The Journal of the Institute of Hospital Engineering January/February 1981

HOSPITAL ENGINEERING

Lord Snowdon opens International Year of Disabled People

'Hospital Engineering' is published monthly, except in January and July, by Mallard Publications

Individual copies cost
£2.45 UK postage paid

The annual subscription is UK: £21.00
Overseas: £25.00 Americas: $56

Average circulation per issue
(January-December 1979): 2628

ABC

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All correspondence relating to the Journal should be addressed to:

'Hospital Engineering'
Mallard Publications
48 Southwark Street
London SE1 1UN, England
Telephone: 01-403 6166

UK ISSN 0309-7498

Printed by JB Offset Printers
(Marks Tey) Ltd
Station Approach, North Lane
Marks Tey, Colchester, Essex

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HOSPITAL ENGINEERING

The Journal of the Institute of Hospital Engineering

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Volume 35 No. 1 **January/February 1981**

Front Cover:
"What we have got to ensure is that anybody and everybody who is disabled in the world is given an equal opportunity, if feasibly possible, to enjoy their lives to the full, not as a favour nor exception, but as a normal dignified human right." Lord Snowdon, speaking at the opening ceremony in January 1981 of the International Year of Disabled People, of which he is President.

Neither the Institute nor the Publisher is able to take any responsibility for views expressed by contributors. Editorial views are not necessarily shared by the Institute.

Institute News

The End of the Beginning

The 'Chartered Hospital Engineer'

Readers of HOSPITAL ENGINEERING will have noted, with pleasure, that following the Institute's election to Affiliate Membership of the Council of Engineering Institutions and the consequent ability to sponsor individual Members, for registration as Chartered Engineers, that three Corporate Members have been accepted, and can now describe themselves as Chartered Hospital Engineers.

It is with some justification that this event can be said to mark 'the end of the beginning' as far as the endeavour to increase the professional standing of our Institute is concerned. Bearing in mind the stringent requirements of the CEI in respect of candidates sponsored in this way, these Members can hold their heads high, for it has been recognised by their peers that they have measured up to those standards of academic attainment, practical training, professionalism in practice and management acumen that one normally associates with Corporate Membership of one of the Corporation Members of the CEI.

It is the wish of the Council that any Corporate Member who feels he has the right qualifications and background should make the necessary approach for sponsorship to Chartered Engineer status through the Institute. In saying this, the Assessment Committee of the Council wish it to be known that before supporting an application, they themselves would need to be assured that the high standards demanded have been attained.

New Year's Honours List

We are delighted to report that Mr K. H. Dale received the award of the OBE in the recent New Year's Honours List.

Mr Dale is, of course, Regional Engineer to the Yorkshire Regional Health Authority and is a long standing member of the Institute.

37th Annual Conference

The 1981 Annual Conference of the Institute will be held at the Hallam Tower Hotel, Broomhill, Sheffield from 13 — 15 May.

Full details of the technical programme and any other information relative to the Conference may be obtained from the Institute Office at 20 Landport Terrace, Southsea, PO1 2RG.

As usual there will be a separate programme for the Ladies. In addition the social activities will include a Civic Reception and the Conference Dinner Dance which will be held in the Hallam Tower Hotel on the evening of Thursday 14 May and this will be attended by certain distinguished guests.

Energy Management Seminar

A one day seminar, run by the Institute of Measurement & Control, is to be held at Gatwick Park Hotel, Gatwick Airport, Surrey on Wednesday 20 May, 1981. From 9.00am to 5.00pm, 8 subjects are to be presented by speakers from industry, the Midlands Electricity Board and The Department of Industry.

The charge of £38 includes coffee, lunch and tea, and VAT. Full information from Mr I. L. Barnard, W. S. Atkins & Partners, Woodcote Grove, Ashley Road, Epsom, Surrey KT18 5BW. Tel: 03727 26140.

