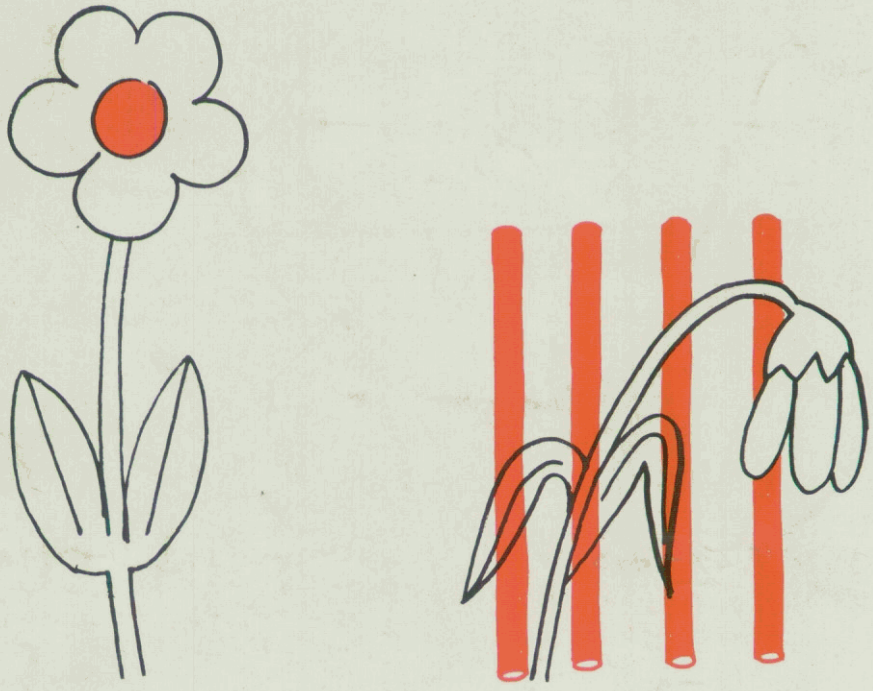
HE
Hospital Engineering
DECEMBER 1976

The Design of Security Units

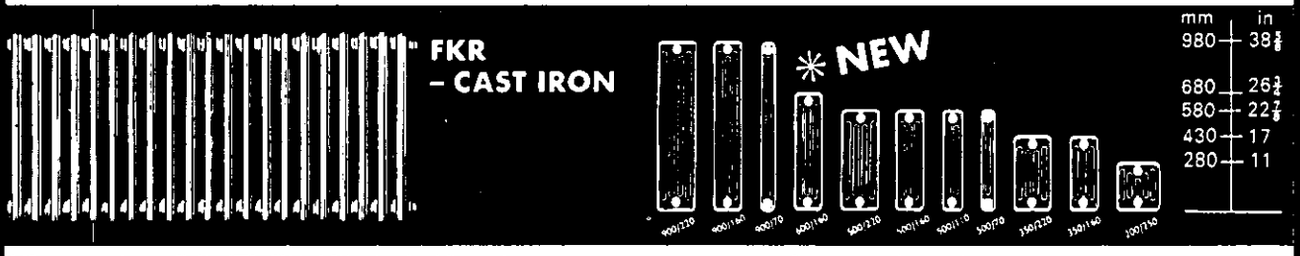


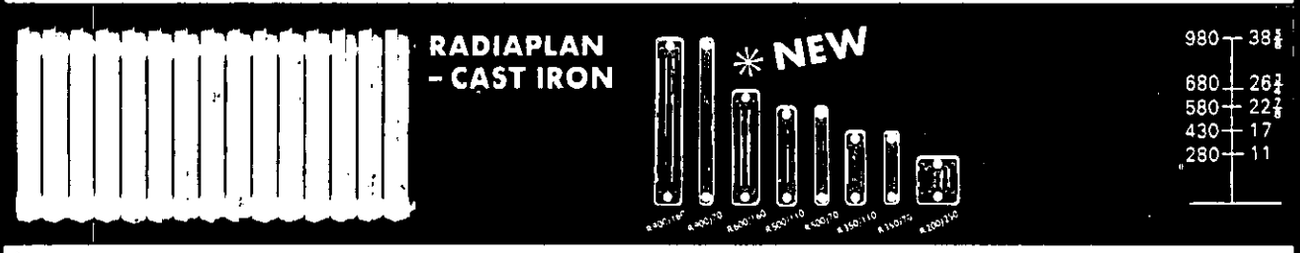
The Seminar Papers

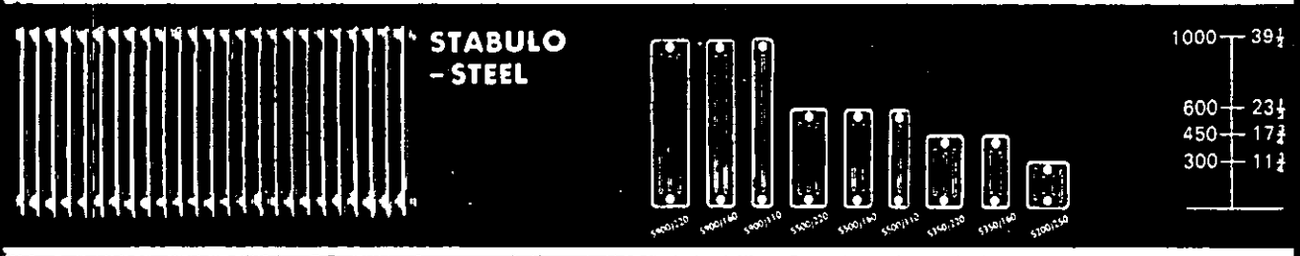
Institute of Hospital Engineering

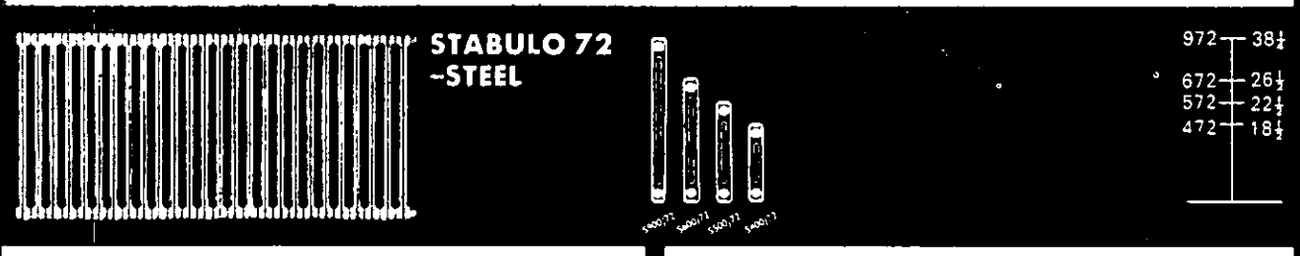
Clyde-Combustions... the Column Radiator people

now offer four ranges (and all the accessories) – two cast iron and two steel – in a total of 32 sizes. There's the well-known FKR cast iron range: hospital approved and now available in 11 sizes. And the attractively-designed RADIAPLAN cast iron range: eight sizes with the advantages of high heat emission rates and easy maintenance. Both ranges suitable for hot water up to 6·0 bars or steam up to 4·0 bars. Steel column ranges? The STABULO and STABULO 72 – in nine and four sizes respectively – available for low, medium or high pressure hot water up to 10 bars. Delivery? Six to eight weeks maximum. If you want to know from the column radiator people just fill in the coupon – there's new Clyde-Combustions literature available now.









Northern Region
Clyde Fuel Systems Ltd.,
Queen Elizabeth Avenue, Hillington, Glasgow G52 4TE.
Telephone: 041-882 3291
Telex: 778407

Southern Region
Combustions Ltd.,
Cox Lane, Chessington,
Surrey KT9 1SL.
Telephone: 01-397 5363
Telex: 928372

To: **Combustions Ltd.,**
Cox Lane, Chessington, Surrey KT9 1SL.
Please send radiator literature to:

Name_____

Company_____

Address_____

_____

Tel:_____

HE/12/76

'Hospital Engineering' is published monthly, except in January and August, by Earlsport Limited

Individual copies cost
£1.70 U.K. postage paid

The annual subscription is UK: £14.50
Overseas: £17.50 Americas: $40

Average circulation per issue
(January-December 1975): 2011

ABC

Editor
Christopher Tanous

Art Editor
Bob Rixon

All correspondence relating to the Journal should be addressed to:

'Hospital Engineering',
Earlsport Limited,
33 Ludgate Hill,
London EC4, England
Telephone: 01-248 0148/9

Subscription agent for the Americas:
International Scholarly Book Services Inc.,
PO Box 555, 2130 Pacific Avenue,
Forest Grove, Oreg. 97116, USA
Telephone: (503) 357-7192
2nd-class postage paid at Forest Grove, Oregon, and at additional mailing offices

UK ISSN 0046-7960

The Institute of Hospital Engineering,
20 Landport Terrace,
Southsea, Hants. PO1 2RG, England
Telephone:
Portsmouth 23186 (STD 0705 23186)

Secretary
J. E. Furness, VRD

HE

Hospital Engineering

Incorporating 'The Hospital Engineer'

Vol. 30
December 1976

The Journal of The Institute of Hospital Engineering

Contents

HE
Hospital Engineering
Incorporating 'The Hospital Engineer'
Vol. 30
December 1976

Institute News

Season's Greetings

We wish a Happy Christmas and a successful New Year to all our readers.

Annual Conference Pitlochry

Suffice it to say, Pitlochry is an area of great national beauty, and offers a superb setting for the conference.

Ceud Mile Failte A Hundred Thousand Welcomes

Our Scottish correspondent, Coinneach MacUilleim, CEng FIHE, has sent us a glowing report on the attractions of the Pitlochry area. Sadly, lack of space prevents us from using it in this edition, but we hope to do so in the January/February issue.

Readers will remember that details of the conference were given in the November issue. It is to be held at the Atholl Palace Hotel from April 27 to 29. Non-members are very welcome.

Maurice Burke OBE

Maurice J. Burke is known in engineering circles — and beyond — throughout the hospital service, not least for his outstanding contributions to the "Engineering Management Courses" which the Institute of Hospital Engineering held at the University of Keele for 11 years, until 1975.

All those who have come into contact with him over the years will share the pleasure at his inclusion in the July Honours List, when Maurice Burke received the OBE.

Mr. and Mrs. Burke appear in this happy photograph. Readers should not be fooled by the suggestion that those eyes appear to be nearly closed!

Congratulations Maurice.

Engineers' Registration Board — A Reminder Registration Renewals

The Engineers' Registration Board is considering the introduction of a simplified procedure for the annual renewal of registration. It is unlikely, however, that the revised system will be announced until later in 1977.

Meanwhile, it is not intended to issue the usual renewal slip in 1977, but the renewal slip valid to the end of 1976 will be considered re-validated for 1977 so long as the registrant remains a paid-up member of his sponsoring Institution.

Charles King

Charles King has become known to many members of the IHE through his participation in the Keele courses — since the earliest course in 1964. What will be less well-known is that for four years he has been preparing by part-time study, to enter the ministry of the Church of England.

On September 26 last he was ordained Deacon by the Bishop of

Charles King.

Reading. The Reverend Charles King does not intend to leave his post as a Training Officer with the Oxford Regional Health Authority until he retires in the normal way in 1979. He then hopes to minister in a small parish in furtherance of his belief that everyone should have a parish priest living close at hand.

The Auxiliary Pastoral Ministry to which he has been ordained differs in one respect only from the usual beneficed ministry — it carries no salary. But it does bring a wealth of worldly experience into the Church and Charles King's long association with the health service will be especially valuable.

We wish him well in his new profession.

London Branch

Tuesday January 25, 1977	**Interstructure — disciplines relationships in the NHS.**	L. Davies — Wolfson Theatre, National Hospital, Queen Square, WC1.

West of Scotland Branch

Thursday February 3, 1977	**From Pipeline to Patient.** Dr. J. G. B. Hendry, Consultant Anaesthetist, Victoria Infirmary.	GGHB, Sauchiehall Street, Glasgow. 7.30 p.m.
Thursday February 24, 1977	**Practical and Theoretical Aspects of Insulation.** Dr. B. R. Anderson and I. W. L. Hendry, D of E Building Research Establishment, Scottish Laboratory, East Kilbride.	GGHB, Sauchiehall Street, Glasgow. 7.30 p.m.

New Members

Applications for membership have resulted in the following elections:

FELLOWS

AVEYARD, C., Wakefield AHA.
BALLINGER, A., Department of Health and Social Security.
BOYCE, R. P., West Sussex AHA.
CLAYTON, D., Tameside AHA.
CRIPPS, N. F., West Midlands RHA.
EDGAR, B. D., Greater Glasgow Health Board.
FLETCHER, J. R., Cleveland AHA.
GLAZEBROOK, R. G., D. R. Chick and Partners.
GRANT, A. H., Scottish Health Services Common Services Agency.
HARDMAN, J. G., Wakefield AHA.
HORNBY, L., Howorth Air Conditioning Ltd.
HORVATH, A. E., North Yorkshire AHA.
HOWELLS, J. K., Hoare, Lea and Partners.
KEDDIE, J. S., West Sussex AHA.
KNIGHT, A. W., Hoare, Lea and Partners.
LEE, K. G., Staffordshire AHA.
MARKWELL, M. J., Upton Associates.
MATON, P., Enfield and Haringey AHA.
POTTER, F. R., Lothian Health Board.
RUSSELL, J. E. A., Royal Engineers.
SHINDLER, K., Pashler and Partners.
TANSEY, P. R., Ian Hunter and Partners.
WAGSTAFF, T., Department of Health and Social Security.
WATSON, J. A., Lancashire AHA.
WHEATLEY, J. G., Greenwich and Bexley AHA.
WHEELDON, R. R., West Glamorgan AHA.
WHITAKER, D. M. H., South Western RHA.
WILLIAMS, P. B., H. D. Lockwood and Partners.

MEMBERS

ADAMS, G. S., Oxford RHA.
ASCOTT, L. D., Associated Mining and Electrical Supplies Ltd.
AXISA, G. F., Government of Malta.
BANKS, A. M., Derbyshire AHA.
BEATTIE, D. A., Revall Hayward and Partners.
BELGRAVE, B. A., Surrey AHA.
BLANDFORD, R. W., Hereford and Worcester AHA.
BRACKSTONE, C. F., East Sussex AHA.
BRITCLIFFE, J. E., Leicestershire AHA (T).
BROWN, N. R., Alan G. Usher and Partners.
BROWNE, D., Graham Bell and Partners.
BUCHANAN, N., St. Helens and Knowsley AHA.
BUTCHER, R., Ronald Butcher Associates.
CARTER, T. W., Birmingham AHA (T).
CASSAR, V. C., Government of Malta.
CHAPLIN, D. W., Hampshire AHA (T).
CHATWIN, P. K., Birmingham AHA (T).
CHORLEY, J., Cornwall and Isles of Scilly AHA.
CHRISTIE, N. H., Scottish Health Services Common Services Agency.
COLQUHOUN, W., University of Glasgow, Building Services Research Unit.
CYMAN, A. M., Central Public Health Laboratory.
EVANS, J. R., Austen Associates.
EVANS, R., Sefton AHA.
FERROS, S., Barnet AHA.
FIELD, J. C., Essex AHA..
GAINFORD, D., Cumbria AHA.
GAIZE, M. G., Lambeth, Southwark and Lewisham AHA (T).
GARDNER, R. W., Greater Glasgow Health Board.
GARRETT, P. J., Kensington and Chelsea and Westminster AHA (T).
GILBEY, R. L., Cleveland AHA.
GRAHAM, A. J., Kent AHA.
GUEST, E. W., Lancashire AHA.
HILL, E. G., BOC Ltd.
HODSON, P. L., E. G. Phillips Son and Partners.
HUNTER, M. J., North Yorkshire AHA.
JACKMAN, F. C., Upton Associates.
JAMES, D. G., Mid Glamorgan AHA.
JONES, D. A., Clwyd AHA.
JONES, D. A., South Glamorgan AHA (T).
JONES, G. H., Camden and Islington AHA (T).
JONES, T. L., Oxford RHA.
KEETON, B. H., East Sussex AHA.
KENT, G. R., East Sussex AHA.
KIRBY, S. C., Derbyshire AHA.
LAPSLEY, I., Wirral AHA.
LEA, W. F., Devon AHA.
LECOINTE, J. N., Ealing, Hammersmith and Hounslow AHA (T).
LOVELL, D. G., Lambeth, Southwark and Lewisham AHA.
MACDOUGALL, A., Argyll and Clyde Health Board.
MARSHALL, D., Tayside Health Board.
MILNER, J. B., Suffolk AHA.
MORGAN, D. H., Dorset AHA.
NAYLOR, J. C., Camden and Islington AHA (T).
NEILL, R., Leeds AHA (T).
NJOKU, N. J., Greenwich and Bexley AHA.
OGLE, J. H., Building Design Partnership.
OLIVER, R. W., Suffolk AHA.
OVERTON, J. J., Solihull AHA.
PALEY, M. R., Durham AHA.
PARSONS, R. K., South Glamorgan AHA (T).
PEARSON, L. E., Leicestershire AHA (T).
PERKINS, I. T., Leicestershire AHA (T).
POSTANS, J. H., Hereford and Worcester AHA.
PRATT, W. H., Wiltshire AHA.
PRIMAROLO, K. J., Norfolk AHA.
ROBERTS, P., Clwyd AHA.
ROSE, H., David and Rose.
RUDGLEY, I. F., Norfolk AHA.
SIMMONS, A., Avon AHA (T).
SISK, J. M., Guy Williams and Partners.
SMITH, D., Lincolnshire AHA.
SMITH, P. E., Kent AHA.
SMITH, T. K., Hampshire AHA (T).
STRACHAN, J., Greater Glasgow Health Board.
TANSLEY, B., R. W. Gregory and Partners.
TAYLOR, G., Nottinghamshire AHA (T).
TAYLOR, N., Derbyshire AHA.
THOMAS, F. N., Dyfed AHA.
WARD, P., Mid Glamorgan AHA.
WEBB, B. P., Parsons Webb Partnership.
WITHEY, D. M., Oscar Faber and Partners.
WORSELL, K. B., North Yorkshire AHA.

