subsequent phases; and the external works are high as they include the main elevated entrance roads and incoming engineering mains for the complete building.

The cost per square foot of the complete hospital including external works will drop from the Phase One analysis figure of 225s 6¼d to approximately 208s 0d per sq. ft. This figure reflects the increase in the rate due to the shrinkage of departmental areas achieved and also the cost of the artificial internal environment. Despite the cost of the wide span structure and the structural inter-floor voids the building elements amount to less than 100s 0d per sq ft. This compares favourably with other hospitals recently built and offsets to a degree the cost of the service elements. A comparison of the tender analyses of six other contemporary major hospital projects with Greenwich shows that although the Greenwich structure frame is indeed taller than normal, the aggregated cost of the building structure (excluding engineering) is the lowest of the seven schemes examined, with the building fitting-out and finishing elements being significantly below each of the other schemes. This result has not been achieved by drastic reductions in specification standards towards the end of the design stage, but by careful integration of all facets of the design with recognition of the interaction of the cost consequences of one facet on another throughout the whole of the design process, particular emphasis being placed on cost-planning techniques.

APPENDIX D

EXAMPLES OF INVESTIGATING SUB-GROUP NOTES

IP 3/1a
JG
26.9.63

ice | M.O.H. a | Gr

In-Patients - Organisation

B 4/5 Economic Aspects - Labour

1. As much direct visual supervision as possible to be provided but patients privacy also to be considered e.g. single rooms to have glazed panel in door (and corridor wall).

RHB - "Why 6 beds?"

2. 6 bed bays - however openly planned are less easy to supervise than Nightingale ward.
3. Staffing figures should not be presupposed at this stage but staffing shortages may occur temporarily and be allowed for in planning.
4. More <u>privacy</u> and less <u>noise</u> should be the aim in design and layout.
5. Use of call systems should be explored as an aid in reducing labour content of nursing work. COM
6. T.V. unlikely to be justified on cost grounds (it is not efficient in use when televising subject in dim light when it could be of most use - e.g. in single rooms at night.) COM

ref: Lakenheath U.S.A.F. air base hospital

7. There might be a case for special T.V. control in single rooms or intensive care unit when nursing staff are in short supply - also for monitoring senile patients, for example, or for geriatric and seriously ill patients in 6 bed wards COM
8. Monitoring systems can be useful in intensive care units and in anaesthetic rooms - 'Fingerstall' clamped on finger end to record pulse, temperature and blood pressure. Very good for use in intensive unit. SD/EQ

IP 9/5
RM/AN
23.1.64

In-Patients - Function

D7 Medical procedures (contd.)

Ward rounds

Purpose of the ward round is to check on the progress of the patient, to order or alter treatment, and to make further diagnoses.

The smallest ward round consists of a houseman and the ward sister or staffnurse, but another nurse will often also go on the round. COM

Matron

There is at least 1 round per day. The main one is in the morning. The doctor says a few words to all the patients; there is limited examination in bed for a few patients with special symptoms and may carry out some minor treatments. He examines the temperature and other charts, and in a few cases the records, of the patients. The sister takes the records trolley (with a diagnosis tray) on the round; the temperature chart may be kept with the patients notes or on the bed. REC

Mr. Sewell

There is sometimes a subsidiary round in the afternoon which is relatively perfunctory. The houseman again visits at 10 p.m. mainly to prescribe, but he may see a few patients. The night round ends with a cup of tea.

The major ward round occurs 1, 2 or 3 times a week. This consists of the consultant, possibly a registrar, and the houseman, the sister, nurse in charge of the patients, and any other nurses who are free at the time. (Not many other activities can take place at the same time as a major ward round.) COM

Matron

APPENDIX E

EXAMPLES OF OPERATIONAL POLICY STATEMENTS

example 1 TRAINING IN THE WARD

As much training of nursing staff as is consistent with the comfort and well-being of patients will be carried out in each ward. The provision of a seminar room is assumed for each pair of ward units and full use is expected to be made of this room for teaching, demonstration and discussion purposes. Training of other administrative, medical and housekeeping staff will be carried out in ward units. **TRG**

The ward sister will be responsible for clinical teaching of the staff under her care. She will maintain close contact with the nurse training unit to ensure proper coordination of school and ward training programmes. It is envisaged that student and pupil nurses will train together and in some instances gain their practical experience together in the same ward. **TRG**

example 2 TREATMENT AND EXAMINATION OF PATIENTS

Where patients are in *multi-bed areas* examinations and minor treatments will be carried out at the patient's bedside with curtains drawn. Major treatments/examinations and those likely to cause offence to neighbouring patients or risk of cross-infection will be carried out in the treatment room.