IMechE Conferences 1981

Among a series of conferences organised by the Institution of Mechanical Engineers during 1981 are:

30 June — 2 July
Gas Borne Particles
St Catherine's College, Oxford (Thermodynamics & Fluid Mechanics Convention)

15 & 16 September
Education of Tomorrow's Engineering Designers
Robinson College, Cambridge

18 & 19 September
Managing Projects and Business
(Graduates and Students Conference)
University of Surrey, Guildford

7 & 8 October
Steam Boiler Plant Technology

Papers will be considered for presentation at some of these conferences and fuller details can be obtained from G V Williams, The Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1H 9JJ, Tel: 01-222 7899.

Diary Note

The 1981 Five Branch Meeting will be held at the John Radcliffe Hospital, Headington, Oxford on Saturday, 6 June 1981. Programme details will follow later.

CEI Notice to all Chartered Engineers

Notice is hereby given that the Sixteenth Annual General Meeting of The Council of Engineering Institutions will be held at The Royal Aeronautical Society, 4 Hamilton Place, London W1 on Thursday 26 March 1981 at 1600 hours. All Chartered Engineers are entitled to attend.

The business of the meeting will be the presentation and consideration of the Annual Report and Accounts for the year ended 30 September 1980, the appointment of the Auditors and the fixing of their remuneration and the announcement of the result of the ballot for the election of the elected members of the Board.

By Order of the Board
M W Leonard
Secretary.

Copies of the Annual Report and Accounts will be available at the meeting. Members unable to attend the AGM and who wish to receive a copy of the Report and Accounts should send an addressed envelope to The Secretary, CEI, Little Smith Street, London SW1 3DL. Summary reports including the accounts will be sent to all Chartered Engineers in due course.

The Institute has been concerned for some time about the role of hospital engineers in the proposed new structure of the Health Service. The following correspondence between the Secretary and The Rt Hon Patrick Jenkin will be of interest to all members.

Restructuring the NHS

The Engineer's Role

16th October, 1980.

Dear Mr Jenkin,

This Institute has been following with considerable interest the events leading to the latest proposals for changing the structure and management of the National Health Service. We submitted evidence to the Royal Commission and we have debated in Council the Commission's report and more recently Patients First and HC(80)8.

Our primary role is the promotion of the science of hospital engineering in order to secure the best possible facilities for the treatment of patients within the constraints of cost effectiveness and safety of patients and staff. It is in this context rather than that of concern for the personal interests of our membership that we offer comment on the Department's guidance on Structure and Management.

The field of hospital engineering is extensive and ranges from heavy plant and building services to sophisticated instrumentation and equipment employed in communications and patient care. All of it is heavily relied upon by those who are directly providing care and treatment.

It is in the nature of things that those who provide the support services, however vital, tend to be taken for granted. The airline captain is commonly regarded as far more important than those who design, construct and maintain his aircraft. It is therefore of some concern to this Institute that HC(80)8 omits to stress the importance of professional accountability for the engineering function to a level above the Unit.

There is a hierarchy of activity in engineering from the skilled manual operations of the craftsman through the technical expertise and supervising role of the technician grades to the controlling of standards by the professional engineer. It is important to structure accountability up through this hierarchy if professional standards affecting function and safety are to be maintained.

While HC(80)8 does not preclude such accountability it does discourage it and leaves the decision to the new Authorities who may well be blinkered to the importance of this vital support role. This was the case with many HMCs prior to 1974 and the Public Accounts Committee was critical of the lack of professional management of the works function. Since that time technology has made even greater strides and patient care is far more dependent on its support.

The Institute would urge that further advice should be issued so that Health Authorities are left in no doubt as to the need for professional accountability for the works function to qualified senior officers at District level.

J. E. Furness
Secretary.
The Institute of Hospital Engineering

J E Furness Esq MBE VRD
Secretary
The Institute of Hospital Engineering

6 November 1980

Dear Mr Furness,

Thank you for your letter of 16 October about the implications for hospital engineers of the policies announced in HC(80)8.

First of all I should like to say that I recognise the essential contribution made by hospital engineers towards care and safety of patients and staff in maintaining services to the NHS estate and that they will continue to have an important role to play in the reorganised Health Service.