GRADUATES

BAKER, D. M., Suffolk AHA.
BROOKBANKS, G. H., Hampshire AHA (T).
CLARK, C. P., Kirklees AHA.
CLARKSON, J. M., Greater Glasgow Health Board.
DAY, A. D., Royal Masonic Hospital.
FLEET, J., Hampshire AHA (T).
FORD, R. B., South Glamorgan AHA (T).
GLOVER, D., Liverpool AHA (T).
GRIEVES, R. J., Lambeth, Southwark and Lewisham AHA (T).
HITHERSAY, C. S., H. D. Lockwood and Partners.
KIRK, B., Greenwich and Bexley AHA.
LANDSBURY, E. J., Wakefield AHA.
LUCKING, A. R., Greenwich and Bexley AHA.
McHUGH, J. A., St. John's Hospital for Diseases of the Skin.
MEHTA, B., Bromley AHA.
PARTON, A., Cleveland AHA.
PEEL, T. J., Essex AHA.
SLATTERY, T., Merton, Sutton and Wandsworth AHA (T).
SRIKANTHA, S. M., Camden and Islington AHA (T).
SUTTON, W. J., John Laing Construction Ltd.
THOMAS, J. W., Hampshire AHA (T).
TOOMS, C. B., City and East London AHA (T).
WARD, D. D., Surrey AHA.
WIGMORE, R. J., Somerset AHA.

ASSOCIATES

ASKEW, M. E., BOC Ltd.
BLOXWICH, M. J., Static Switching Ltd.
COLE, N. H., Nilfisk Ltd.
GREENAWAY, J. R., Andrews-Weatherfoil Ltd.
NAPPER, G. T. H., Dorset AHA.
PRYER, J. E., BOC Ltd.
READING, W. A., Andrews-Weatherfoil Ltd.
RILEY, C., East Sussex AHA.
SALISU, O. N., Drug Houses (Nigeria) Ltd.

AFFILIATES

ROBERT JENKINS SYSTEMS LTD., Rotherham.
WANDSWORTH ELECTRICAL MFG. CO. LTD., Woking.

We reprint below the papers given at the Institute's very successful seminar held on October 20. The seminar was chaired by Dr. M. J. MacCullock, Principal Medical Officer, Department of Health and Social Security, whose introductory remarks are given below. The remaining papers are reprinted on pages 4 to 19.

The Design of Security Units

Chairmans Introduction

As the first general meeting to be held on this particular aspect of secure units, it is an extremely valuable opportunity to exchange views. The Department regard it as particularly important for Regional Health Authorities to establish secure units as soon as possible, and meetings like this can help to act as a real catalyst for action. The Department is generally encouraged by the energy with which most Regions are planning the establishment of secure units, but the aim is for one in each Region to be operational by 1980, and the timetable is very tight.

It was not in fact the Butler Committee (as suggested on the agenda for the symposium) which first recommended secure units. What Butler did was to point out the deteriorating situation over the past 15 years or so and to reiterate the urgent need for action. As long ago as 1959 a circular of the then Ministry of Health, HM(59)46, contained a warning that the need for some continuing security arrangements was in danger of being overlooked and the Minister accordingly asked Boards to ensure that treatment under secure conditions was available for patients who needed it. As a result of the report of the Working Party on the Special Hospitals in early 1961, this advice was repeated and strengthened in HM(61)69, and the Ministry followed this with a letter to Secretaries of Regional Hospital Boards which it is perhaps still useful to quote today: "There is a real danger that the pendulum is swinging too far and that, in their enthusiasm for the open-door principle and the successes it had achieved, hospitals were overlooking the needs of those patients — admittedly quite a small minority — who, in their own interests or that of society, require treatment under a degree of supervision which guarantees adequate security for the community". The letter questioned whether, as in the past, hospitals should continue to "consume their own smoke", or whether it would be best to concentrate resources in a relatively few secure units. But it stressed that "it is not proposed that these units should be expected to cater for patients who are only temporarily violent — e.g. psychiatric emergencies of various types — since these are normally dealt with by psychiatric hospitals as part of their day-to-day work".

However, ten years later very little significant progress in setting up such units had in fact been made. Increasingly, the mental hospitals had been opened up — to the enormous advantage of the vast majority of patients, as well as the staff — but increasingly there was difficulty in providing appropriate facilities for the small number of patients who required treatment under secure conditions. Meanwhile also, the special hospitals were bursting at the seams, often with patients who did not need such a high degree of security. By the 1970s, it was evident to many that something more must be done. First, a DHSS Working Party on Security in NHS Hospitals produced a report (the "Glancy Report", 1973, revised in 1974) concluding that there was an urgent need for secure units; and then in 1974 the Committee on Mentally Abnormal Offenders, under the chairmanship of Lord Butler, expressed its concern at the absence of adequate secure facilities in the NHS by issuing a special interim report urging that secure units should be established in each region. Both of these reports were distributed in 1974 under cover of circular HSC(IS)61.

The Glancy Report should be read carefully by all those involved in setting up secure units. Essential reading also are the *Regional Security Units Design Guidelines*, issued by the Department in July 1975, which discusses such questions as adaptation or purpose-building, secure design, size and design of functional units, treatment, training and teaching facilities, recreation and rehabilitation facilities, call systems and fire precautions. The Design Guidelines also contain four Appendices on a small functional unit, floor space for patients, upgrading of existing buildings, and extracts from a report on secure accommodation for children.

Mr. Lake is Nursing Officer at the Department of Health and Social Security.

Nursing Considerations

CLYDE LAKE RMN RNMS SRN

In any discussion on the role of a secure unit it is perhaps important that we should first of all remind ourselves of the purpose and original concept which was accepted and embodied in the NHS Act 1946. This was that the proposed service must be "comprehensive" — Comprehensive in two senses — First, that health care must be available to all people and, secondly, that it should cover all necessary forms of health care.

In recent years, one of the most serious problems within the psychiatric field has been in acquiring suitable placements for the more difficult and behaviourly disturbed patient. These difficulties have arisen, not only through the acceptance of admissions through the courts and on transfer from the prison service, but also on direct admissions from the community and on inter-hospital transfers. On occasions these problems have reached serious proportions — certainly the decisions which have been taken have not always been in the patient's best interests. I am thinking of incidents where, because of differences of opinion as to the security and other needs of a patient, hospitals have either refused admissions or have dis-

charged a patient on the sometimes not very well established grounds that the patient is either too dangerous or difficult to treat, or that facilities are inadequate. As a result of these difficulties the Health Service has experienced mounting criticism, not only from the courts, but also from Members of Parliament, the press, individual members of the public, and from staff within the NHS itself.

Under the present arrangement of the Mental Health Act 1959, and indeed since the inception of the NHS Act 1946, it has been the responsibility of the NHS to provide facilities to treat all types of patient with mental disorder. The only exception has been those who require to be treated in conditions of maximum security. We are not, therefore, talking of an entirely new category of patient, but of patients who are, in the main, already resident in psychiatric hospitals.

What is now proposed is an additional element of service, in an area of psychiatry where it is generally recognised that certain gaps exist in our present provision for the more difficult behaviourly disturbed patient. The ultimate aim is to provide as comprehensive a psychiatric service as possible, with special hospitals, regional secure units, psychiatric hospitals and community care. Such a range of facilities would allow easier movement of patients to and from all parts of the service, which, in turn, would lead to a more effective programme of care designed to meet a more specific need, and to a more intensive use of all available facilities.

Unfortunately, one of the consequences of the "open door" regime has been that some hospitals have not always made alternative provision for the continually difficult type of patient. This, in turn, has placed greater pressure on the special hospitals, which are already overcrowded. In any case it would be quite wrong to impose a greater measure of security on a patient than that which he actually requires. Whilst the change in attitude which the Mental Health Act 1959 was intended to promote has brought a vast reduction in the number of patients formally detained, there now seems a danger of this change in attitude being carried too far.

As in any organisation, the success of the unit will largely depend on the effectiveness of the operational policy and communications network, which will need to be developed with great care. It is essential, therefore, that all staff recognise and accept the potential value and benefits that can accrue from a multi-disciplinary approach. As stated in the DHSS White Paper *Better Services for the Mentally Ill* which was issued in 1975: "It is only through the building up of team-work and close relationships between professional and lay staff that it is possible to turn facilities into a working and comprehensive network of services".

All staff, particularly those who will be directly responsible for the management of the unit, need to be kept fully informed and as closely involved as possible in the decision taking processes which will ultimately determine its function, design and operational policies. In addition, it is equally important to obtain the fullest possible co-operation, at the earliest stages of planning, of the Staff Side associations, and to ensure effective liaison with the local community.

Whilst the DHSS has accorded the provision of secure accommodation a very high priority, it considered that it would be preferable to allow regions the utmost flexibility in their choice of policy and design, in order that they may take account of their own particular local policies and situations. It was not, therefore, thought necessary to issue any formal guidance. However, following the publication of Health Circular HSC(IS)61 *Security in NHS Hospitals for the Mentally Ill and Mentally Subnormal* numerous requests for advice were received, and resulted in the publication of the document *Regional Security Units — Design Guidelines* in July 1975.

Initially, the aim will be to provide accommodation for some 1,000 patients. This will be followed by an increase to the figure of 2,000 which was recommended by the Committee on the Mentally Abnormal Offender, if the need is confirmed by experience, when resources permit.

Perhaps the biggest obstacle to be overcome is in getting general acceptance of the concept of care considered necessary within these units, and in ensuring that all staff fully comprehend and subscribe to the unit's philosophy on the security requirement. Unfortunately, the word "security" often conjures up the image of a fortress-like building, with its accompanying high walls. It is often said that security militates against therapy — that a secure environment, with its locked doors, perimeter fencing and the limitations that it imposes on freedom, is not conducive to a therapeutic approach. In order to successfully overcome objections of this kind, it is necessary to emphasise that the secret of success lies in the development of effective inter-personal relationships combined with active treatment programmes.

Ideally, security should be a combination of physical containment measures such as locked doors, secure windows and possibly some form of perimeter fencing, as well as high staffing ratios coupled with the development of active treatment programmes. It is also important that staff recognise and accept that it is possible to have graduation of security within a unit. Security can perhaps be best described as an awareness of the specific needs of each patient at any given time and the ability of staff to utilise the facilities and levels of security within the unit with the best possible advantage to the patient. In this context security means adequate supervision of and direct involvement with patients, backed up as necessary by built-in security measures.

Staff also have misconceptions of the severity of the management problems which may be encountered as a direct result of concentrating behaviourly disturbed patients within a single unit. A number of staff have expressed the view that the particular difficulties which they have experienced with individual patients in an ordinary psychiatric ward, will inevitably multiply in direct proportion to the number of patients who are admitted to the unit. Experience within the special hospitals has shown however that such fears are unfounded.

No one would pretend that the operation of regional secure units will be a simple matter. Indeed, part of the difficulty is that we have no precedents from whose experience we can learn much. However, we are embarking on a considerable challenge — not only for the staff who will work in these units, but also for the policy-makers and planners who must plan, design and work out operational, admission and discharge policies which staff will find workable. The need for adequate secure provision has existed like this in the NHS for a considerable period. It is a need which must urgently be met; it is a challenge to which all in the profession must rise.

Mr. Williams is Acting Assistant Regional Engineer, Trent Regional Health Authority.

The Design of Security Units Engineering Considerations

A. WILLIAMS CEng MIEE

The Trent Regional Health Authority is proposing to build two Secure Units, the first in Leicester to have 60 beds and the second in Nottinghamshire with 45 beds.

Obviously, before the Engineer can begin to consider what the engineering content of any Secure Unit must be, he must first have a brief from his client.

When we undertook to produce this paper, we were not in a position to write a brief, as this was still under discussion with the Project Team. We were, however, given a design policy by the Leicester Project Team that would enable an engineering brief to be formulated at a later date. This policy tells us that different groups of patients will be accommodated in the Unit and there is a need to provide sections of accommodation capable of meeting the needs of those requiring from maximum to minimum security, with the capability of adjusting the amount to meet varying numbers of patients of each category.

One section will accommodate new admissions, mainly for assessment, requiring maximum security.

The second section will be for those requiring more intensive investigation and might contain various forms of treatment. Security in this section should be capable of variation to meet the need at any particular time.

The third section will house a group of patients requiring long term treatment as a therapeutic community. Security within this section will usually be minimal, but individual rooms may require a greater degree of security to meet special circumstances. Design should aim at the maximum flexibility in use, thereby avoiding any environmental difference between the most and the least secure parts of the Unit.

The Unit should also be seen to provide treatment in secure conditions rather than long term security. Patients should not be admitted unless they are likely to benefit from treatment. Thus the long term security risk patients will be avoided.

Security

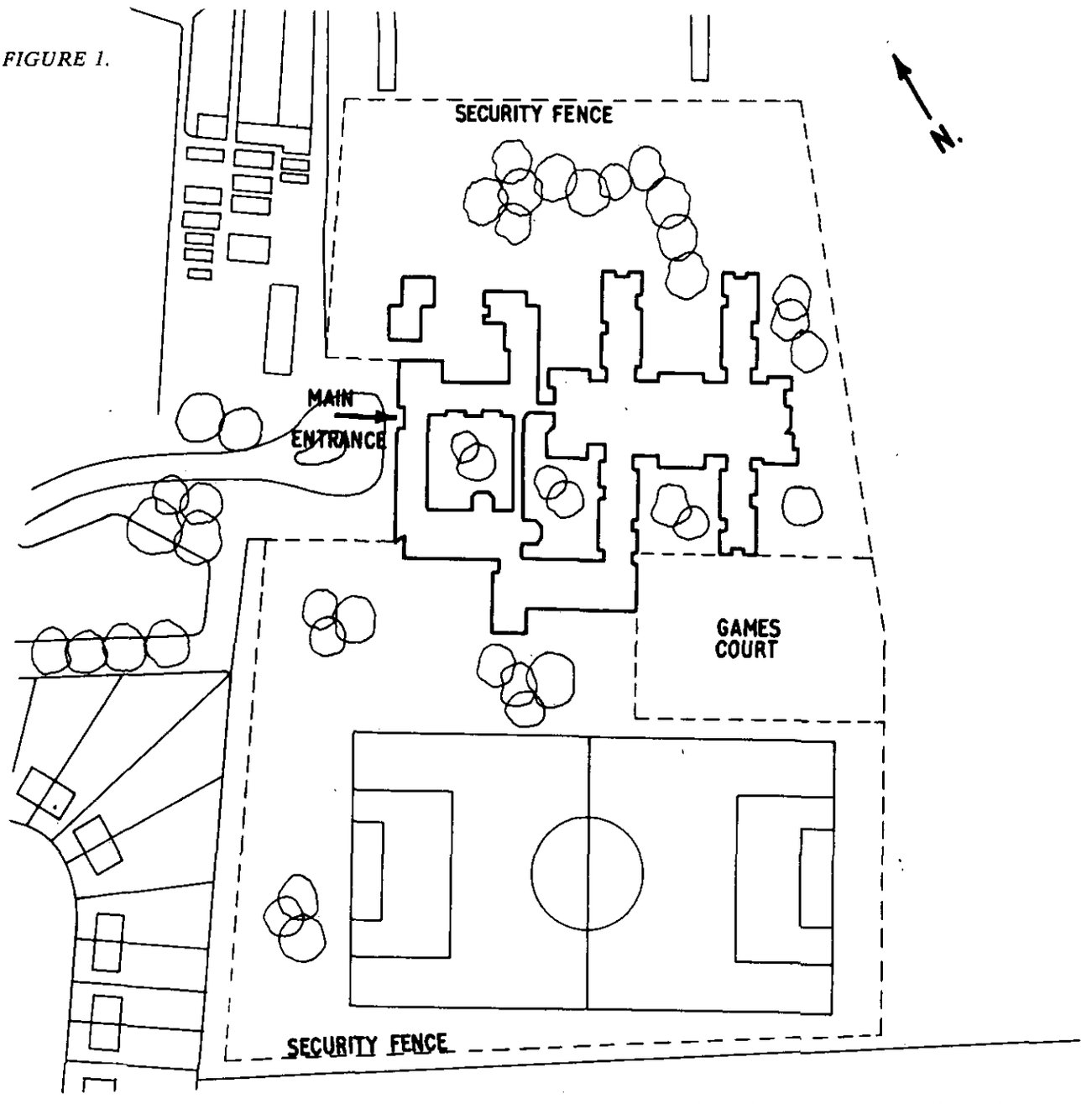
What considerations then should the Engineer give in deciding on the degree of security? We are told:

1. The Units will not be expected to emulate Special Hospitals, or Prisons, in the type of security provided, nor will they be expected to take into account outside rescue attempts;
2. They will not be trying to contain the determined absconder;
3. Units will be expected to stop patients simply walking out or leaving the premises without staff knowledge;
4. Staff will need to deal with disruptive patients from time to time, who might be violent in some situations. They would be also expected to take into account the varying conditions of individual patients and take steps to prevent their leaving the Unit (depending on their condition). In other words, there should be varying degrees of security;
5. Security should not be considered synonymous with high walls, or impregnable buildings. It should consist more of surveillance, observation and direct involvement with the patient, backed up as necessary by built-in security systems;
6. Security devices should be kept as simple as possible. If highly sophisticated systems are provided they may become over used and thus minimise the involvement of staff with patients;
7. Built-in security systems, however, are essential in order to build up staff confidence in being able to deal with a difficult situation, should it arise;
8. Units should be designed in order to provide a potentially secure environment and every effort should be made to avoid intrusive security measures but, of course, a particular situation may demand that the security measures can no longer remain discreet;
9. Even the most secure part of the Unit should have no environmental difference in terms of decoration and finish from the rest of the Unit;
10. Whilst it is not essential, according to the DHSS Working Party, to have security fences, the Trent Regional Health Authority felt that their first Unit at Leicester should be designed with this facility. The perimeter fence, however, should not be considered as a means of preventing a determined absconder leaving the Unit, but more as a delaying mechanism, which would enable staff to observe that an attempt to abscond was being made. The perimeter fence should also provide security against intruders.