Treatments and examination of patients in *single rooms* will generally take place at the bedside. Some special or *dirty treatments* may have to be dealt with in the main bathroom. Patients requiring treatment away from their bed areas may be moved in bed, by wheelchair or may be ambulant.

Where treatments are carried out at the bedside a clean dressings trolley with requirements is prepared in the clean supply area. After the treatment procedures have been carried out the trolley is taken to the dirty utility area for disposal of waste, disposal of material for re-processing as CSSD (instruments) and cleaning of trolley before return to clean supply area.

Some treatments may take place in other departments, eg physiotherapy, x-ray. **PHY.X.**

Physiotherapists may require to conduct exercises on a group basis within the ward unit.

NOTE

The headings or titles used for the operational policies at Greenwich were those which emerged from the Investigating Sub-group discussion under the heading 'SCOPE – range of functions', but they have here been rearranged to follow the sequence derived from the information subject classification listed in Appendix B.

APPENDIX F

EXAMPLES OF DESIGN POLICY STATEMENTS

example 1

7.1 ARRANGEMENTS OF ROOMS WITHIN THE WARD UNIT

Patients' Rooms – generally

PATIENTS' bed areas should be naturally lit and beds sited so that patients can see outside. This applies particularly to long-stay wards but does not need to apply to intensive therapy wards. Day rooms and doctors' and relatives' rooms may also be on an outside wall if space permits. **L** **ICU**

For patients in general acute wards it is to be assumed that for part of the day up to 80 per cent of the patients may be ambulant to varying degrees. SITTING SPACE sufficient for all patients in a 'bedroom' is to be provided in that bedroom and in addition a central day space must provide sitting space for dining or watching TV for up to one-third of the patients in the ward unit. It is intended that there should be a CHOICE OF ARRANGEMENT of the patients' bed areas so that day sitting space may either be integrated into the bedrooms, or alternatively be provided in one large room of the same size and type as, and readily convertible into, a multi-bed room. It is not intended that full ENGINEERING SERVICES should be provided to all potential bed positions but only to those designated as bed positions for the time being, that is, in Phase One. **E**

Ancillary Rooms

Toilet areas, seminar rooms, utility rooms, offices, stores, waiting areas may be located on the inner side of the circulation space within the ward unit. Patients' TV/dining rooms may also be located away from the outside wall provided some day sitting space in the ward unit has a view of the outside.

7.2 Access Routes

Access may be provided to some of these rooms from the hospital 'ring-main' corridor for various types of traffic, that is, goods, people and disposal, but access points will be kept separate as far as possible for each class of traffic in accordance with hygienic, convenience and aesthetic considerations.

7.3 One main entrance for patients, visitors and staff is to be provided between each pair of ward units in the zone allocated to administrative and staff rooms and near the groups of patients' single-bed rooms.

Supply and disposal access points will be kept separate from each other and from 'people' access points. **SD**

Access for equipment movement, cleaning and maintenance will be through the equipment cleaning rooms. **COM**

Movement of patients at admission, transfer to another department, death or discharge will be through the main access route under the control of the ward clerk or sister, but a secondary entrance may also be sited nearer the T junction where the radial corridors meet the ring main corridor. **COM**

example 2

8.2 Clinical and Utility Rooms

8.21 The TREATMENT ROOM must be located so as to interconnect via hatches with the clean supply room and the disposal room and be accessible directly (or via an air lock) from the ward corridor. It should relate to the 'more seriously ill' end of the multi-bed rooms rather than to the single rooms or the self-care end of the multi-bed rooms. **E/vent**