I appreciate the points you make — indeed I was aware of them when taking final decisions on the nature of management arrangements. Looked at solely from an engineer's point of view they do, of course, have some force. But I had to consider the question of hospital management in a wider sense. I did not take the decisions lightly or without the benefit of a good many views of those involved in the NHS. As you know, the Royal Commission took evidence on the matter, and in their comments on functional management said that it was clear to them that the quality of management of institutions had suffered substantially since reorganisation. Accordingly, in "Patients First" we proposed that, wherever possible, staff working within hospitals in non-clinical support functions should be accountable to the hospital administrator. I acknowledge that those working in specialised functions affected by this proposal opposed it, but I think it is significant that 55 out of the 57 health authorities which commented supported the proposition (as did 46 out of the 47 community health councils).

Of course, it is not a question of simply arranging for non-clinical support staff to report direct to the unit administrator. As we recognise in our circular, it is for individual authorities to consider how they might arrange for specialist advice to be available at district level. We set out in the Circular, in very broad terms, the arrangements which extensive consultation showed there to be general support for, and we must now leave it to individual authorities to work out what arrangements are best in their own particular circumstances.

I am sure that the new DHAs will have support services and the need for an efficient works input very much in mind when making their appointments and deciding arrangements for accountability.

Patrick Jenkin
Secretary of State
for Social Services.

The Institute of Hospital Engineering
Membership Category
Upgrading from Member to Fellow

Council is aware that many 'Members' of the Institute, since their election to that category have progressed in their careers and/or have obtained additional academic qualifications so that they may now be eligible to be upgraded to become a Fellow of the Institute.

Council is of the opinion, further, that it is entirely fitting both for the individual and for the Institute that members should hold the category of membership for which they are properly eligible.

Accordingly, as a matter of information, we set out below the minimum requirements for the category of Fellow:

Academic Qualification:	HNC or City and Guilds of London Full Technological Certificate.
Age:	Not less than 28.
Experience:	Not less than five years superior responsibility and experience in hospital engineering preceded by at least two years practical training.
Post:	As a guide, so far as members employed in the NHS are concerned, Council would expect an applicant for the grade of Fellow to hold a post of, at least, Main Grade Engineer (at Region) Area Engineer (at Area) or District Engineer (at District).

Any 'member' who would like to become a Fellow and believes that he meets these requirements is invited to submit application for the relevant Upgrading through the Institute office for consideration by Council.

Legionnaires Disease Conference

The Industrial Water Society, which is a learned body concerned with the correct and efficient use of water in industry and commerce, is sponsoring a major conference in London during May 1981.

The reported causes of this Disease range from bacteria in shower heads, to spray from cooling towers, air conditioning systems and contaminated drinking water.

In an attempt to put the facts before the public, papers will be given by speakers from the medical, scientific and engineering professions.

Details are obtainable from The Secretariat, The Industrial Water Society, 35 Broomfield Avenue, Fazeley, Tamworth, Staffs B78 3QL, Tel: 0827 65089.

Safety Courses

The British Safety Council has issued two new free leaflets entitled, "On Course for Safety" and "In-Plant Training Service."

The leaflets give details of nearly 400 safety training courses ranging from the basic operative training courses required by law — for example Abrasive Wheels regulations and Power Press regulations to the sophisticated management training courses which lead to qualification for the Diploma in Safety Management (DipSM).

Available free from Mrs Helen Kelman, British Safety Council, 62/64 Chancellors Road, Hammersmith, London W6. Tel: 01-741 1231 Ext: 259.

IHF Study Visits

Four special study visits, organised by the International Hospital Federation, are detailed below:

10-17 May
Hospitals and PHC
German Democratic Republic

31 May — 12 June
Child Health Services
Canada

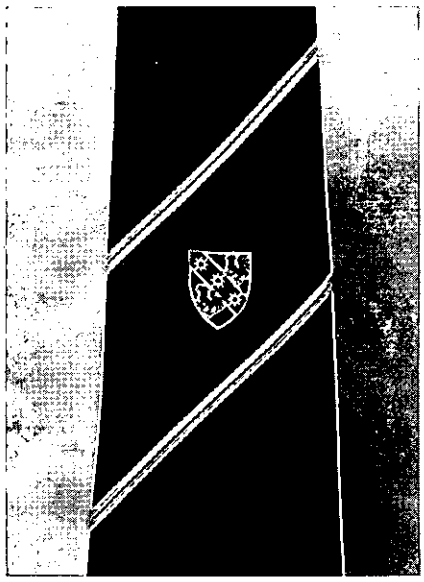
20 — 29 July
First-line Hospitals and PHC
Mexico

8 — 18 September
Fire Safety
England

For full information, please contact M C Hardie, IHF, 126 Albert Street, London NW1 7NX, Tel 01-267 5176.