Preliminary Proposals

The plan indicates the first layout proposed by the Leicester Project Team. Bed accommodation, for the greater part in the form of single rooms, is provided in four wings, with toilet facilities in close proximity to the bedrooms. In addition, there are three special bedrooms. Servery and dining facilities are near the bed areas.

FIGURE 1.



To the left of the plan are the entrance area, with the administration sections, treatment area and a rehabilitation flat. At the bottom of the building layout are the occupational therapy and recreation facilities. The Unit is, as already mentioned, surrounded by a security fence which, in general, would be breached only by the main entrance to the Unit, although vehicular entrance would have to be provided for estate maintenance, removal of waste, etc.

The Engineering Approach

What approach, then, should the engineer use to design such a Unit? Previous experience for secure accommodation has been limited to the provision of special rooms in some psychiatric units and simple security devices, such as the electrically released locks on outer doors of hostel accommodation. It was therefore felt appropriate to enquire into the experience of those who have the responsibility for the management of similar secure accommodation, such as the special hospitals and those involved in the design of the new special hospital accommodation.

A visit was made to Rampton Hospital to view the accommodation and to discuss the special features of the engineering services. It was learned that a new special hospital — Park Lane — was under construction and, through the good offices of our colleagues in the Engineering Division of the DHSS, a visit was arranged to view the specification and drawings for this hospital at the Public Services Agency's design offices. In addition, we held discussions with a specialist consultant on security, who has many years' experience with the Home Office in connection with the design of prison accommodation. We also considered a report commissioned by the Department of Health and Social Security as a Research and Development Project on Secure Accommodation for Children.

During our visits and discussions early thoughts on the special nature of engineering services arising out of

consideration of the DHSS Guidance on Regional Secure Units, were thrown into complete disarray. At Rampton, for instance, we found that little attempt is made at providing anything special in the way of engineering services, with the exception of the precautions taken in the side rooms, which are extremely stark accommodation. On viewing the plans for Park Lane, however, we were struck by the high standard of provision in the patients' bedrooms.

We were, of course, looking at the two extremes in viewing Rampton and Park Lane. It is obvious that the nursing management and the regime at Rampton is very different from that envisaged at Park Lane. Our conclusions were that:

a. the need for special engineering features in Regional Secure Units is directly related to the nursing pattern and the treatment and rehabilitation philosophy of the Unit. It followed, therefore, that we should not adhere entirely to the same pattern as in the Special Hospitals;

b. that Regional Secure Units should provide at least as good an environment in terms of patient comfort as a new Special Hospital;
and, finally

c. that established Hospital Engineering practices should not be ignored.

It is stressed in the design policy for the Regional Secure Unit that treatment and rehabilitation of the patient within a normal environment is of prime importance, and that security is secondary to this.

Bearing in mind and accepting that a high nurse-to-patient ratio will be maintained, we addressed ourselves to the problem of the nurses in managing the patients and also to the nurses' two main concerns, which are the safety and well being of the patients, and their own safety in managing the patients.

We also divided our attention between two aspects, that of the normal running of the Unit, i.e. the day-to-day management and maintenance of such a Unit, and the operation of the Unit in an abnormal condition, such as fire, or physical disturbance among patients.

How, then, can the engineer assist in these respects and provide the reassurance which the nurse requires in order to manage patients with confidence?

Safety of Patients

Let us first consider the safety of the patient. The Engineer must consider in what ways the patient could harm himself, by accident or by desire, as a result of the provision of engineering services within the Unit;

1. He may readily scald himself, if water temperatures at the tap are in excess of 50°C;
2. He may easily suffer burns, if heating surfaces are in excess of 50°C;
3. He may drown;
4. He may hang himself;
5. He may injure himself on sharp edges and corners, particularly where hard materials are in use, or by using detachable or breakable parts of equipment as weapons against himself;
6. He may swallow small objects, such as screws;
7. He may electrocute himself;
8. He may put himself and the rest of the staff and patients in the Unit at risk by fire-raising.

Safety of the Nurse

Now to consider the safety of the nurse, who may be at risk from the patient.

The patient may use detachable or breakable parts of the equipment as weapons for assault, or may throw the nurse against sharp or hard objects, or surfaces.

How can the Engineer help?

The first consideration should be in the day-to-day operation of the Unit and the engineering provisions in this aspect. The engineer can help to prevent injury to the patient, in the following manners:

1. He can provide water at the tap at a limited maximum temperature of, say, 50°C; this, of course, would not apply to the kitchen where there would have to be an exception;
2. He can provide heating systems in unsupervised areas, single rooms, etc., or wherever a patient will not usually be continually observed, which have surfaces exposed to the touch at a maximum temperature of 50°C;
3. The depth of water in baths could be limited, either by providing an overflow at a suitable level (this is only partially effective and nurse supervision would, obviously, be the main safeguard);
4. In any room where there is not continuous observation, high level fittings must not allow for the possibility of the patient hanging himself, by attaching a rope or cord, or any other device;
5. Equipment, other than that mounted at high level, should be selected and made of appropriate material, and designed to avoid sharp edges and protrusions;
6. It should not be possible for equipment, or any parts of the installation, to be dismantled by unscrewing or other means, even with a determined effort on the part of the patient;
7. In all single rooms and areas where patients may not be continually observed, there should be no means enabling a patient, by interfering with the electrical installation, or the equipment connected to it, to receive a fatal shock;
8. In selecting equipment, fire resistance should be considered and any substance which might give rise to toxic fumes when burning, should be avoided. Obviously, a system of automatic fire detectors should be installed in bedrooms and in unattended areas and where, if a fire occurred, life would be at risk.

Our solutions to the problems posed are a synthesis of all we have learned in the visits and the discussions we have had, and are presented as a considered view of what should be sensibly provided at a reasonable cost. More elaborate solutions may be offered, but these, of course, would have cost penalties and we felt that our guiding principle should be "simplicity is best".

Maintenance

All components of the building, be they builder's ironmongery, sanitary equipment, plumbing or engineering building services' equipment and installations, should be selected with a view to minimum requirements for maintenance. All equipment should, wherever possible, be standard manufactured items, which are readily replaceable. In patient areas, certain modifications to standard items may need to be carried out, however, to allow for loose covers and other components to be retained on the main body of the equipment, by means of chain or other securing device.

Throughout the Unit, it will be necessary for maintenance staff to work closely with the nursing staff in programming maintenance work, so that advantage is taken of those

periods when rooms are out of use, thus avoiding so far as possible contact between maintenance staff and patients. The obvious advantage of this is that the chance of patients being tempted to gain possession of tools or materials is removed. Planned Preventive Maintenance is therefore an essential system for the Regional Secure Unit. Planned, not only in the sense of the interval between inspections, but planned also as to the times of day when the work is carried out, which should be in accordance with the Nursing Management pattern.

The maintenance staff and any Contractors' men who are required to enter the Unit, will need to be properly instructed in security, and in the methods by which security is maintained within the Unit. There will need to be a system of checking in, and out, the tools and materials used by the workpeople. Whilst at work in the Unit, they will need to take particular care to retain tools wherever possible on their person, or locked in a tool bag, particularly in areas such as circulation spaces, where it may not be possible to exclude patients during the period when the work is being carried out. Clearly, it will be preferable for all work to be carried out by Hospital Works Staff, thus minimising the need for the instruction of Contractors' workpeople and, perhaps more importantly, giving greater confidence to the nursing staff.

Emergency Procedures

We should now consider how the provision of engineering services can help the nursing staff in the event of an abnormal situation, i.e. a fire; patient disorder; etc.

We have been particularly impressed by what we have been told at other Secure premises, about the need for the nursing staff to operate to a set pattern in dealing with emergencies, such as disorderly conduct, or a fire. These procedures may involve containing patients by the locking of doors or, in the case of a fire, unlocking doors to allow patients to pass into safe areas. In either case, there will be a need to summon assistance and, in the latter case, to warn the Fire Brigade.

The confidence of the nursing staff will obviously be enhanced by any reliable facility which can be provided by the Engineer for operation in an emergency situation.

Engineering Solutions

Main Services

In the case of the Trent Region, the Leicester Secure Unit will obtain its main services from the parent hospital, although of course, this may not be the case in all units.

Plant Rooms

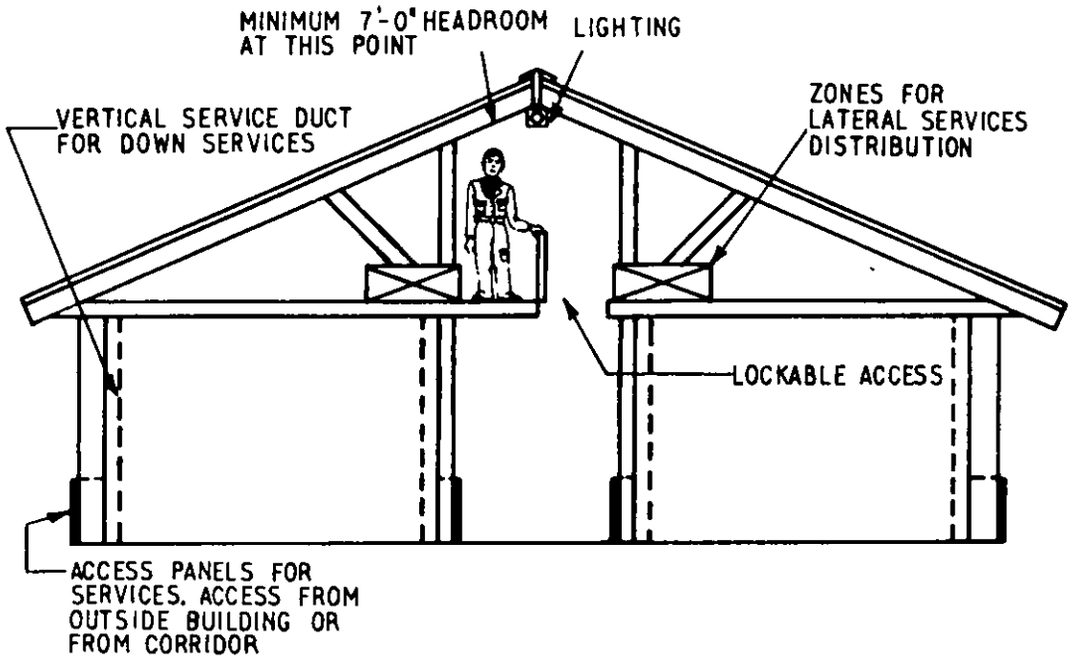
Plant Rooms within the Unit should be located, where possible, remote from patient areas, with access from the outside of the perimeter fence and adjacent to the main entrance. The plant rooms will be secure from access within the Unit, but will require securely locked entrance doors, observable from the main entrance as a safeguard against outside interference.

It has been suggested to us that interference with the main plant rooms is not beyond the bounds of possibility, as part of a determined attempt by outside persons to effect the escape of a patient inside the building. The plant to be housed within the rooms may be steam to water calorifiers for heating and domestic hot water services, although it may also be necessary to have boiler plant, if the Unit were remote from parent hospital services. There would also be the necessity of housing the main electrical intake, with its associated switchboard, and the standby diesel generator.

Distribution of Engineering Services

The Leicester solution is a pitched roofed single-storey building. For security purposes, the ceiling will be of substantial construction. It will thus be possible for maintenance personnel to have ready access throughout the roof void where engineering services will be distributed.

FIGURE 2: **Typical cross section of Single Bedrooms Block**



The diagram indicates a possible arrangement, with the roof construction allowing full height walking access generally over circulation corridors, from which access to the roof void will be obtained. Vertical ducts will be provided for down connections for all services.

Heating

For economy in capital outlay, normal hot water flow temperatures are to be preferred, but it follows that precautions are necessary in the selection and location of the heating units, for those areas where patients will not be under continual observation.

We have, in general, considered the standard Building Note recommendations for Mental Illness Units to be adequate, and the diagram shows the temperature and ventilation requirements for such accommodation. It can be seen that the design temperature for bed accommodation would be at 21°C, with a night reduction to 16°C. Consideration, of course, should be given to the zoning of the heating controls to take into account the orientation of the building. It is not thought necessary to provide individual room controls for the heating services.

In the single maximum secure rooms, of which there are to be a small number in each secure unit, a high level wall mounted radiant panel installation would possibly be the best solution. This would have the advantage of flush mounting, and the absence of sharp corners. The control valves for such a unit could be mounted in the roof void (*Figure 4*). For the next level of security, i.e. medium or assessment wing, we have considered various alternatives, firstly, a Plenum system with warm air into the rooms and the associated extract which, whilst having the advantage of keeping a clear room, i.e. no low level fittings, has higher running costs than the other alternatives.

There is another consideration to be given to this system, that is, if the grilles in the ceiling were to be made secure enough to prevent the patient removing them and using them as a weapon, they would then present the problem of providing a secure anchor point for a rope, as referred to earlier in the "Considerations to be given to Patient Safety".

Another problem with ducted air systems is that the design would have to be carefully considered to avoid too great a noise transference from room to room via the duct system.

We have also found, when these units have been installed in Mental Illness Establishments, that patients sometimes "post" bits of paper down the grilles and eventually fill up the back of the convector with material which then presents a fire risk.

FIGURE 3: **Suggested Temperature and Ventilation Requirements**

	Temperature °C	Temperature °F	No. of Air changes per Hour	Ventilation Type
Bed-Sitting Room	21	70	3	Natural
Reduced at night to	16	60		
Maximum Security Bedroom	As above		As above	As above
Living/Dining Room	21	70	3	Natural
Bathrooms and Showers	21	70	2	Natural
W.C.	18	65	2	Natural
Servery	16	60	3	Natural
Staff Base	21	70	2	Natural

FIGURE 4: **Heating for High Security Bedrooms**

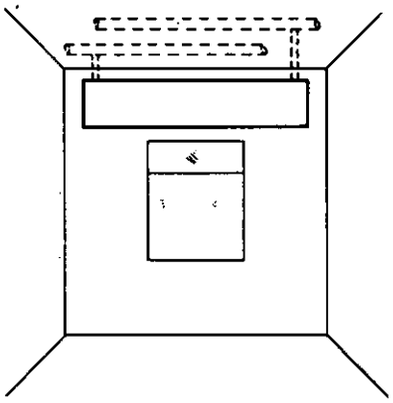
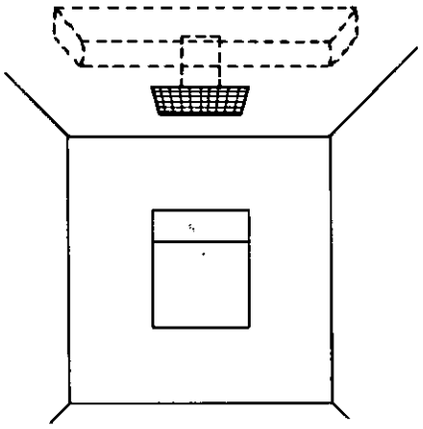


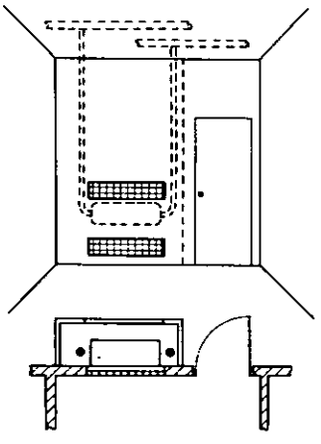
FIGURE 5: **Plenum System for Heating Medium Security Bedrooms**



Plenum ventilation (extract similar) heavy duty grille with secret fixings in ceiling with ductwork in access space above.

The second alternative for the Medium Secure area, is the provision of a convector built into the corridor wall of each bedroom. This enables maintenance to be carried out in the corridor outside but would, of course, have the disadvantage of not being placed in the best position to counteract downdraughts at the window.

FIGURE 6: **Convector Heating System for Medium Security Bedrooms**

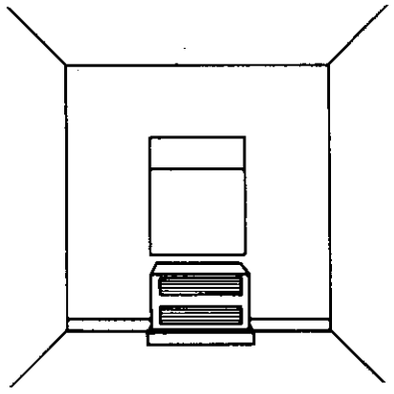


Natural convector at low level with heavy grilles built into wall. Access via locked cupboard in corridor.

For the remainder of the bedrooms, a continuous under-sill convector installation may be preferred. A finned tube flow and return pipe could be run continuously along the perimeter of the bedrooms. The pipe system could be concealed behind purpose-made heavy duty sill and fascia panels, mounted on substantial steel brackets. Alternatively, a standard sill line con-

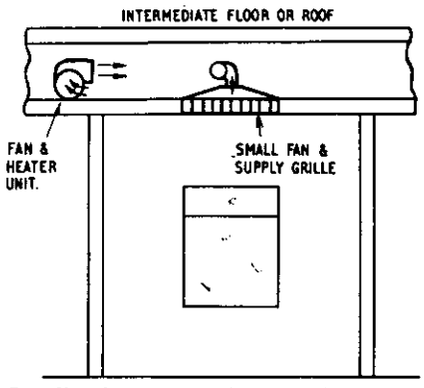
vector unit might prove acceptable and less costly, but a substantial front panel would have to be added.

FIGURE 7: **Heating for Normal Bedrooms where burning is considered a risk**



We have also considered a system combining warm air and radiant ceiling heating, offered by a particular manufacturer. The system provides fan coil units in a ceiling void, with fan units to draw the warmed air from the void into the room. The warmed air within the roof space has the effect of warming the suspended ceiling and thus creating a radiant ceiling. The system, whilst requiring further evaluation, has possibilities for such an installation and has the obvious advantage of occupying no floor space.