An air lock entrance to the treatment room is perhaps desirable but space is unlikely to be available to permit an air lock which would admit a bed.
A suitable size for this room is 13 ft 8 in long × 11 ft 8 in wide with the entrance doors at one end opening in from the ward corridor. The doors will be 1½ leaf with 4 ft 4 in clear opening (4 ft 6 in if made sliding) and will be centrally placed to allow access by a bed or stretcher trolley without the need to turn in the room. A double-ended pass through cupboard hatch for set trays and individual items will be sited to open into the clean supply room. A similar hatch but with an additional pass through cupboard below it for disposal trolleys will be sited to connect with the disposal room. A sink for scrubbing-up will be positioned on one side wall near the entrance doors.
See Study 4 *User Reqt. IBSG.*

example 3

8.6 ROOMS which may be SHARED between 2 adjoining ward units.

8.61 A SEMINAR ROOM which can also serve for demonstrations, interviews and on occasions (for example, weekends) as a reserve waiting space needs to be located to serve two **TRG** adjoining ward units. It should preferably serve the same two units which share a common entrance and staff toilet facilities. The entrance to the seminar room needs to be easily accessible from both the ward corridor and the main corridor without ingress or egress of staff disturbing patients. One of the sisters' offices or the ward clerk's desk can be conveniently planned adjoining the seminar room for supervision. It is estimated that not more than twelve nurses would use the seminar room at one time but a patient may be involved for demonstration purposes to rather smaller groups of, say, eight. Teaching may be done formally or informally and the shape and size of the room needs to offer reasonable freedom and flexibility of arrangement. At least twelve stacking chairs, a desk, table and storage cupboard should be allowed for. Closed circuit TV might be used to link theatres and treatment rooms, and so on to seminar rooms. The layout of the room should cater for this. A space of about 15 ft 8 in × 13 ft 8 in is regarded as a minimum.

The maps published with this book are stored in the Library Office

METRIC CONVERSION TABLE (TO NEAREST MILLIMETRE)

Measurements in bold type relate to the Greenwich planning grid and other key dimensions

1in	**25mm**
2in	51mm
3in	76mm
6in	152mm
9in	229mm
1ft	305mm
2ft	610mm
6ft	1·829m
7ft	2·134m
9ft	2·743m
16ft	4·877m
64ft	19·507m