Institute Tie — New Design

The Institute tie has been re-designed as shown in the picture below. Available in Navy Blue, Maroon or Green, they cost £4 for UK buyers, £4.50 for overseas and are obtainable only from the Secretary of the Institute, 20 Landport Terrace, Southsea, PO1 2RG.



Library News

Members will recall that in 1979/80 it was decided to introduce into our Library service a modest number of Cassettes.

The Library now holds nine of these Cassettes. Four *Waterlow* cassettes each with a running time of some 50 minutes. Both types constitute an essential programme pack of particular value for educational group counselling as well as individual use.

At the start of the New Year it is felt that members may wish to have a further brief resumé of the content of these cassettes.

It is further suggested that Branch Secretaries may wish to make use of any number of these cassettes as a package, a method which is ideally suitable for such occasions as Branch Meetings or Seminars.

Waterlow Cassettes:

1. The Health and Safety at Work etc Act 1974
A conviction of a breach of this important act could lead to a fine or even imprisonment. It is vital that you understand how the act affects you and your employee.

In this talk, Greville Jannel explains in depth how the Act works, and how it affects every business in the country. If you want to stay out of trouble you need this cassette.

2. The Employment Protection Act — In Action
It doesn't matter how many people you employ — you still need to know how to cope with the Employment Protection rules now in practice. Did you know that you can get free advice from the Advisory Conciliation and Arbitration Service; do you know how maternity rights operate; redundancy warnings; disclosure of information and recognition procedures? If not, you will find that Greville Janner and Sir Desmond Heap go through this important and complicated piece of legislation so thoroughly that you will have a positive understanding of its workings. These rules are not affected by the E.P. (Consolidation) Acts 1978, which consolidates the law, but in no way changes it.

3. How to Handle Dismissals
An unfair dismissal could cost your organisation £15,000. This talk will help you keep to a minimum your chance of making this payment, or even any part of it. Everyone you employ has a contract with you that you may wish to terminate. How you do it, and stay on the right side of the law is the heart of this conversation between Greville Janner and Sir Desmond Heap. The tape also includes an exact breakdown of the different kinds of dismissal, the amounts of money an employee can claim, and many hints on how to make the law controlling dismissals work for you and not against you. Conversely if you are dismissed you need to turn this law to your own good account.

4. Coping with Tribunals
Industrial Tribunals will hear over 100,000 cases this year. So however much you hope you'll keep away from them, the chances are that sooner or later you will be involved.

When you have listened to this talk by Greville Janner in conversation with Sir Desmond Heap, you will find that you will be more confident about facing a tribunal or court. You will know the procedures, how to present your case in the best possible way, and how to make sure that you win whenever possible.

In addition, Mr Janner offers much valuable advice about how to stay out of Courts and Tribunals — by far the best way to cope with them. The talk was recorded in July 1977 and lasts for an hour.

Holdsworth Cassettes:

1. The Management Process
The skills of planning, organising, motivating and reviewing. John, a project manager, explores difficulties with a feasibility study. He later applies these management principles to the setting-up of a service unit.

2. Managing Time
Diary analysis, time planning, net-worth analysis and other aids to time management. Martin, an export section head, explores why he never seems to have enough time, and discusses how he can improve the use of his working hours.

3. Rational Management
The skills of problem-solving and decision-making. Paul, the technical service manager, has a problem with the call-rate of his engineers. A colleague talks him through the stages of Describe, Diagnose, Diverge and Decide, and discusses the main barriers to effective problem-solving.

4. Managing People
How to understand and influence the behaviour of subordinates. David, an accounts manager, has problems with a keen but under-utilised accountant, and a poorly motivated supervisor. Conversations with them and a colleague help him to cope better with these situations.