FIGURE 8: **Combined Warm Air/ Heated Ceiling System**

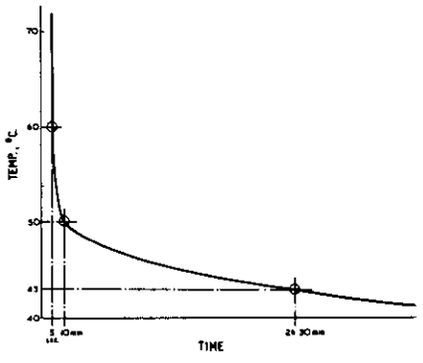


In all other areas of the Unit, a conventional hot water radiator installation would be preferred.

Domestic Hot Water Supply

The hot water service to outlets of washbasins, showers and baths used by the patients, should be at a temperature of 40°C. This follows standard practice in Hospital Psychiatric units and the June 1976 issue of *Health Service Engineering* contains an article on recent research into this subject. We have produced a diagram in order to demonstrate the critical temperatures for injury, i.e. by burning or scalding, to patients touching hot water or heated surfaces. It can be seen that the curve is an asymptote to the axes at both the hot and the cold level of the scale; it can also be seen from the curve that, at 40°C, it is impossible to burn oneself. Obviously the warmer the temperature of the water, the less the time taken to effect a serious burn.

FIGURE 9: **Time taken to cause Superficial Burns at Various Temperatures of Heaters or Water**



Ventilation

It is anticipated that, as we showed earlier in *Diagram 3*, provision of windows incorporating adequate secure opening areas would provide the necessary natural ventilation. This, of course, only applies to the Leicester solution, and mechanical ventilation may be found to be necessary depending upon the building configuration.

Hosereels

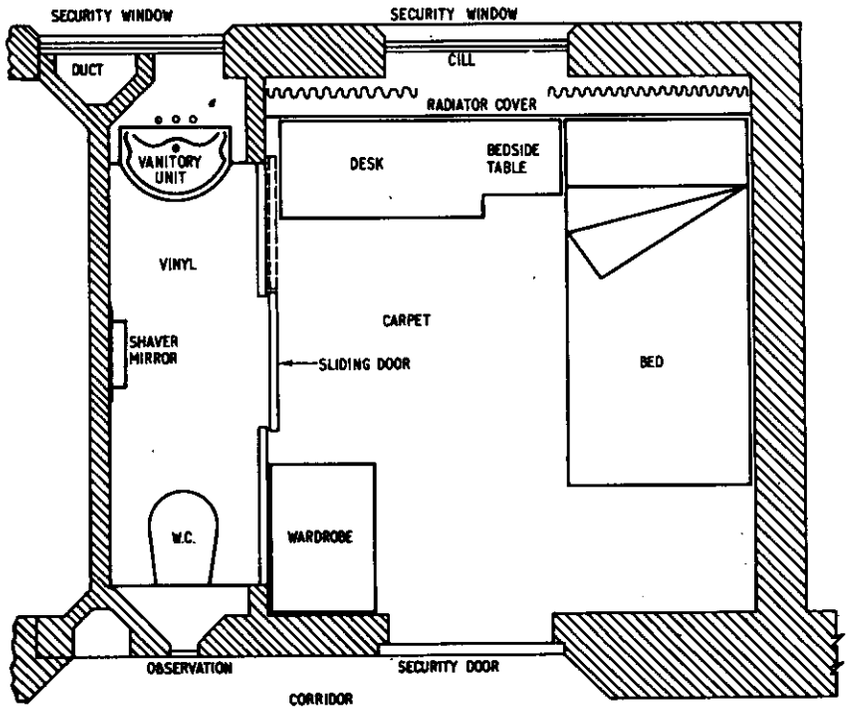
Hosereels should be provided in strategic positions, housed in lockable cupboards and all members of staff should carry a key. It is felt that the provision of this type of fire fighting appliance is preferable to chemical fire extinguishers, which may be more vulnerable to abuse by patients.

Sanitary Ware

Consideration should be given to the provision of non-breakable acrylic water closets and washbasins. If normal earthenware units are provided on the basis of lower initial capital cost, however, these should be of a manufacturer's range which can readily be replaced.

The diagram indicates an arrangement of washbasins and w.c.s to provide access to service connections via panels in corridors and outside the building. Such spaces will need to be adequate in size for rodding. The recently published Hospital Service Engineering Data Sheet No. CA5, is helpful in this direction.

FIGURE 10: **Typical Bedroom Plan with En-suite Sanitary Provision**



Internal Drainage

The design of sanitary pipework will require particular attention to enable blockages to be cleared easily. Here again it would be advantageous for this pipework to be contained in concealed services ducts accessible from corridors or outside the building to facilitate maintenance.

Electrical Services

Interior Lighting

Considerable thought has been given to the problems of selecting interior light fittings for various areas of the Unit. The Unit can be divided into two distinct areas. One comprises the administrative and treatment areas, including the communication spaces, the other comprises the patients' bedrooms. The patients' bedrooms can again be divided into two sections, the three high security rooms forming one group and the remainder of the bedrooms the second group. In the first group, the fittings should be of a type having a robust construction and a substantial polycarbonate or armoured glass diffuser. In the remainder of the patients' bedrooms there should be no marked difference in the type of lighting provided throughout the Unit. Some arrangement of either recessed fluorescent fittings or surface mounted fluorescent fittings having polycarbonate diffusers or some form of high impact resistance diffuser, would be adequate. In the communication spaces, also administrative and treatment areas, standard fluorescent fittings could be used, although again it may be advisable to have some form of high impact resistance diffuser fitted in these areas.

In the patients' bedrooms, there should be facilities for a reduced level of illumination, to provide a night light. This could either be a form of tungsten lamp incorporated in the main fitting, or may be a small fluorescent tube, perhaps thirty watts. Here it would be advisable to have a dimming arrangement so that the level of night lighting could be adjusted to enable nursing staff to observe patients in the dark hours.

Lighting Switches

Standard lighting switches can be used throughout the installation. It was thought, at one time, that perhaps the switches controlling the lighting in the patients' bedrooms should be fitted to the outside of the rooms, i.e. in the corridor, to prevent misuse by the patients. This, however, was contested by the medical advisers who considered that therapeutic advantage is gained by allowing the patient to have control over his own lighting.

It was further considered that light switches should be key operated, to keep them under the control of the nursing staff. Here, the obvious cost penalty of such a design would make this an unnecessary sophistication, and staff supervision should be enough.

Socket Outlets

When the design of the Secure Unit was first considered, it was thought the provision of socket outlets could be divided into two distinct areas: The administrative, treatment and rehabilitation area; and The bedroom accommodation.

In the first of these two sections, standard socket outlets could, of course, be provided to the normal degree; whereas in the communication spaces and the bedroom areas, there would have to be special provision for socket outlets.

Firstly, they should only be provided in the communication spaces and, under no circumstances, should socket outlets be allowed in the patients' bedrooms.

Secondly, those socket outlets that are provided in the corridor, should be key operated, so that the patients have no access to them whatsoever.

Following our initial thoughts, however, we have again discussed with the medical advisers the need for providing socket outlets in the bedrooms themselves. This is to enable the patients, whenever their condition allows, to have use of perhaps television or radio in their bedroom. It follows, therefore, that the entire Unit could have standard socket outlets provided throughout. However, in order to remove the electrical supply from socket outlets in the patients' bedrooms, when their condition demands it, provisions for isolation would have to be made.

Emergency Supplies and Emergency Lighting

One point that was impressed upon us most forcibly by nursing staff with experience of managing patients in Secure conditions, was the fear of being left in the dark with patients who may be in a disturbed condition. It follows, therefore, that adequate emergency lighting should be provided. This should be in the form of standby generation facilities with a battery operated back-up system.

In the consideration of the emergency generator, this should preferably be provided in the works area, situated outside the main perimeter of the Secure Unit and should be of such a size as to cover the entire load of the Unit. It obviously should be an automatic start machine, but there would be no need for any sophisticated no-break system.

To ensure lighting after a power failure, battery operated lighting should be provided everywhere but in the patients' bedrooms.

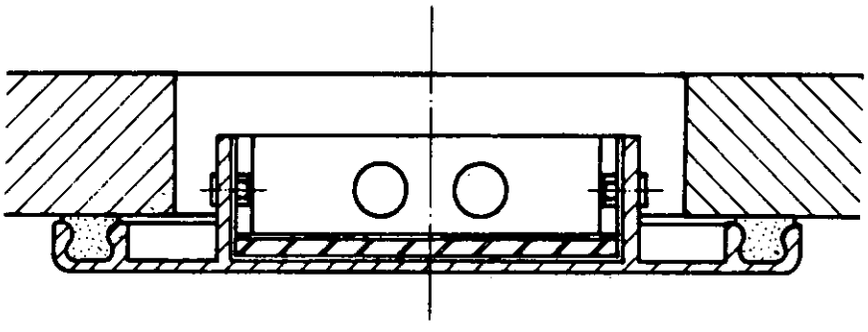
The batteries should be capable of covering a period of, say, two hours, should the generator fail to start.

In view of the high maintenance time associated with units having integral batteries, it would be advisable that all the battery lighting be covered from one central battery supply, which could be situated in some non-patient section of the Secure Unit.

Isolation of Electrical Supplies from Bedrooms

As stated above, it is advisable that there is no environmental difference

FIGURE 11: **Possible Arrangement of Flush Mounted Fluorescent Module**



between bedrooms, except the three high secure rooms.

We have already considered that socket outlets, lighting switches, etc., should be placed in the bedroom for the patient's use but, of course, particularly in the assessment wing, there may be instances where the patient is in no condition to use such services.

It follows, therefore, that some method of isolating the socket outlets should be provided. This can easily be done by providing a small miniature circuit breaker board, or other form of isolation for each bedroom, mounted into the maintenance access panels in the corridors.

Internal Communication and Alarm Systems

The Unit would obviously require adequate provision of telephones and, in general, these should be placed to avoid misuse by the patients. It may be that in the areas used by the patients they should be mounted in locked cupboards, although some argument against this could be put forward by our medical advisers. In places where telephones cannot be kept away from the patients, however, this solution would seem to be an acceptable one.

A public telephone should be placed in the patient area, perhaps in the Day room, or adjacent to the Day room, in order that the patients may make use of this facility. Here again, however, one would have to restrict the use of this telephone to certain patients. It has been suggested that, if a patient were in the unit because he was prone to making obscene telephone calls, it would not be reasonable for the engineer to provide him with the wherewithal to continue his hobby whilst in the Unit!

With regard to the provision of a staff-to-staff call system, a great deal of thought has been put into this, both by ourselves and by various manufacturers. In a Unit of this sort there must obviously be the facility for a staff-to-staff communication system in cases of emergency. This can either be done by the simple method of providing enough staff to enable voice contact to be made at all times and, preferably, for visual contact too, or one has to provide some built-in system of internal communication. It must of course be a system which is not open to abuse by the patient, but which can easily and quickly be activated by a member of the staff in emergency.

We have considered the use of push-buttons placed at strategic points about the Unit, but this is obviously open to abuse. Alternatively, the push-buttons could be replaced by key-operated switches. The main disadvantage with this system is that a member of staff may be under pressure from a violent patient, when it would not be an easy matter to insert a key into the lock to initiate the alarm.

With this in mind, we have spoken to manufacturers to seek their solution to the problem. One suggestion is to employ a system which has a series of ultra-sonic detectors, positioned in the ceiling, with each member of the staff carrying an ultrasonic generator secured to his or her belt or person. The generator would be activated by the removal of a pin. It then generates an ultrasonic signal transmitted back to the main control area, thus giving the alarm. The advantage of this system is that it can be coupled to a standard staff location system. The initiation of the alarm would not only show on the main control point, but at the same time would issue a series of bleeps to a particular code. All carriers of receivers in the area in which the alarm originated would be alerted.

Finally, there would also be a need to have a patient-to-staff call system, from the patients' bedrooms. Having said this, it is obvious that the system will be open to abuse by the more disruptive patient, and provision should be made to lock out sections of the call system, if abuse takes place.

The need for the system, however, is particularly obvious if the operational policy calls for toilets which are not integral with the single rooms and a locked door policy was in operation. Under this condition the patients would have to draw the staff's attention to the fact that they wish to make use of the toilet facilities, particularly during the night.

Consideration has also been given to the provision of an escape alarm to be mounted on the doors or windows of the Unit. This was thought to be unnecessary in the Leicester situation, as a perimeter fence was to be used, and particularly if movement detector systems were employed along the perimeter.

Fire Alarms

This certainly represents an important part of the installation. The necessity is obvious, in that patients may be of the type who are given to starting a fire in order to arouse attention, or create a diversion from other activities.

This particularly applies to some form of detectors in the single bedrooms, which one would imagine would be the only area where a patient could be left unattended by staff for a long period.

A problem arises, however, in that the mounting of standard heat or smoke detectors on the ceiling of these bedrooms, would leave them very vulnerable to malicious damage.

With this in mind, we have considered a number of systems and have investigated the use of the system developed by the Ministry of Defence known as "Stamp" which, to give it its full name, is a Single Tube Automatic Multi Point System, an entirely new concept in fire protection devices. It comprises a main unit which is connected to the protected areas where there are single small bore pipes. During normal operation, small samples of air are continuously drawn from each sensing point into the main unit, where they are examined for the presence of smoke. This system has not yet been fully tested, to see if it is commercially viable, but it has obvious advantages, in that no surface mounted detector is required. The only protrusion beyond the ceiling would be the end of a small bore pipe.

Such a system would only need to be employed in the bedrooms. In other communications spaces and areas where patients are under surveillance by staff, a standard heat detector system would suffice.

In addition to the detector system, provision should also be made for a break-glass or, perhaps, more suitably a key-operated system to be an integral part of the whole system, so that the alarm can be raised by staff in the event of them discovering a hitherto undetected fire.

Discussions have been held with Fire Prevention Officers, to obtain their views on what they would expect in accommodation of this type and, apart from the provision of an acceptable fire detector alarm system, they have suggested that this type of accommodation should have fire doors spaced at no more than forty feet in all corridors.

This causes some problems in that where constant surveillance along the corridors, particularly in the dark hours, is required, the fire doors

would have to be kept open, thus requiring these doors to have magnetic catches.

The fire detection system should be arranged in such a manner that it is zoned, and that only the doors in that zone in which the fire was detected would need to be closed under the alarm condition. This would leave the remaining doors in such a position as to facilitate the easy evacuation of staff into the grounds, or some other safe part of the building, in the event of a fire.

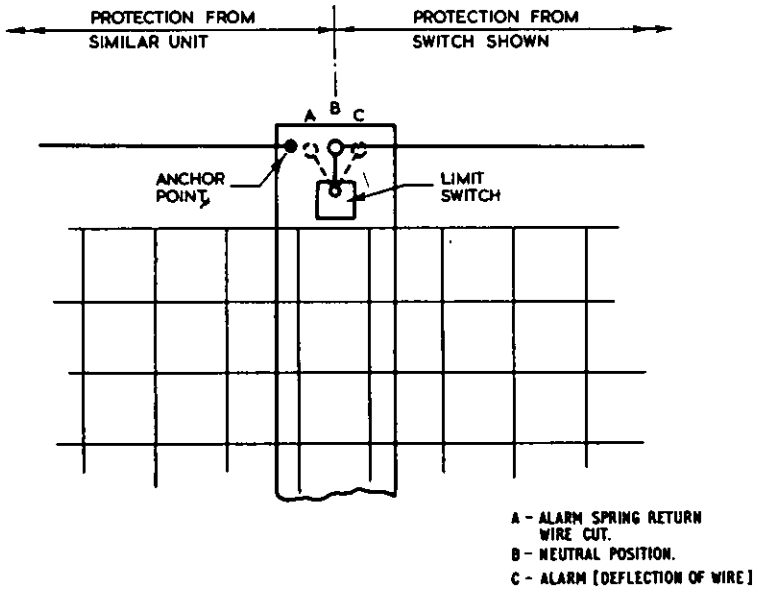
The Perimeter

It is felt that the perimeter could be illuminated when required, although it would be advisable that the installation were as unobtrusive as possible. It may be thought desirable to have some system to detect an attempt to scale the perimeter fence and, on detection, to switch the lighting on. We have considered various methods of achieving this and have come up with the following solutions:

a) The fence would have a detection wire running horizontally round the top of the fence posts. This wire could be used in conjunction with the standard industrial limit switch to detect either the wire being deflected by the fence being climbed, or the wire being cut. *Figure 12* shows this simple arrangement.

b) On the market there is a system of providing an invisible microwave fence, which comprises transmitters and receivers mounted up to eighty metres apart. These produce an invisible wall of energy which can be trimmed in sensitivity to detect a human body passing through it. The sensitivity can be arranged to ignore the breaching of this barrier by birds, or small animals such as cats. The detectors are entirely weatherproof and may be mounted outside without damage. Obviously it is very easy to design a very secure system comprising movement detection on the perimeter fence, coupled with flood lighting, or some other form of perimeter lighting, even to the extent of closed circuit television cameras, but apart from the high cost of providing such a system, it is perhaps not an advisable solution. It would be very difficult to make a system unobtrusive and the net result would give the impression of a high security penal establishment.

FIGURE 12: **Fence Alarm System using Standard Limit Switch**

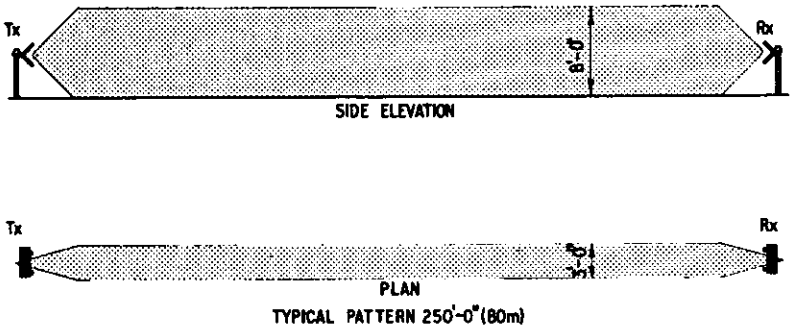


Perimeter Lighting

Whilst, as already indicated, some perimeter lighting would be desirable around a secure Unit, the choice of lighting fittings gives one a lot of scope. At Rampton Special Hospital, the lighting of the perimeter was achieved by mounting floodlights on fairly short poles, about 12 feet high. Whilst this would obviously provide lighting of very high intensity, it may be more considerate to make the design more unobtrusive, using street lighting columns carefully chosen to provide a decorative feature.