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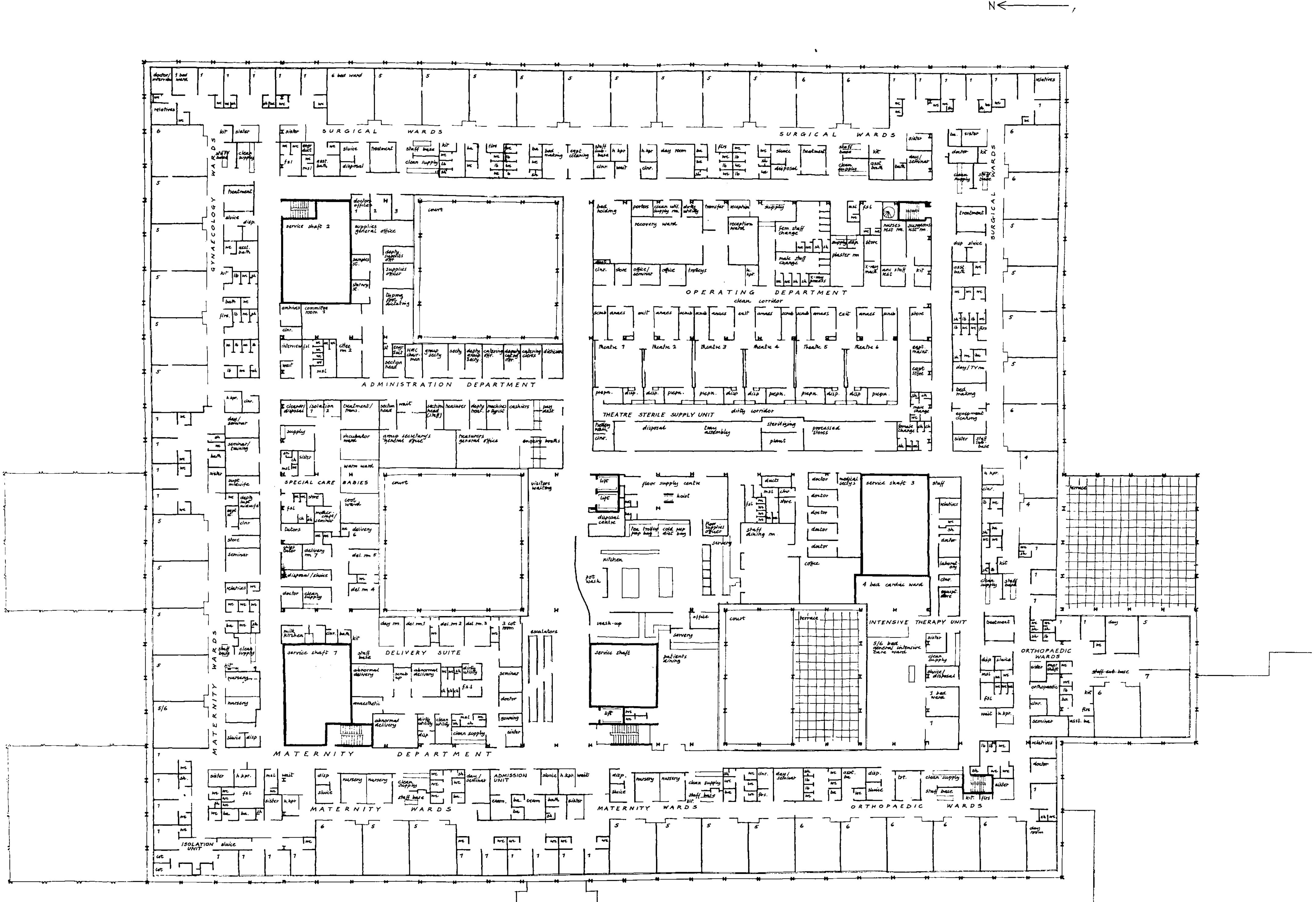
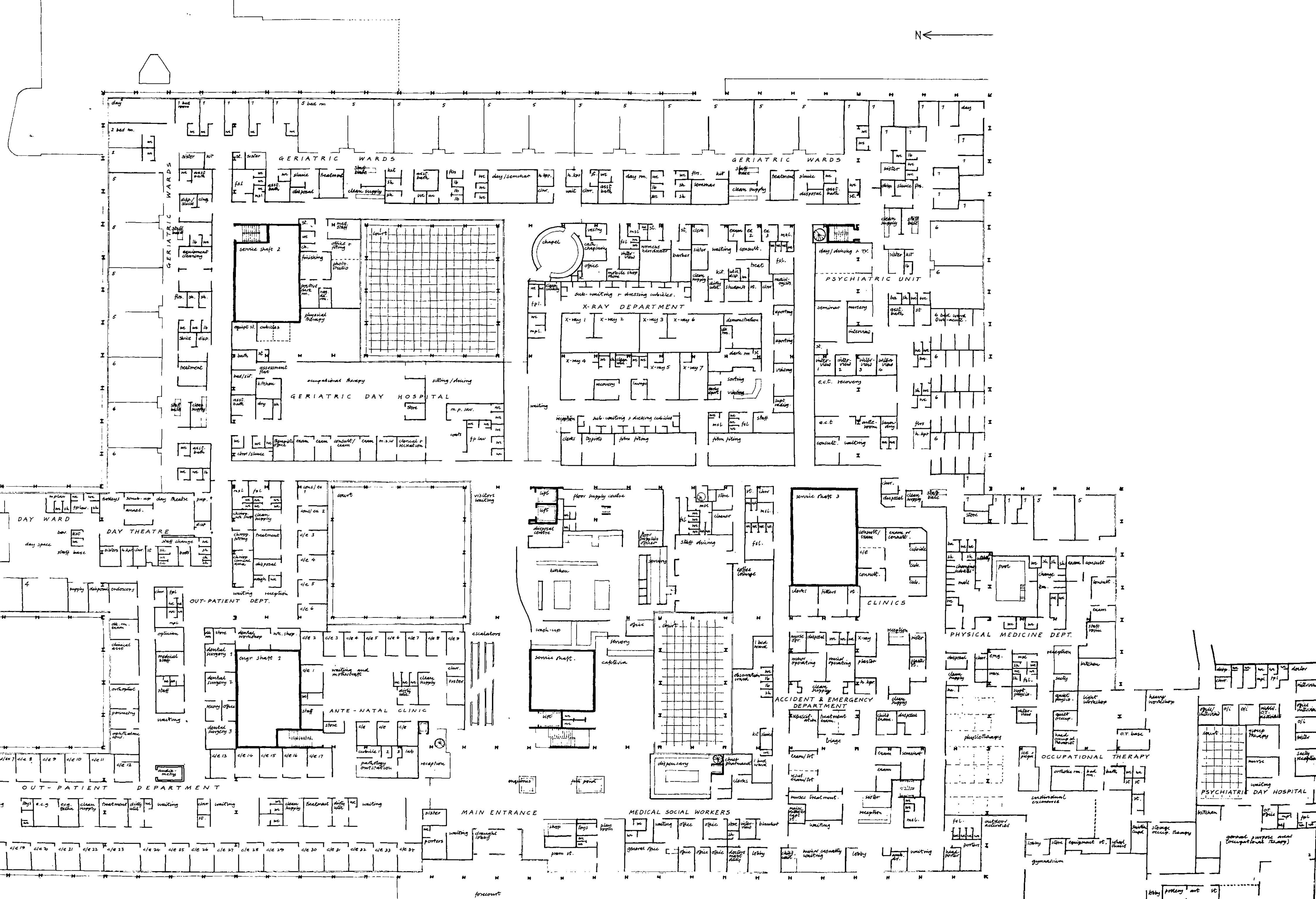
64ft	19·507m