5. Managing a Team
Understanding the structure and dynamics of groups and how to get individuals to work with each other. Branch Manager James explores the principle as applied to a number of meetings and interviews with members of his product group.

The cassettes are now available to Members on loan, applications to the Honorary Librarian in the normal way as for books.

R G Smith, Honorary Librarian, "Dryhill", Cold Slad, Crickley Hill, Witcombe, Gloucestershire GL3 4UQ. Tel: Witcombe 3628 or Wolverhampton 737221 (daytime).

International Year of Disabled People

The United Nations has designated 1981 the International Year of Disabled People. Disabled includes people of all ages with physical, mental, hearing or visual handicaps.

The aim of the Year is to promote the full participation and equality of disabled people in all aspects of society — at home, work, and in leisure. It is hoped to make the public, and particularly influential groups in society, more aware of the needs of disabled people and more responsive to them. The UN logo for 1981 symbolises a disabled and an able-bodied person holding hands in mutual support, to underline the theme.

At the request of the DHSS, which is responsible for the official Government contribution to the Year, the National Council for Voluntary Organisations has set up a Committee to stimulate and co-ordinate work of voluntary organisations in England for 1981.

As it is an International Year not just *for* but *of* disabled people, it is appropriate and vital that disabled people take a lead in planning the

Year. The Committee for IYDP reflects this principle. The majority of its members are either disabled themselves, or are the parents of handicapped children. They include Baroness Masham, Sir Richard Attenborough, Norman Croucher, Jack Ashley MP and Brian Rix.

A number of special groups have been set up to decide priorities and to recommend specific action on a wide range of issues, including the prevention of disability, employment, housing, access, leisure, mobility, the family, attitudes towards disabled people in society, the Third World, information and technological developments.

IYDP is in touch with national and local Radio and TV stations as part of its campaign to increase public awareness of the needs of disabled people. Already the BBC has begun work on special programmes for the Year, including some for peak-time viewing. Many national associations and local community organisations not primarily concerned with disability have been asked to play a part in the Year, and there are encouraging signs that churches, womens' and youth organisations, fund-raising bodies, Community Health Councils and others wish to do so. As well as reaching the public, the aim is to influence those groups which can give direct practical help to realise the objects of the Year. Discussions have already been held with Parliamentary groups, and meetings with the CBI, TUC and others will follow. A competition to make architects more responsive to the needs of disabled people will be held. As a long-term investment towards a better understanding of the needs of disabled people, a number of schools projects have been prepared, and it is hoped that information on these will reach every school.

Very many national societies are involved in making plans for the Year. But it is equally, if not more, important that there is a strong local campaign, involving as many individual disabled people as possible, to get across directly to the public, employers, trade unions and others, that disabled people can, and want to be equals in society.

There are many community organisations not normally involved with disability who are already expressing an interest in contributing to the success of IYDP. It is hoped that Councils of Voluntary Service and Local Associations for the Disabled will work together with local branches of national disability societies, and local authorities, to help translate the ideals of IYDP into reality in the coming years. 1981 with its international, national and local focus on disabled people is a unique opportunity for all those concerned to work together to make 1981 a significant turning point for disabled people.

The Institute of Hospital Engineering is making a contribution to this International Year of Disabled People by staging a special one-day symposium which will be held at the Royal Festival Hall, London on Wednesday 29 April.

To drive home the fact that 1981 is IYDP, the Post Office will be issuing a special stamp.

Letter to the Editor

A disappointing occasion

Dear Sir,
I felt that I had to write to express my disappointment at the manner in presentation of the awards for the Hospital Energy Conservation Competition.

The awards were given but with no explanation of the project, the costs and expected paybacks and in two cases without even saying where the prize-winner came from.

There was no display of the entries, apart from a Poster Display, that was very much second rate, I refer of course to the Display not the poster.

The whole attitude seemed to be one of let us get it over with so that we can get on with the rest of the programme.

For everyone who had gone to see what Hospital Engineers could produce, in the way of ideas of the future it must have been a bitter disappointment.

The sessions which followed, with the notable exception of "Energy Conservation and Innovation" by Dr F J Clarke, BSc PhD FInstP bore little relationship to the immediate, or even medium-term needs of the Health Service.