The only area which may require high intensity of lighting, would be the entrance at the front of the building, where flood lighting would give the necessary level of illumination to assist in the movement of the patients in and out of the Unit.

FIGURE 13: **Features of the Microwave Fence**



Conclusions

It was stressed earlier in the paper, that the engineering solution should be directly related to the management pattern and nursing philosophy of the Unit, and that over-sophistication of security systems should be avoided. These, I feel, are important factors to be borne in mind by the design engineers. With the expertise and the equipment available, anything can be designed into these Units but, obviously the higher the degree of sophistication, and the more variance in the standard of installations, the higher the cost penalty.

Acknowledgements

TO: Mr. M. J. Evans CEng MIMechE, and Mr. R. S. Heslam CEng, MIMechE, Principal Assistant Engineers at the Trent Regional Health Authority, for their help in the necessary research for the compilation of this paper.

Mr. Ingham is Regional Architect, South West Thames Regional Health Authority.

The Design of Security Units

Architectural Considerations

JOHN INGHAM FRIBA

There are two things, more than any others, which distinguish this problem from probably any other we have had to face in the health service. One is the aspect of security, and the second is to sift the emotion from the fact, to distinguish between emotive and factual opinion and opposition.

The problem was well summed up in a recent editorial in the Hospital and Health Services Review: *A unit like this is not a response to public demand (although indirectly we can perhaps argue that it is a response to public need), it doesn't provide a local service (except insofar as a small handful of local patients may be concerned), and brings no prestige to the community. How do you sell it? Or solve it?*

One interesting aspect is that ever since the concept was launched by DHSS, under a banner labelled "Regional Security Units", working groups up and down the country have been trying to find alternative names for it, not with any intent, I think, of concealing its purpose, but merely to try and ensure that it isn't clouded with too many emotional overtones from the start — ones which may be unhelpful in terms of helping the units to do their job.

Special Supervisory Service; Regional Forensic Psychiatric Hospital; Intensive Care Unit; Regional Psychiatric Special Care Unit — we probably recognise one of our own ideas here!

What I will try to do is to identify the main aspects of the problem which have design implications, and talk about them.

I would like to do this under four main heads: —

1. Understanding the problem;
2. The site;
3. Security: What is required, and how do we achieve it?;
4. Planning and design.

The Problem

Firstly, understanding the problem. It is a pity that too much emphasis and opposition has polarised on "the unit" itself, without this being seen for what it is. It is the hospital component in a total service, and a link, albeit perhaps the major one in building terms, in a chain of total care.

We are talking about a service, rather than about bricks and mortar, but part of that service will have a building requirement. I think it is universally accepted also that the need for, and the value and success of any regional unit, will be directly related to the accompanying services available to us, and that without understanding, good staff/patient relationships, out-patient and social services, and community support, we are wasting our time.

Having said that, there seems to be an agreed need for what we might call the hospital component in the system, the half-way house if you like, giving the regional base for this special service, something which will provide facilities for assessment, diagnosis, treatment, rehabilitation and research, all in a protective setting.

It is probably inevitable and healthy with a requirement for pilot units that different proposals will emerge from different regions, but the terms of reference are fairly well spelled out in the guidance documents, and there does appear to be a common denominator of a kind developing in the proposals now put forward by several regions — a unit to take something like sixty or so in-patients. Some regions may be attempting to diversify more, but I would like to concentrate on a sixty-patient module. I would like to stop to consider the question of size and scale — what it is we are talking about and have to provide for. I've had to remind myself quite often, in listening to many of the arguments, that what we are talking about is a comparatively small unit, providing treatment and rehabilitation in a sheltered environment, something like the smallest size of acute mental illness unit (sixty in-patient beds, treatment suite, day hospital, and ancillaries). Alternatively, it is the equivalent of two of our old villas for mentally-handicapped patients, if we were still building them, plus a few extras. Sometimes I've had to remind myself that we are not providing, or faced with, a mini-Broadmoor for the criminally insane, a top-security complex with the latest in computerised protection, probably with searchlights, possibly with helicopters overhead, certainly with unscaleable walls and electrified fences, all approached by a long road up which there is a never-ending stream of ambulances, police convoys, and supply vehicles, and with a ghost town of empty houses and emptied schools roundabout. I don't want to denigrate or minimise the problem but can we

just agree that what we are talking about is providing a service for a small group of particularly disadvantaged, and, if you like difficult patients, a self-contained community in many respects, but leaning with advantages on any other health or central services already on site. It can be a relatively modest, probably single and two-storey development on a bit of land of its own, normal-looking so far as possible inside and out, and of a domestic rather than an institutional character. If I was asked to use one word to describe what we should be aspiring to in terms of buildings I would say they should be unprovocative.

One last thought in terms of understanding the problem. Any building is only as good as its brief, any successful design has to be founded on a complete and proper understanding of the problem. If you want to get the best out of your designers in terms both of understanding the need, and coming up with the most hopeful building framework for this service I suggest you involve them as early as possible. What the designers need to know are the activities, the philosophy, the people, the equipment behind a requirement, not just to be given cold room schedules and asked to get on with it.

The Site

Perhaps I can just run through some of the points of opposition that have been met with in one or two schemes, as these may be helpful to those of you just facing up to the problem. As I have already said, the problem is to separate the emotional from the factual, but we have to be careful that, in necessarily taking the wider-based view, we do not just dismiss local opinion as being too subjective.

This is a difficult and emotive problem. It is not a service any community is going to welcome, and there is probably no site in the country where it is possible to reconcile the proper service aspects of the requirement with community acceptance. Most people and groups will agree the need for the service, and advance every reason for it being somewhere else. You will be told there are far better sites, and will find a willingness to tell you where and in which other community it should be. Under those circumstances it is difficult for local opinion to see that what are being considered from a regional service point of view, are not just the disadvantages of a particular site, but its advantages, and the greater disadvantages of other sites by comparison.

The second problem is one of security, and beyond a certain stage I suggest that physical security measures are counter-productive, will cause anxiety, and be a challenge to absconders. The challenge for us is to strike the right balance between reassuring or provoking the community, the staff, and the patient.

Thirdly, and if as is likely, we are talking about adding the unit to an existing hospital situation, strong concern may well be met about the effect it will have on the special therapeutic environment which that hospital enjoys, and on the special staff/patient relationships there are there, and on the relationships with the local community, the shops, voluntary workers, and so forth.

There will be fears for children, whether they are patients or those of staff and other members of the public, and concern about the value of residential property in the district.

There will be staff concern too about the affect of change, about the "lead", and over a possible loss of amenity.

There could be a feeling that a particular area already has its share of problem services.

And you will, of course, and in addition, have to consult with the planning authority.

Well, having looked at something of the case against, can we now look at some of the possibilities.

In some regions there may be existing accommodation available, theoretically capable of adaptation. In the present climate this obviously has to be very closely looked at, and perhaps with AHAs currently having to trim their sails and to consider closing certain hospitals, one or two opportunities will emerge for this type of approach. For the main unit we are talking about, however, this will probably be the exception rather than the rule. Our existing mental illness and mental handicap hospitals mainly comprise old, inadequate buildings which so far as possible have been upgraded in recent years by increasing bed centres and improving accommodation standards and the environment generally. This means that the better, existing buildings are being utilised to house a smaller patient population, and that anything remotely "available", pending any future phasing-out on a larger scale, is almost certainly the worst part of that particular hospital. If an existing building were available, to convert it to the special and sensitive requirements of the unit, with its emphasis on rehabilitation, single rooms, security, and safety, would probably be both costly, in relation to the DHSS guidelines for economic investment in old buildings, and difficult.

Let us, then, concentrate on the idea of a new building, though many of the detailed requirements will be the same for an existing one.

I suggest that there are obvious and very considerable advantages in putting the unit on an existing hospital site, and preferably one of a comprehensive nature (one having or aspiring to a DGH, acute mental illness unit, and mental handicap beds).

There it can operate, be staffed, and, most important perhaps, be seen and identified as part of a total health service, and not be isolated and possibly stigmatised in the way which a separate location might encourage — out of sight and out of mind. In that way there could be maximum cross-fertilisation and involvement of staff at all levels. The opportunity will exist for the unit to depend to the maximum on many important supporting services, on the boiler house and works dept., on the laundry, on the catering services, administration, records, supplies, and possibly many more besides. If the general hospital is on site as well, then advantage can also be taken of things like the pharmacy, X-ray, pathology, physiotherapy, and out-patients departments, with considerable benefit to escort duties and to staff/patient ratios generally.

If we have this comprehensive service on site, then not only can we siphon off parts of the requirement, with considerable cost benefits, but a better and more integrated service will result. Even so, and because of the particular nature of the problem, we are still left with our small community, sixty or so in-patients, and all the activities necessary to support them.

We could then come down the scale, through a solution based on an existing mental illness or mental handicap site, to what I consider the least acceptable siting solution, a separate unit on a separate site.

Wherever the site is, however, whether in a new building or an

existing one, certain selection criteria need to be met. Regions seem to be in fairly general agreement regarding these:

a. Location in the region, geographically, and in relation to other health and social service facilities, the courts, the prisons, and to any teaching facility;

b. Adequate suitable land which can be utilised without loss of amenity (probably something like five or six acres);

c. The ability to provide unobtrusive perimeter security;

d. Good rail and road communications;

f. The ability to acquire or provide adequate residential accommodation for staff;

g. Staff availability, accepting that there is probably a national problem in terms of these units and that everyone is going to be competing for experienced, scarce staff at the same time;

h. Local amenities;

i. Community aspects and attitudes — probably the most difficult to predict and assess objectively;

j. Cost.

Security

Security is something which seems to mean many different things to different people. At one end of the spectrum we have the theory that security is all and only about people, forming effective relationships, staff/patient ratios, and management. At the other extreme it is seen as something much more physical: walls, fences, compartmentation and locks.

The solution is almost certainly somewhere in the middle. Can we remind ourselves, again, that we are talking neither about an alternative to special hospitals and prisons, nor about the level of security which these require. We are talking about a building environment which will provide shelter for the assessment, treatment, and rehabilitation of patients — a secure environment, yes, but one in which the security is not essentially a custodial one but a safety umbrella, under which patients, hopefully, can be rehabilitated towards a more normal way of life. An umbrella under which staff can undertake and concentrate on their work, without having to worry too much whether anyone has walked out, and outside which the local community can be reasonably reassured. An approach based on staff/patient relationships, on adequate supervision, and on sensible design, each assisting each other.

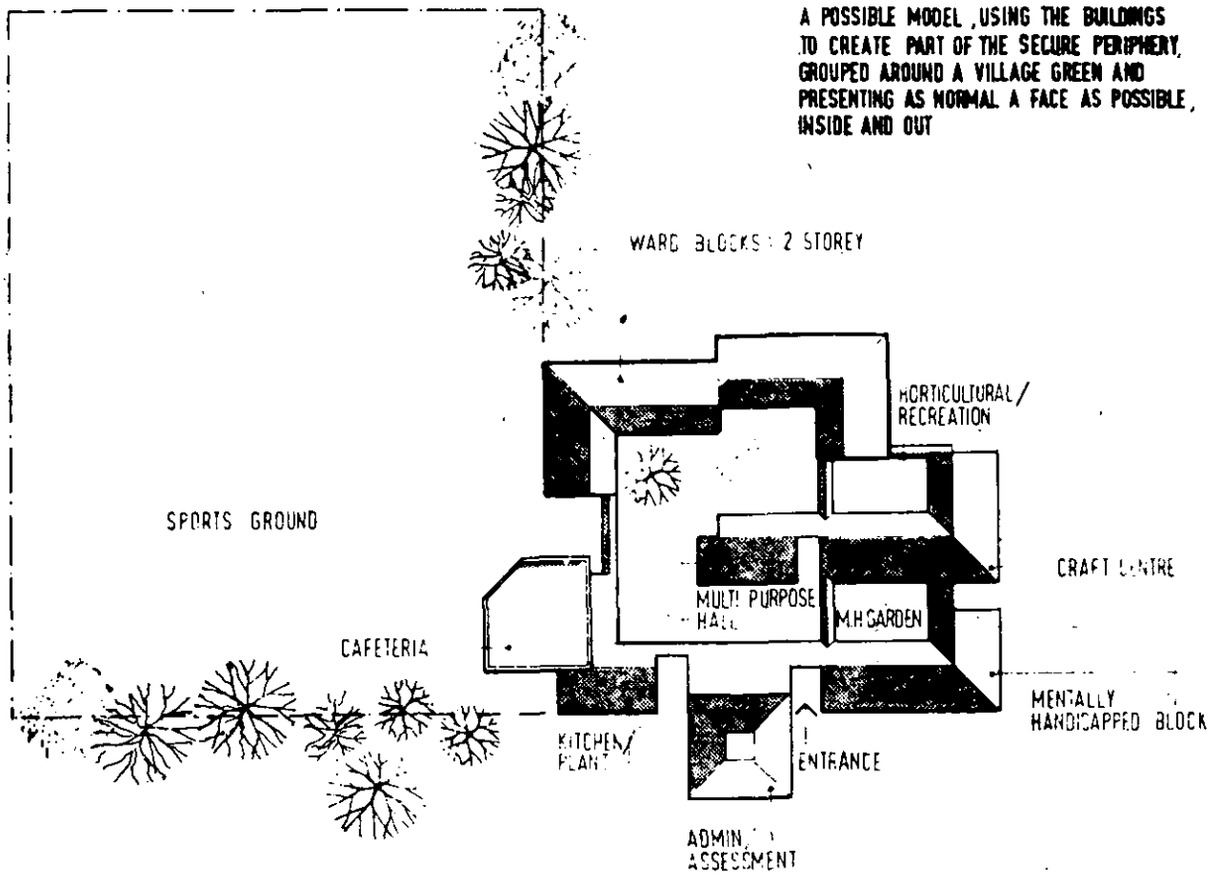
Is there such a thing as graded security? I find this a difficult question, and if we are not careful I think we could fall into the trap of providing so many separate and graded parts that we make the whole thing very inflexible.

I think there are two degrees of security which the planning should allow for. One of the questions often posed is: If you are not taking the potentially dangerous patient — the psychopath, the determined absconder, the highly disruptive — and yet you are taking people referred for assessment, how can you be sure you haven't got one of these until you've assessed him (or her).

I do think, therefore, that there must be one localised and self-contained area within the total unit which affords a higher level of security than the rest — the assessment unit.

I also think that the total design of the unit should have careful regard

FIGURE 1.



to reasonable security throughout — by its layout and by its detailed design. If you have the facility for discreet, localised security you can always, and consciously, relax it. It is much more difficult, and expensive, to put it in afterwards.

A reasonably secure periphery then, probably fencing rather than walling, or a mixture of the two, and possibly using the building itself, a normal looking building, as part of that periphery, and keeping what is obviously fencing or screen walling to situations where it is not abnormal or unusual to have it — the outdoor recreation areas and games areas. If your site is a natural field or other enclosure or about the right size, so much the better, because then there is probably a very good chance to keep the inward and outward appearance unprovocative, using the existing boundaries as a natural screen.