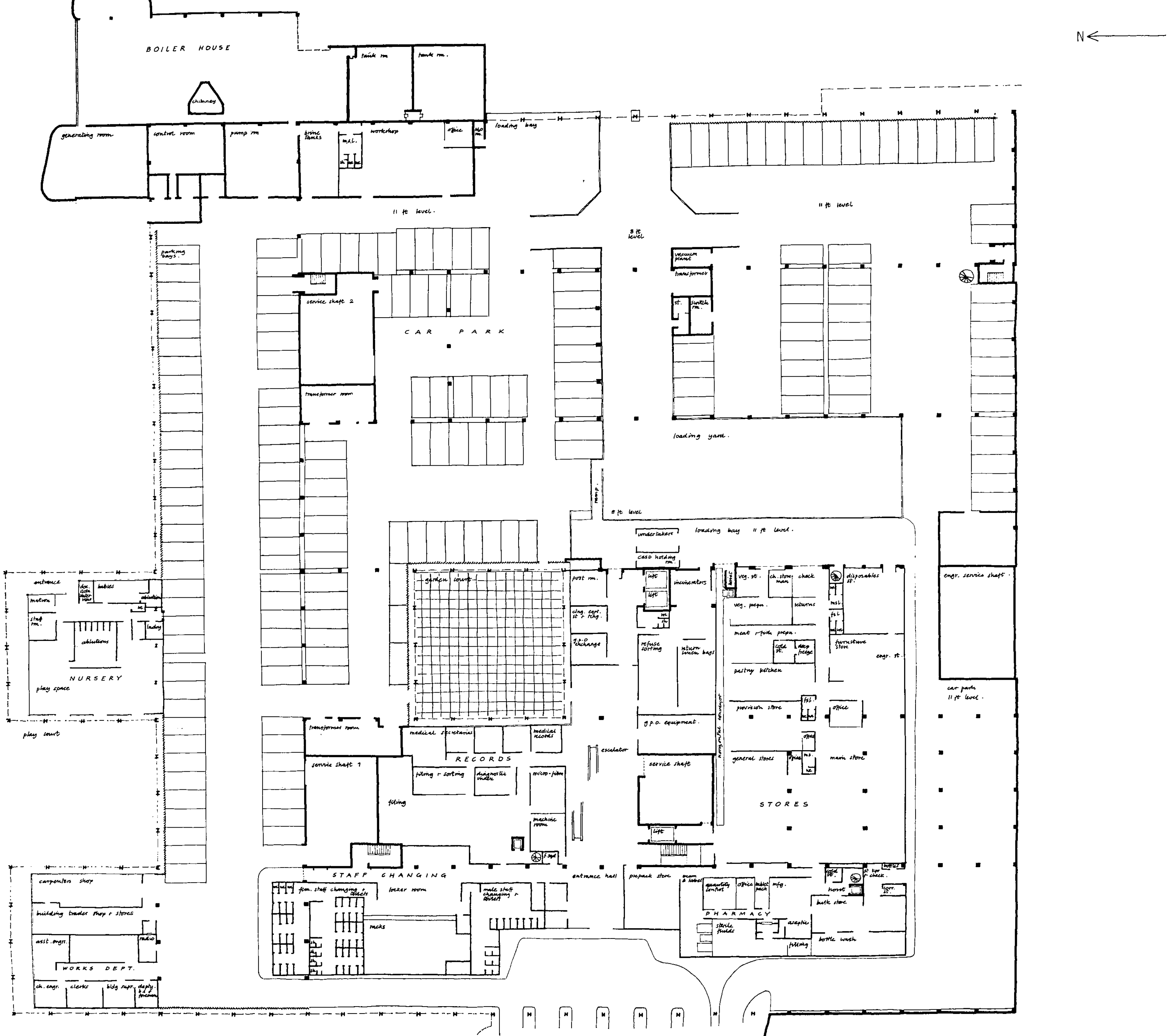
FIRST FLOOR
GREENWICH DISTRICT HOSPITAL

0 10 20 30 40 50 feet

CN + JG Jan 1970

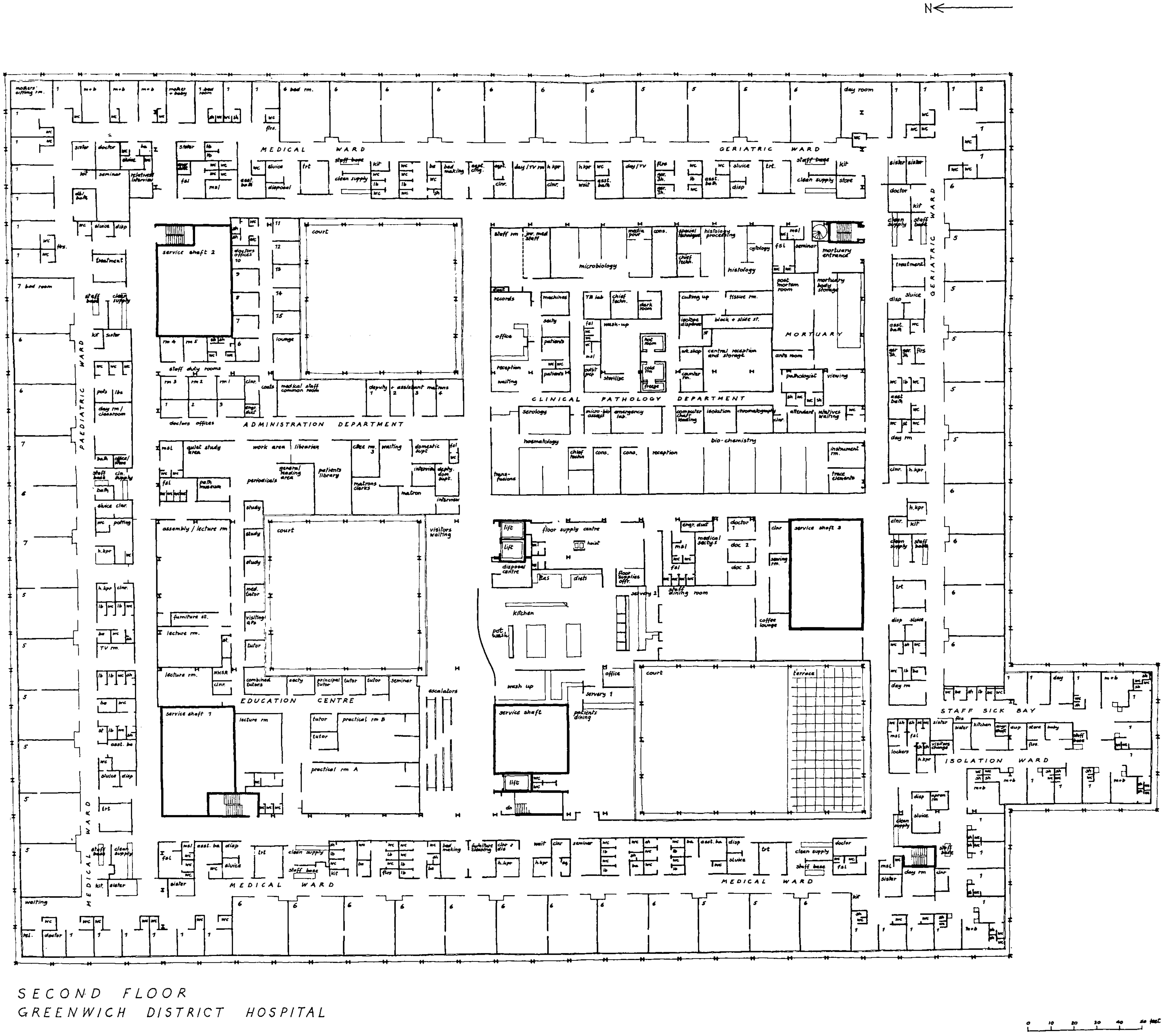


GROUND FLOOR
GREENWICH DISTRICT HOSPITAL



LOWER GROUND FLOOR

GREENWICH DISTRICT HOSPITAL



SECOND FLOOR
GREENWICH DISTRICT HOSPITAL