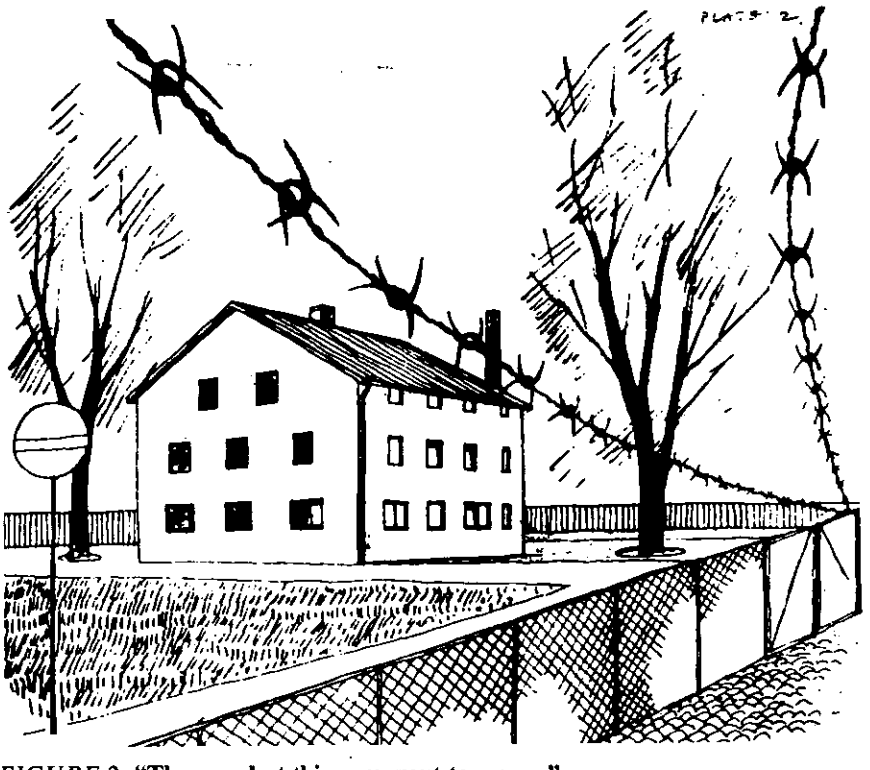


FIGURE 2: **"The very last thing we want to see . . .".**

The last thing we want to see is the very obvious institutional building inside a high wire fence with lots of people walking aimlessly about inside. How can we make it easy for ourselves, and the staff, and yet as near normal as possible? Can we look at detailed security possibilities a little more closely: many of the items are fairly obvious: —

1. A high staff ratio and a high degree of staff skill and involvement;
2. A reasonably secure total periphery to the unit, possibly part building, part wall, part fence, unprovocative, as normal looking as possible, and essentially a discreet delaying mechanism;
3. The layout, by its general arrangement and design. If you do use the building as part of the periphery try and keep that part of the building for the staff zone, limit your windows as much as possible and have them either fixed or restricted opening. Plan individual blocks so that the staff zone controls the entrance and gives maximum oversight. The problem here will be to reconcile good oversight and supervision, the maximum staff/patient contact visually and aurally, with a degree of privacy for the patient;
4. No vehicles to enter the secure periphery, except in emergency;
5. Have only one entrance/exit to the total unit, for everyone and everything, staff, patients, visitors, supplies, staff-controlled 24 hours a day, and possibly with the control point in an intermediate lobby, with controlled doors both sides;
6. Every person (staff, patient, visitor) to be booked in and out (even the consultants!). No keys to leave the building;
7. Have certain zones and most rooms lockable even if they aren't necessarily or habitually kept locked except in times of low staffing. Internal doors to bedrooms and similar patient zones to have observation panels, w.c. and similar doors to open outward. But generally people able to move fairly freely about inside the unit, without a constant locking and unlocking of doors, but with the facility to contain part of the accommodation if necessary;
8. Means of escape in case of fire or other emergency to be into the courtyard or external spaces of the building, that is, within the secure periphery;
9. Windows to be normal looking (not barred) and, fixed or restricted-opening where necessary, polycarbonate plastic glass in the secure zone and toughened or laminated glass elsewhere. It might be necessary to consider metal frames rather than wood. If you have to have the window frames and sashes sub-divided I suggest it is done horizontally rather than vertically — it isn't quite so reminiscent of prison bars;
10. Don't make it easy for any unauthorised person to get up into roof spaces or into service ducts;
11. Consider the possibilities of self-inflicted or other injury by attention to detailed design and choice of furniture. There is a conflicting view about loose or fitted furniture. If it's fitted someone can harm themselves on it — if it's loose you can clear the room, in an emergency. It's probably a good idea to have a bit of each, but keep it normal-looking;
12. Services will be dealt with in the paper on Engineering Considerations, but I don't want my normal building covered with electronic devices, flooded with light, or with everything controlled by staff. I do think that normal room switching should be within the patients' control, with the capability of being over-ridden by staff;
13. Other aspects of construction: primarily this will be living accommodation for people and should look like it. Cavity brick or block walls; solid concrete block internal partitions; pitched or mono-pitched roofs (the Home Office will tell you if you use tiles on the roof, don't make them heavy ones — they hurt too much if someone gets on the roof and throws them down);

A reasonably tough ceiling to patients' living quarters; and, where possible, self-finished, maintenance-free finishes. There is one problem

with loose equipment, which perhaps someone else will answer — can we look to the use of normal cutlery, glass, and tools in patients' areas, or is there any risk here?

14. Externally we do want attractive, usable spaces inside the grounds. Perhaps you keep big trees away from the fence and concentrate your planting on low-level ground-cover — this will give visual security within, and low maintenance — otherwise it can be fairly normal, as I hope the outside lighting will be;

15. One last point on security: it is possibly worthwhile to have one designated security officer for the unit, leaving other staff free to concentrate on more normal aspects of their work.

Planning and Design

I will conclude by covering one or two other aspects of general design.

This is a new and untried requirement and it is very important that the design is not too rigid and inflexible. It must not be geared to or dictate, just one pattern of use, but should, if necessary, permit future changes of policy without too much disruption. It must be subordinate to, and supportive of, the service which will be provided there.

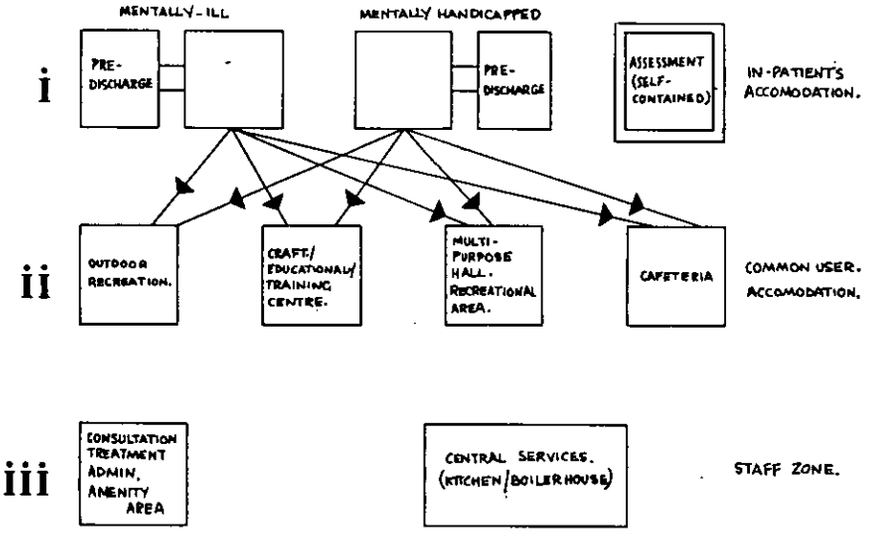
It should be kept relatively simple in concept, a building envelope and environment which will, hopefully, do its job and not put too many constraints on the users: and yet, if we are not careful we could decide there are so many categories of requirement — of handicap, of behaviour, of age, of sex, of security, of treatment stage, that we end up with a unit so sub-divided that almost every room or area has only one very specific use.

To accommodate these many categories I suggest that any sub-division must be in broad and flexible terms. To look at this more closely: we have men and women, and some younger people; an age-band running from, say, 17 to something like the late forties; we have the mentally ill and the mentally handicapped (though not the severely mentally handicapped). All of these categories will pass through successive stages of assessment, treatment, and rehabilitation, requiring different programmes, and, theoretically, requiring different levels of security. If you break sixty patients down into these many categories you end up with very small specialised sub-groups, and although the best way of dealing with patient situations of this kind may be in small groups I don't think it is a sub-division which can be entirely mirrored by the buildings. Probably the staff wouldn't want it to. The group system should be an organisational matter, using available space to best advantage, and not a function of the building design.

If we attempt a breakdown in terms of numbers I suppose we could have something like 10 out of the 60 in the assessment wing, 10-15 mentally handicapped, and a ratio of something like four men to one woman throughout. Of the 60, possibly 10 again might be at the pre-discharge stage. So the accommodation has to be looked at in another but complementary way.

I have already touched on the two fundamental sub-divisions in terms of security: the securer assessment unit, and the rest of the unit.

FIGURE 3.



The assessment unit I would see as a self-contained wing within the total scheme, probably containing residential accommodation in single rooms for a small number of patients; common spaces for daytime use, meals, and occupational activities; and a staff zone which would include consulting/examination rooms, a treatment area, and rooms for individual and group therapy.

The main part of the unit would probably comprise separate, or possibly linked, residential blocks or houses for the mentally ill and the mentally handicapped, each relatively self-contained. Possibly they would be sub-divided again for men and women, and in terms of treatment stage, with some self-help accommodation for those at pre-discharge stage. The bedroom accommodation in these houses is probably best as a mixture of four-bedded rooms and singles, some of which could have integral toilet areas.

I see three other main parts to the unit. Firstly, common user areas, the cafeteria, multi-purpose hall and games area, and the craft centre (occupational, rehabilitative, recreational, training, and educational facilities, including a library), much of which might be used on a programmed basis rather like a school; secondly, staff facilities and visitors' rooms; and thirdly, common services (kitchen/servery, plant rooms, etc.). On a separate site this last section would probably be more extensive and more costly.

Certain parts, then, allocated to and built for, specific requirements — assessment, the mentally ill, the mentally handicapped — and the rest, shared accommodation. The whole can possibly be arranged, not as a single building within a secure fence, but as a small community grouping with separate or linked blocks, with different buildings for different activities, providing as near normal living and working conditions as possible. I do not see a single building, all activities together, everything approached internally, as providing normal living conditions or the right environment for rehabilitation.

Specific proposals from several regions are now with the DHSS, and, hopefully, will be allowed to proceed, to point the way for the service which is so obviously required.

The injection of steam is increasingly being recognised as a most effective way of raising the humidity of air in ventilation systems. The equipment used is relatively simple, and easily installed. Because control valve and steam traps are outside the air duct they are easily maintained.

Great care is taken in the sizing of the Humidifiers to meet the design loading but often they are installed in convenient rather than suitable positions. This article gives the factors that should be taken into consideration.

Mr. Hayes is a Technical Engineer with Spirax-Sarco Ltd.

Humidification by Steam

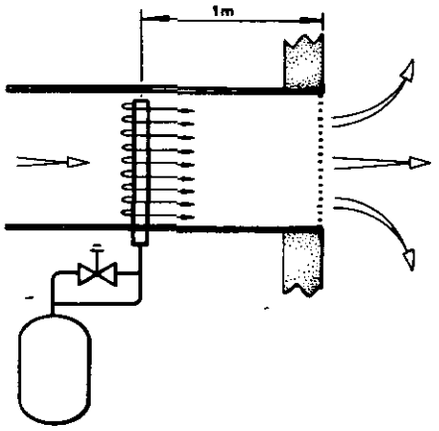
A Few Practical Considerations

P. J. HAYES

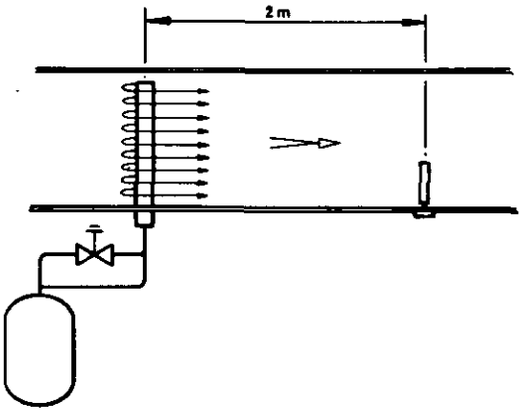
Trouble-free steam humidification requires efficient mixing of the steam with the air, with no precipitation of condensate within the duct. This "wetting out" is a common phenomenon and occurs when a saturated steam impinges on cooler obstacles in its path and condensate is precipitated. Every effort is made to remove any moisture in suspension in the steam, by passing it through a separator prior to its being injected into the air stream. With efficient Humidifiers, this effectively prevents carry-over of moisture with the steam, but it is imperative that the steam mixes completely with the air before meeting any obstruction within the duct.

Often insufficient free duct area downstream of the Humidifier is allowed, and the steam is incompletely absorbed into the air before impinging on bends, turning vanes, batteries, filters or fans which are positioned

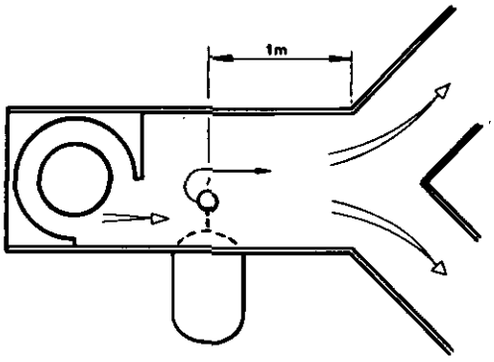
FIGURE 1: Location of Humidifiers in Air Handling Systems.



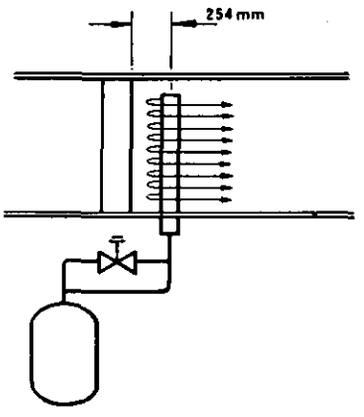
Manifold should be located upstream as far as possible from discharge grille, elbows and division points.



Allow at least 2 m between temperature controller sensing element and humidifier manifold.



When installing manifold in package air handling units, where possible locate manifold downstream of fan and where the air flow is most active.



It is recommended that the manifold be installed at least 254 mm downstream from the heat coils.

too close to the Humidifiers. These all present ideal surfaces on which the unabsorbed steam can wet out. As a general rule a minimum distance of one metre (39 in.) should be allowed before any obstruction. If this distance cannot be achieved, then consideration must be given to using more than one steam manifold. This will improve the dispersal of the steam into the air and assist absorption.

The temperature and velocity of the air at the Humidifier, and the cross-sectional area of the duct are further factors governing absorption of the steam into the air. Combinations of these could dictate that more than one manifold should be used to ensure the effective dispersal of the steam to aid absorption. If the temperature of the air is too low, then not only is absorption of the steam impaired, but some of the steam could condense into water droplets, which would be held in the air until such time as they collected on the duct walls, or on obstacles in the path of the air. As a general rule air at the Humidifier should have a dry bulb temperature in excess of 15°C (60°F).

If the velocity of the air is too high — in excess of 5 m/s (1,000 ft/min) then a much longer length of clear duct after the Humidifier will be required to complete the absorption of the steam. The cross-sectional area of the duct in which humidification is to take place will affect the length and number of manifolds to be used. The greater the area, the greater the need to spread the discharge of steam to promote speedy and even absorption. If there are any doubts the manufacturer's advice should be sought.

Incorrect steam pressures serving Humidifiers can lead to poor control and even to malfunction of the Humidifier. Although most steam Humidifiers can operate on steam pressures up to 400 kPa (60 psig), pressures above this could cause abnormally high velocities and of course, exceed the maximum differential pressures against which the control valves can operate.

It is recommended that a steam pressure of 140 kPa (20 psig) should be used, as at this pressure the noise of injection is minimal and the control of steam flow very good. When pressure reduction is required the pressure reducing valve serving the Humidifiers should be sized to pass the humidification load plus 15%..

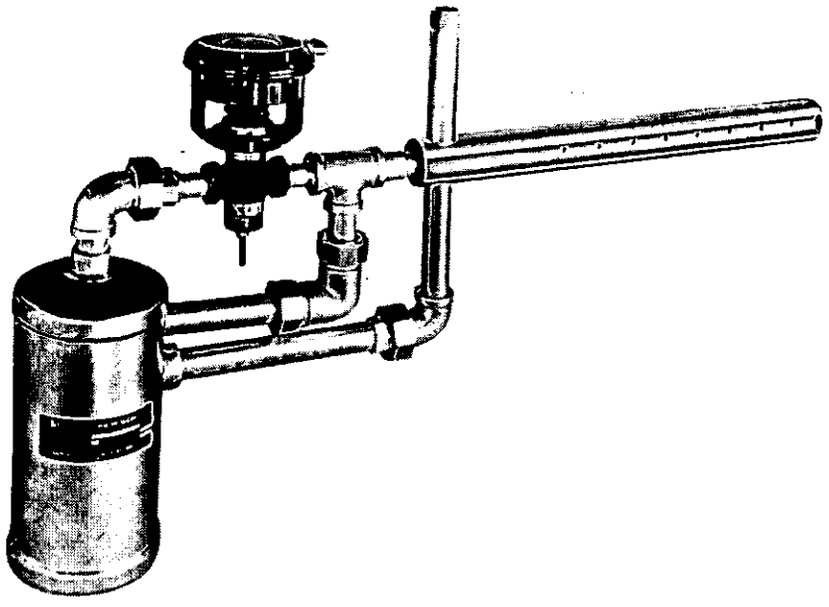


FIGURE 2: Multi-Manifold Installations.

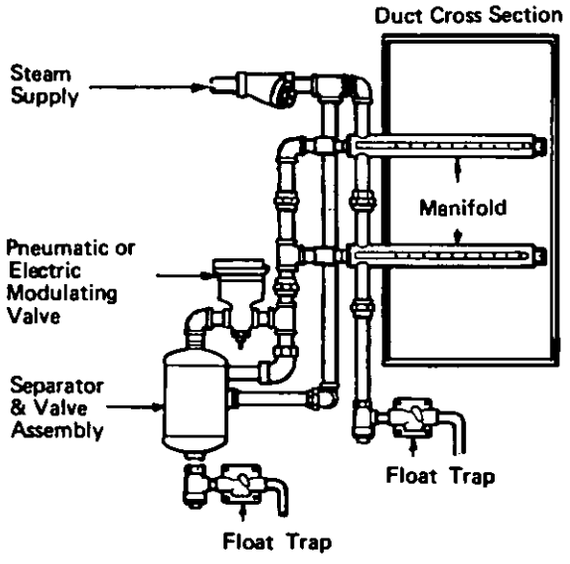
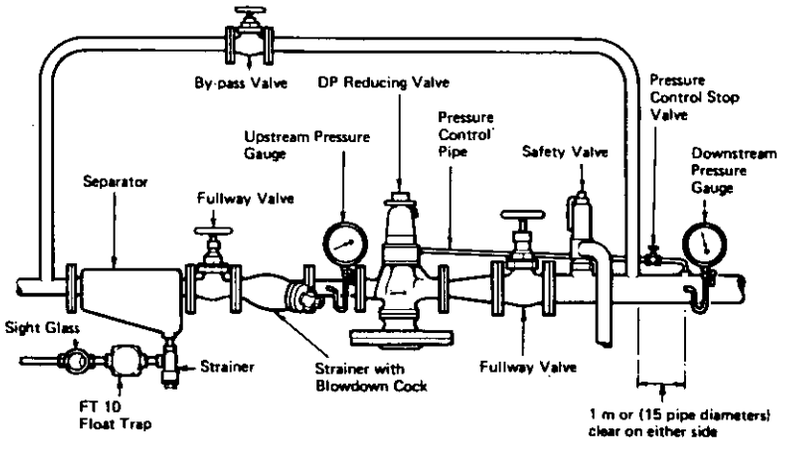


FIGURE 3: Typical Pressure Reducing Valve Station supplying steam to Humidifier.



The extra 15% is necessary to cater for the losses in the pre-heated manifold.

It is important that the injected steam be as dry as possible, and to this end the separator of the Humidifier should be kept free of condensate. This is best achieved by use of a mechanical float and thermostatic trap discharging into a vented receiver, or into a non-pressurised condensate main. In this way condensate within the separator will be cleared as quickly as it is formed, and its efficiency greatly enhanced. Avoid all unnecessary lifts after the steam trap, and make sure that any back pressure exerted is not in excess of the supply pressure.

A lightweight steam Humidifier is a very versatile unit. Because it takes up so little space, there is no need to confine it to the Plant Room. There are situations, such as may occur in Burns Units, where boost humidification to give varying relative humidity levels in individual Wards is required. In such situations individual units can easily be installed in the branch ducts above the corridor ceilings, and controlled from the room humidistats to give the required humidity conditions. The separator and associated pipework should be insulated to reduce heat gains/losses. Always allow at least one metre (39 in.) of clear duct between the Humidifier and the duct outlet, to ensure that the steam mixes with the air in the duct — and not in the conditioned space.

These practical considerations may appear obvious but the very simplicity of installation of the Humidifier often leads to them being overlooked. Correctly installed the steam injection Humidifier will give many years of trouble-free efficient humidification.

Mr. Moore is Marketing Manager, Crompton Electricars Limited.

Crompton are a subsidiary company of the Hawker Siddeley Group, and have been the largest producers of battery electric road vehicles in the world for many years. Their ambulance, utility and other road vehicles have, under the previous brand name Morrison, been the widest used vehicle of this type in U.K. hospitals. In addition Crompton Electricars supplies a range of tow tractors, platform trucks and trailers which were formerly known as Brush and Brook Victor but are both now produced under the "Crompton Electricars" name.

Hospital Electric Vehicles

R. A. J. MOORE

The basic advantages of electric vehicles whether they are employed for carrying patients and staff, for moving essential stores or for carrying out maintenance jobs, are thoroughly consistent with the need of providing essential hospital services with the absolute minimum disturbance to the hospital environment.

The use of electrics has long been recognised as the best solution to the provision of transport services within the precincts of hospitals, because of the freedom from noise both in starting and in operation in close proximity to hospital buildings. Starting efficiency is a major consideration in winter conditions where there are no cold start problems, noise or fumes as would be generated by an internal combustion engine. Freedom from exhaust pollutants also enables electrics in many cases to be used inside buildings in transport and communications corridors. The basic low gearing and restricted top speed of elec-

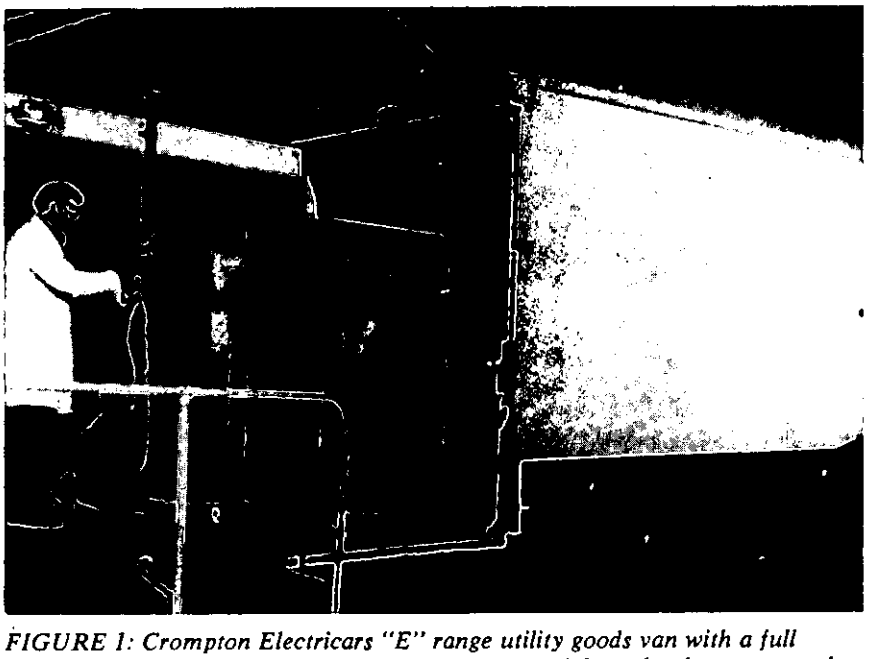


FIGURE 1: Crompton Electricars "E" range utility goods van with a full width tail lift pictured delivering sterile stores materials to the theatre area of a Midland Hospital.

trics enables precise movements, whilst ensuring the vehicle can be driven around hospital grounds at speeds consistant with the safety of both patients and staff. Of particular note are the "close control" capabilities of electrics, which are especially necessary for the movement of acutely sick patients.

Long Term Reliability

Whilst the environmental benefits of electrics are nowhere better utilised than in hospitals, there are equally important cost effective features associated with electrics which favour their increasing use.

The longer life of electric vehicles is of major importance in reducing future demands on capital budgets where frequently the actual life of electric far exceeds the expected or depreciated life. A major reason for the length of life of electric vehicles must be attributed to the hand-built method of manufacture and the widespread use of non-corrodable materials such as fibreglass, aluminium and stainless steel. The average life of electrics in use in the U.K. is in fact approximately 18 years. The necessity for a heavy weight battery-carrying steel chassis and the lower accident risk due to lower speeds of operation also contribute significantly to this figure.

Cost Effectiveness

The operating costs of electrics are substantially less than equivalent ICE engined vehicles. Firstly the use of electricity is an extremely convenient type of fuel obtained as it is by overnight low tariff charging where the cost per mile is extremely low compared to petrol or diesel fuel.

FIGURE 2: Crompton Electricars E range ambulance with accommodation for seated, semi-ambulant or stretcher cases in the rear and communication walkthrough from cab area.

Secondly, labour and spare parts costs are minimal. This follows from the extreme simplicity of the traction motive unit. This simplicity, with a very small number of moving parts, gives rise to the well established reliability of electric vehicles. Reliability of course, is doubly important where single or small numbers of vehicles are employed at one site. Also batteries and chargers are both simple and reliable.

Vehicle Specification

The choice of type of electric vehicle system falls between a four-wheeled road vehicle and the tractor-trailer combination, where the motive unit is either a platform truck or tow tractor. In the first case vehicles may have goods or utility bodies with tail lifts for catering, laundry CSSD and other service uses (*Figure 1*). There is a growing fitment of goods tail lifts on these types of vehicles.

Alternatively an ambulance type vehicle can be specified, with or without a walkthrough facility from the cab to the patient area (see *Figure 2*). Again such vehicles can be fitted with a tail lift for loading wheelchaired patients.

Where more flexibility is required a tow tractor/platform truck and trailer system is often the answer (*Figure 3*). Here the motive unit in conjunction with several different types of trailer is able to complete an essential delivery of, for example, clean linen — uncoupling the trailer and getting on with the next transport job whilst the unitised trailer load is left where it is needed. It is also possible to obtain passenger trailers.

In common with road vehicles trailer interiors are both hand and custom-built. The combination of these two factors ensures the vehicles are precisely specified, to meet health and safety criteria in keeping with Health Service standards.

Two-speed Vehicles

With the ever-increasing need for economy these days, it is often the case that one road vehicle may be required to supply or provide transport for other hospitals within a Sector or District, especially in urban areas. Crompton Electricars have recently produced a vehicle which can perform duties of this nature quite adequately, as the effective daily range of the vehicle is between 45-50 miles.

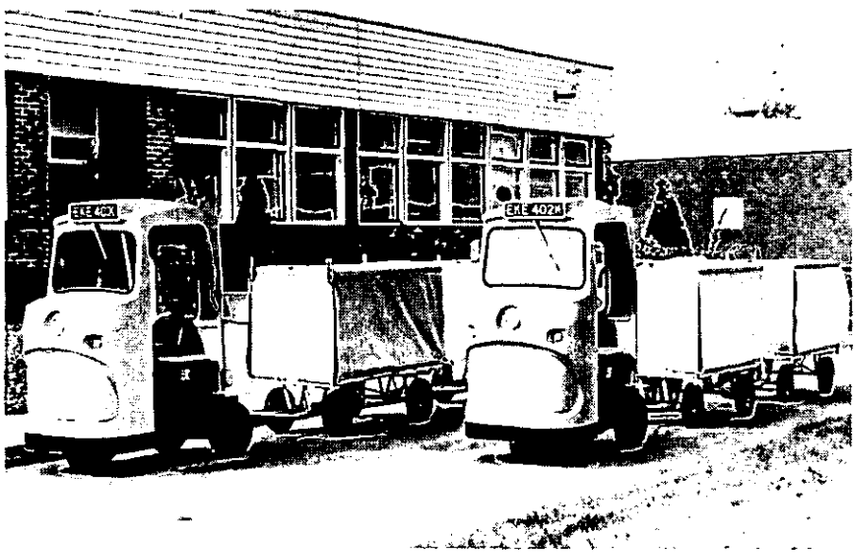
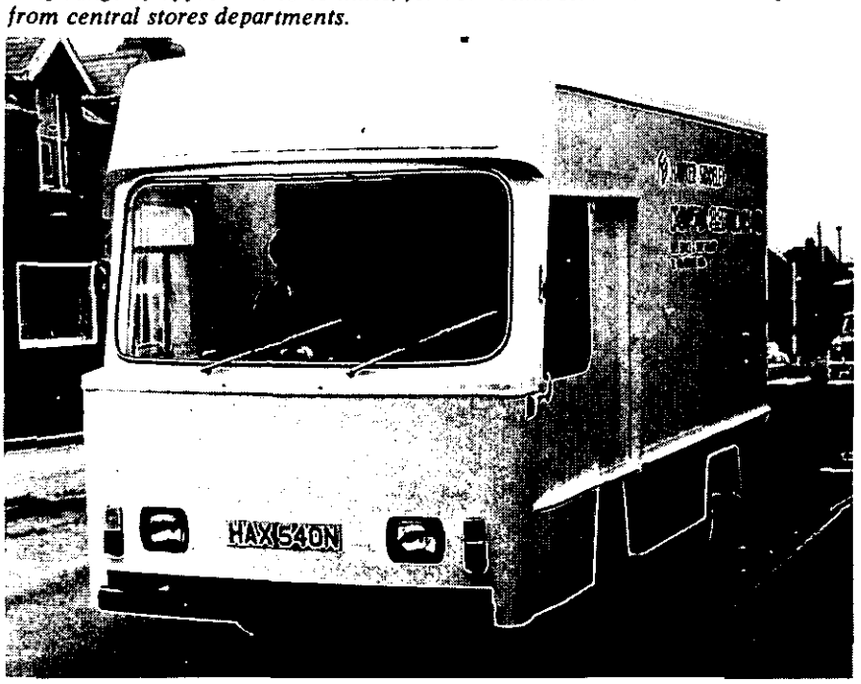


FIGURE 3: Crompton Electricars B range tow-tractor and trailer combinations allow wide flexibility of use. A pair of cabbed tractors with utility trailers are shown.

The Two-speed Vehicle (*Figure 4*) is intended to provide a vehicle which can perform its duties in hospital grounds at normally accepted controlled speed (in this case at a maximum of 12 mph). However where the vehicle has then to deliver to another hospital the vehicle can be run at a higher speed, thus minimising journey time and allowing the vehicle to be driven at speeds more in line with road traffic. Of course, this type of vehicle is most advantageous when it replaces a petrol or diesel vehicle, giving longer life and greatly reduced operating costs.

Whether the vehicle required is a Two-speed or conventional goods or ambulance vehicle, or a tractor-trailer combination, all of them benefit from their nature of manufacture. Specification of the body type is completed at the same time as the battery specification. Manufacturers such as Crompton Electricars provide both pre- and after-sales services to assist in the use of their vehicles. The pre-sales service is essentially a consultation, whereby the manufacturer's sales engineer prepares an in-use survey to establish the most economic specification of vehicle, consistent with the vehicle's intended pattern of use. Essentially, his skill is required in establishing the right ampere hour capacity for the vehicle's battery, while allowing only the most expedient and economic margin of spare capacity. Again, this assistance may well be important in reconciling the needs of differing departments.

FIGURE 4: Crompton Electricars Two-Speed Delivery Van with an effective daily range of approx. 40 to 45 miles, for use in link services between hospitals from central stores departments.



Reliability Through Simplicity

The vehicle, battery and charger which comprises the equipment set for an electric vehicle or truck is essentially an extremely simple and efficient transport machine. The motive power unit, usually a DC series wound traction motor, of 2 horsepower in trucks and up to 12 horsepower in the larger road vehicles such as the two-speed delivery van, is well known to be extremely reliable. The absolute minimum of moving parts eliminates most areas of wear and high cost maintenance. In fact motor brush wear over a number of years is the only significant replacement cost, provided the vehicle is used within its normal capabilities.

The employment of SCR controllers on ambulances and industrial trucks in hospitals is a well established method of ensuring that vehicles can be manoeuvred literally inch by inch into confined spaces, or that they can accelerate from rest in complete smooth progression. This latter point is extremely important where vehicles are being used to move acutely sick patients, particularly in coronary care (*Figure 5*). The SCR controller is of all solid state construction and has a number of technical advantages such as minimisation of starting current losses and reduction of peak loading on the back axle. It is marginally beneficial in extending battery life.

Where however there is not the requirement for such close control and ultra-smooth starting, then the resistance controller is the simple and effective alternative. A simple rheostat in conjunction with a series of contactors from two in smaller vehicles, to four in larger types, again ensures the maximum of reliability with the minimum of part wear and replacement needs. In fact contactor tips are the only real area of wear

FIGURE 5: Crompton Electricars F range ambulance with accommodation for a full bed, lifted by a side lift for use in Coronary Care Units. This type of vehicle specification illustrates how the custom and hand-built nature of electrics can be applied to special needs.

which require regular cleaning and periodic replacement.

Despite the optimism that is expressed in the future of higher-density higher-performance batteries, there is no doubt that the standard lead-acid traction battery is at present well capable of providing an adequate power/storage source for all hospital vehicle users.

Battery manufacturers provide a full uses guarantee in the first year and a tapering degree of guarantee cover for the next three years. In fact the average life of a traction battery is approximately five years.

The recharging of the battery is of course of major importance. Provided that the duty which the vehicle has undertaken is regularly the same, then a very simple single rate charger can be employed. This, the simplest type of charger, recharges over 11 to 13 hours during night time, but if electricity tarriffs or the vehicle's working day demands, a two rate charger will perform the job in eight hours. With the two rate charger there is the need for an engineer or the driver to set a time relay prior to placing the vehicle on charge. However for such vehicles as the Two-speed van, which may well have an irregular day-to-day pattern of use, a range of automatic chargers is available which will "put back in" sufficient charge to the battery, to replace what has been taken out. Since this is automatically monitored by the charger unit there is no requirement for manual calculation of the charging requirement. Chargers are of course frequently on wall mountings, and require only normal 240 volt single phase mains access. Rating of cabling and isolators is fairly straightforward, as the input current is readily available from the calculation:

$$\frac{4 \text{ (no. of battery cells)} \times \text{(starting current charge)}}{\text{mains AC input in volts}}$$

Maintenance

Of prime importance to the economics of using electrics is of course the correct specification of battery size, which is normally based on the expert judgement of the vehicle manufacturer's engineer. However, in use the care of the battery is again most important. Charging is of course a key factor, though such is the simplicity of most chargers, as simple transformer-rectifiers, that a periodic service check is all that is required. The daily round of service and maintenance requirements are quite simple. Firstly, after charging, the battery load spreading switch should be rotated to ensure that the vehicle auxiliaries which are normally driven by the main battery drain the cells evenly over a period of time. In fact, on a periodic basis an equalising charge is advantageous in ensuring all cells are kept fully charged up. After charging again on a fortnightly basis the battery should be topped up with deionised water and the specific gravities of each cell checked with a hydrometer. Cleaning and greasing of battery lids and terminals is always to be recommended.

The whole maintenance operation is extremely simple and short, consuming substantially less in expensive man hours and materials that would be possible if petrol vehicles were used.

In fact manufacturers such as Crompton Electricars do provide regular contract service or emergency call out services for all electric vehicles and chargers from the company's network of Sales and Service Centres, which are also the local sources of spare parts. Mobile service engineers provide this service. Where a number of vehicles are operated in a district, the company provides low cost service and maintenance courses at the Tredegar, South Wales factory, or at Service Centres.

In conclusion there is one major point about electric vehicles which perhaps bears repetition, when one considers the present and unfortunately likely future expenditure cuts that are increasingly being introduced into NHSS budgeting. The electric vehicle is essentially a long term cost saving investment, which through its longer life and greater reliability releases increasingly scarce resources for other uses. When taken together with the rest of the electric's inherent advantages, there is no doubt that they will continue, and probably increase, their contribution to our essential health services.

New Literature

Crompton Electricars have published a new range of sales leaflets for its range of hospital electric vehicles. The range covers electric ambulances, utility vehicles, tow tractors, platform trucks and trailers.

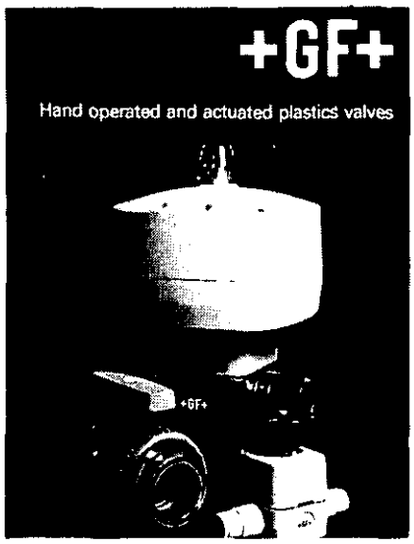
Crompton Electricars vehicles of this type formerly known under the brand names of Brush, Brook Victor and Morrison are widely used throughout hospitals in the U.K. The literature has already been extensively distributed by post. Further copies are available from: *R. A. J. Moore, Marketing Manager, Crompton Electricars Ltd., Crown Avenue, Dukestown, Tredegar, Gwent NP2 4EF. Tel. Tredegar (049-525) 2921.*

Product News

Plastics Valves

George Fischer Sales have published a new catalogue containing full details of their range of hand operated and actuated plastics valves. As well as sizes and specifications, the catalogue includes information about pressures, temperatures and flow valves with a guide to typical calculations associated with valve selection. Copies are available from: *George Fischer Sales, Eagle Wharf Road, London N1 7EE. Tel. 01-253 1044, or from any GF valve stockist.*

The new catalogue.



Interhospital '77

Interhospital '77, the world's largest hospital exhibition, will be held in Hanover, Western Germany, from June 7-10 next year. The exhibition programme will include medical techniques (without including X-ray or nuclear medicine equipment), technical treatment, furnishings, catering equipment, laundry and chemical cleaning equipment, catering supplies and materials, food stuffs, hospital textiles and other services sectors.

The organisers are the German Hospital Association (Arbeitsgemeinschaft Deutsches Krankenhaus, Düsseldorf, and the Deutsche Messe- und Ausstellungs-AG, Hanover (German Exhibitions and Displays Organisation).

Taking place in conjunction with Interhospital '77 will be the 9th Deutsche Krankenhaustag. Literally translated this means the 9th German Hospital Day, but it will in fact be a major conference, lasting for several days.

Further information on both of these events is available from: *Interhospital '77, Deutsche Messe- und Ausstellungs-AG, D-3000 Hanover 82, West Germany. Tel. Hanover (05 11) 89-1. Telex Hanover 09-22728.*

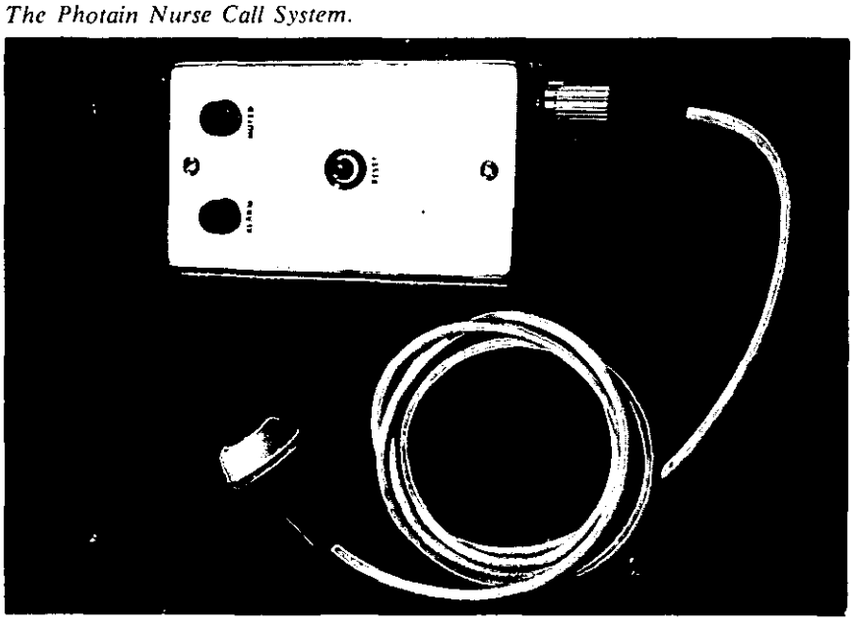
Nurse Call System

Photain Controls Limited have introduced a new Patient/Nurse Call System, enabling any patient to call for the service of a member of the staff by pressing an alarm push button. This illuminates a light signal in an area indicator, and sounds a buzzer. A light is also illuminated at the initiating point, to show the exact position of the patient making the call and reassuring the patient that the call has been recorded.

The area indicator is normally housed in the duty room, and can cater for any number of zones. Up to twenty remote call units may be connected to each zone. The nurse's attention is drawn to the call by both light and sound signals, and the light signal can only be cancelled by pressing the reset button over the patient's bed.

For further information contact: *Photain Controls Limited, Unit 18 Hangar 3, The Aerodrome, Ford, West Sussex. Tel. Littlehampton (09064) 21531-4.*

The Photain Nurse Call System.



New Mattresses

Ellison have introduced a new range of hospital mattresses in conjunction with Dunlopillo. The mattresses have Dunlopillo's Strataflex support, which has a firm foam layer for support, with a softer foam layer for comfort.

The Ellison M/F Hospital Mattress is a general purpose mattress, reversible and with a medium to firm hardness rating. It is ideal for most medical and surgical care applications.

The Ellison S/M Hospital Mattress is non-reversible, and has a soft to medium hardness rating making it suitable for long-stay geriatric and psychiatric nursing.

The Dunlopillo polyether foam does not create dust or fluff, and is bacteriostatic. The covers are of proofed nylon with full length zip, and manufactured to the recommendations laid down by DHSS specification.

Ellison Hospital Equipment, Wellhead Lane, Perry Barr, Birmingham B42 2TD. Tel. 021-356 7306.

Classified Advertisements

To place an advertisement in this section, please write or telephone:
Classified Advertisement Department, *HOSPITAL ENGINEERING*
Earlsport Limited,
33 Ludgate Hill,
London, EC4
Telephone: 01-248 0148/9

OFFICIAL APPOINTMENTS
SITUATIONS VACANT
COURSES, EQUIPMENT, ETC.

APPOINTMENTS AND SITUATIONS VACANT

TAX-FREE APPOINTMENTS

The following Works Staff are required for a new air-conditioned acute hospital in one of the most pleasant parts of the southern Mediterranean. Responsibility will be to a British Chief Engineer. Formal qualifications are not so important as experience and the will to work hard. Age is no barrier.

HOSPITAL ENGINEER
£10,000 salary plus £5,780 allowances

ASSISTANT ENGINEER
£8,000 salary plus £5,680 allowances

BUILDING SUPERVISOR
£8,000 salary plus £5,680 allowances

TECHNICAL ASSISTANTS
£7,000 salary plus £5,630 allowances

ELECTRICIANS, FITTERS & PLANT OPERATORS
£6,000 salary plus £5,580 allowances

The allowances are annual, for housing, furniture, car and terminal bonus. In addition, there will be staff life assurance, family medical care, air fares for bi-annual leave and assistance with educational expenses.

The Engineers and the Building Supervisor must have hospital experience. Technical Assistants will need to have experience of a speciality such as electro-medical equipment, sterilisers, lifts or telephones. Electricians, fitters and plant operators must be experienced in their trade.

Appointments will be for two years, renewable by mutual agreement. It is expected that Hospital Service Superannuation benefits will be protected. This will be confirmed before appointments are finalised.

Location of the hospital and the identity of the foreign government concerned cannot be revealed at present because negotiations are still in progress. Full details will be provided in due time.

Please write, giving age, career and family details to the Chief Engineer, Box 101, Hospital Engineering, Earlsport Limited, 33 Ludgate Hill, London EC4.

Closing date, December 24, 1976.

CLASSIFIED ADVERTISEMENTS for the next issue of Hospital Engineering (published February 4, 1977) should reach Earlsport Ltd., 33 Ludgate Hill, London EC4, by January 25, 1977.

BRISTOL HEALTH DISTRICT (TEACHING)

SECTOR ENGINEER

To be responsible to the Dist*rict Engineer for the manage*ment of emergency services at Bristol Royal Infirmary, Bristol Eye Hospital and Bristol Dental Hospital.

The post will provide ideal experience for an enthusiastic Engineer in the control and operation of a large district general hospital precinct.

Applicants should have completed an *Electrical or Mech*anical apprenticeship and hold a Higher National Certificate in Mechanical or Electrical Engineering with endorsements or other approved qualifications.

Salary scale: £4,371-£5,262 plus £291 per annum supplement to earnings.

Application forms and job descriptions are available from the District Engineer, Bristol Royal Infirmary, Bristol BS2 8HW. Telephone: 290666, Ext. 264.

Closing date for applications, December 20, 1976.

TAYSIDE HEALTH BOARD
PERTH & KINROSS DISTRICT
Bridge of Earn Hospital

HOSPITAL ENGINEER

Mechanical or Electrical Engineer required to supervise maintenance and minor works.

Applicants should be qualified to HNC or C & G Technician's Certificate or First Class MOT Certificate level.

Salary scale: £3,351 to £3,942 per annum plus a flat rate addition of £291 per annum and a Special Responsibilities Allowance of £36 per annum.

A rented house may be available if required.

Further particulars and application form available from the District Personnel Officer, 113 Leonard Street, Perth.

Closing date for completed applications — December 31, 1976.

ASSISTANT DISTRICT ENGINEER (Third in Line)

to assist the District Engineer *in implementing engineering* and maintenance works, ensuring effective cost control, and in providing and collating information for future works programmes and related expenditure.

Minimum qualifications HNC or equivalent, and appropriate management qualifications, and preferably a minimum of three years in an engineering management post.

Salary: £4,974-£5,865 inclusive of London Weighting Allowance and Flat Rate Supplement.

The successful applicant will be based at St. James' Hospital, Balham, but will be required to work throughout the District.

For further information please contact Mr. B. Radcliff on 01-672 1222, ext. 143.

For a job description and application form please write to or telephone Miss M. R. Felsenstein, Personnel Officer (Recruitment), 72 St. James' Drive, London SW17 7RS. Telephone: 01-672 1222, ext. 41.

Closing date: January 7, 1977.

Wandsworth and East Merton Teaching District
MERTON, SUTTON AND WANDSWORTH AREA HEALTH AUTHORITY

NON-MEMBER SUBSCRIBERS

if you are not a member of the Institute your current subscription to Hospital Engineering expires with this issue.

Please see the form on page 27.

CLASSIFIED ADVERTISEMENTS — *continued*

APPOINTMENTS AND SITUATIONS VACANT

South West Thames
Regional Health Authority

PRINCIPAL ASSISTANT ENGINEER (Mechanical)

Salary Scale: £5,676-£6,858 per annum plus £354 per annum London Weighting.

Applicants must be Corporate Members of the Institution of Mechanical Engineers. Corporate Membership of the Institution of Heating and Ventilating Engineers would be an added advantage. They should be capable of directing a team of engineers and technicians on design and contract management of schemes ranging from medium to very large size, and should be experienced in the design of mechanical building engineering services. It would be an added advantage if this experience relates to hospitals and other Health Service buildings.

Location of post: Paddington.

Application forms from: Personnel Officer (S2), 40 Eastbourne Terrace, London W2 3QR.

Completed forms to be returned by December 10.

TEN YEARS' EXPERIENCE OUGHT TO COUNT FOR SOMETHING

Maintenance Engineer

£3,948-£5,142

Do you have an ONC plus 10 years' experience in mechanical or electrical engineering? Then every year of that experience will really count working in our hospitals in Kent, East Sussex and Outer London — especially if that experience has been gained in a hospital environment.

You'll be carrying out important maintenance and operation of a wide range of technical services and equipment in large modern District Generals with highly sophisticated equipment (requiring all your expertise) down to smaller hospitals and numerous clinics and health centres.

If you'd like to make the fullest use of your qualifications and experience, write to Personnel Division, South East Thames Regional Health Authority, Randolph House, 46-48 Wellesley Road, Croydon CR9 3QA, or telephone: 01-686 8877 (Ext. 53).

Closing date January 17 1977. Ref. 666.

CROYDON AREA HEALTH AUTHORITY

AREA ENGINEERING SERVICE

HOSPITAL ENGINEER

to be based initially at Warlingham Park Hospital (Psychiatric Hospital with 626 beds) and to be responsible to the Area Works Officer and Area Engineer.

Salary Scale (for appropriately qualified applicants only): £3,351 p.a. rising to £3,942 p.a. plus £312 London Weighting plus £72 p.a. Responsibility Allowance and Supplementary Allowance at £291 p.a.

HOUSE at moderate rental available on Hospital Estate.

Application form and job description (Ref. AWO 13) obtainable from Area Personnel Officer, Croydon General Hospital, London Road, Croydon CR9 2RH. (Tel. 01-688 7755, ext. 31).

Closing date for applications December 17, 1976.

SCOTTISH HEALTH SERVICE
COMMON SERVICES AGENCY
Supplies Division

PROFESSIONAL AND TECHNOLOGICAL OFFICER

£3,702-£4,176

Two vacancies exist on the above grade in the Supplies Division.

POST I: Based in Edinburgh, the duties include the preparation of layout drawings for diagnostic and therapy X-ray equipment, sterilising equipment and instrument cleaning systems. He/she will also assist in the preparation of specifications for and in testing or commissioning of such equipment. Candidates should have appropriate experience in the supplies field.

POST II: Based in Glasgow, duties include testing of radiodiagnostic, medical ultrasonic and medical thermography equipment. Candidates should have at least an ONC in Electronics, Electrical Engineering or Bio Engineering. Experience in inspection and testing would be an advantage.

Twenty days' annual leave plus nine statutory and public days. Generous superannuation and sick pay schemes. Candidates should note that entrants from outwith the Health Service would normally start at the minimum of the scale.

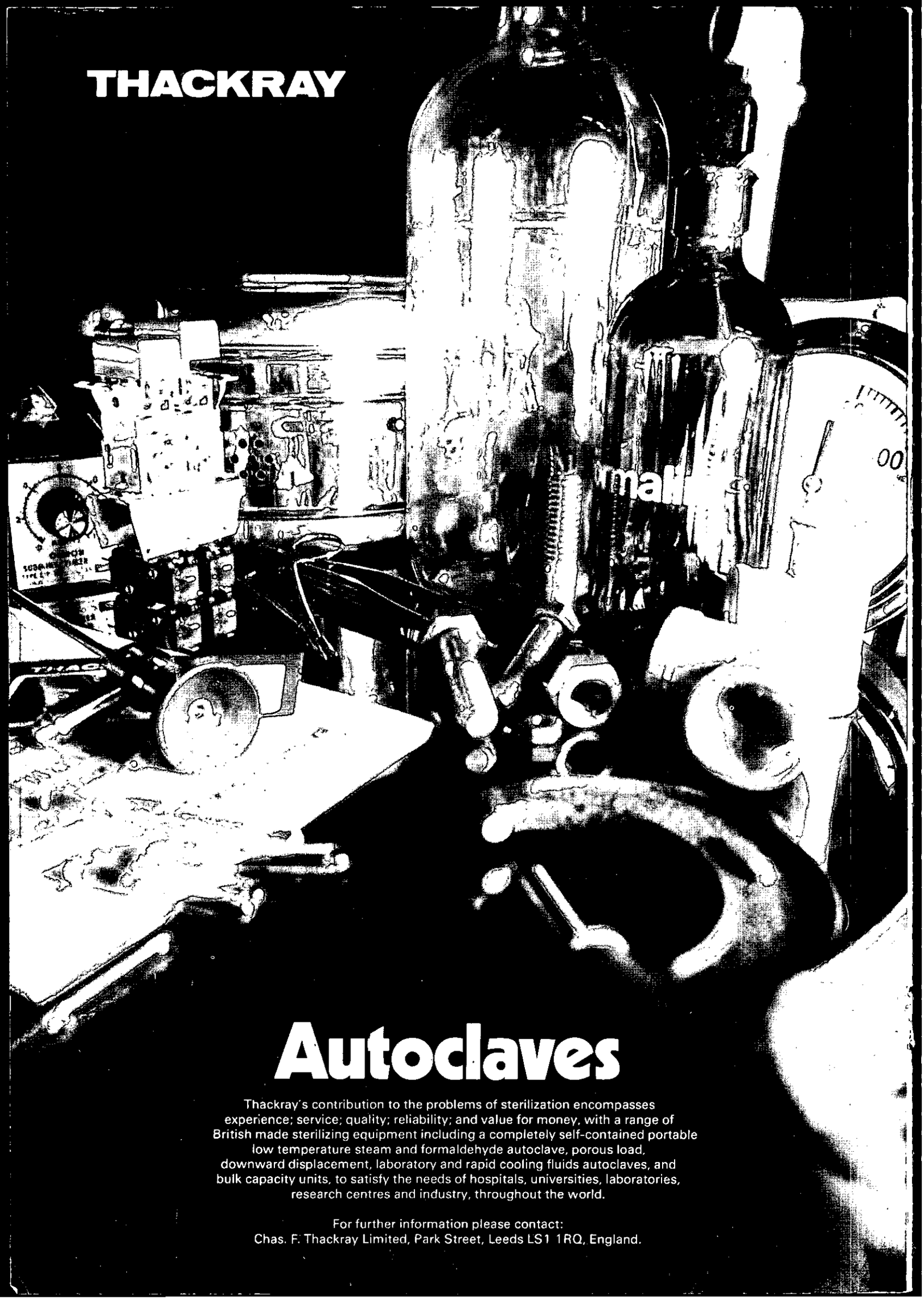
Applications forms and job descriptions are available from Personnel Officer, Trinity Park House, South Trinity Road, Edinburgh EH5 3SE (031-552 6255, ext. 2144) and applications should be returned by Friday, December 24, 1976. Please state post applied for.

EQUIPMENT

MISCELLANEOUS

CIRCULATING PUMPS and Steam Turbines, complete units, electric and steam, spares and service. TURNEY TURBINES Lttd., 67 Station Road, Harrow. Tel. 01-427 1355 and 01-427 3449.

METRICATION / STORAGE TANK DIPSTICKS. Change to litres for better stock controls. For dipstick copykit, contact: Dipsticks Ltd., Slad Mills, Lansdown, Stroud, Glos. Tel. Stroud 78300.



Autoclaves

Thackray's contribution to the problems of sterilization encompasses experience; service; quality; reliability; and value for money, with a range of British made sterilizing equipment including a completely self-contained portable low temperature steam and formaldehyde autoclave, porous load, downward displacement, laboratory and rapid cooling fluids autoclaves, and bulk capacity units, to satisfy the needs of hospitals, universities, laboratories, research centres and industry, throughout the world.

For further information please contact:
Chas. F. Thackray Limited, Park Street, Leeds LS1 1RQ, England.