I accept that this was the final Seminar of a series and a lot of ground has been covered. However, I feel strongly that this should have been the showcase of the undoubted ability and drive that exists in the Health Service.

Instead it turned out to be an esoteric discussion of EEC loans, why heat pumps sell better in Europe than Britain, and the fond hope that we can persuade patients and staff that 66F° is warm enough to recover and work in.

A W Schaffel
30 Brandreth Drive,
Parbold,
Nr. Wigan,
Lancs.

Winner Class 2

The author is the Foreman Engineer at Bristol Royal Infirmary. This paper was the Winner in Class 2 of the Hospital Energy Conservation Year Competition.

Use of Land Water for Low Grade Heating/Cooling Source at Bristol Royal Infirmary

R C AMES

At the present time, land water filters into the sub-level ducts at the above hospital at two main points. The water is collected into sump pits and, at periodic levels, pumped into the surface water drainage system.

Consideration was originally given to using the water as a 'top up' to condense tanks for boiler feed water and a water analysis was obtained. Unfortunately, as can be seen from the enclosed copy of the analysis, the water was far from being suitable for this purpose.

However, the possibility of using the water for a low grade heating/cooling medium was considered and the first task was to find an air handling plant within the locality of the sump pits for this use. The plant considered for this particular exercise was a new unit about to be installed for the Pharmacy area of the hospital. The plant consisted of the following:

Preheat Section capable of raising 6 cu.m/sec. of air from -5°C to +10°C when supplied with steam at 2.75 bar.

Filter Section — automatic roll unit with face velocity of 2.8m/s tested in accordance with BS 2831 using test dust No. 2 at 98% efficiency.

Cooling Section — direct expansion dual circuit coil capable of reducing 6 cu.m/sec. of air from 28°C db/19°C wb to 11° db/100°C wb when supplied with R 22 evaporation temperature 7.78°C.

Reheat Section — capable of raising 6 cu.m/sec of air from +10°C to +30°C when supplied with steam at 2.75 bar.

Fan Section — Centrifugal unit with duty/standby motors capable of handling 6 cu.m/sec of air, against a system resistance of 600N/m^2.

The refrigeration circuit consists of:
A compressor/receiver unit with unloaded start facility capable of 50 ton refrigeration on a 50%/75%/100% arrangement. Because the system handles 100% fresh air, a hot gas bypass arrangement is also fitted;
An air cooled condenser unit capable of 210 kw T.H.R. At 15°c T.D. fitted with head pressure control.

Many considerations (at this stage) had to be taken into account:

a) manner in which system was to be applied;
   air/water spray arrangement;
   heat exchanger;
   heat pipes;
   air battery;
b) physical size of installation
c) performance
d) effect of installation on performance of unit
e) water storage
f) pay back period

Application

It was decided that an air battery would be the most suitable as there would be sufficient room to 'slot' into the unit an additional battery at minimum cost outlay.

Performance

In order to size the additional battery the following figures were considered:

Land water temperature — 16°C (steady state summer/winter)
Air flow to be handled — 6 cu.m/sec.
Design temperatures:
summer 28°cd.b./19°c w.b;
winter — 1°C (slightly less than plant design condition i.e. -5°C);
Battery resistance:air;
water.

From manufacturers data (Biddle Ltd) a battery sized to suit the plant, 1828mm wide x 1400mm high, 6 row, will give the following results:
Summer 28°C — 19°C off coil;
Winter -1°C — 10.4°C off coil;
battery resistance 66 pascal.

(In view of the foregoing the pre-heat section of the plant could be removed to accommodate the additional air resistance.)

Water flow rate requirement of the primary medium 5.3 kg/s at 16°C.

Water Storage

The land water flows on to the existing sumps at approximately 1.0 kg/s — considerably less than the required flow.

Due to the 'off' coil conditions it was detemined that the coil would only be in use for approximately 4 hours per day, thus requiring 77,040 litres.

Flow rate into the sumps per day 86.400 litres, thus storage requirements say 80 cu. metre.

The sump layout at the moment is situated at the base of an inclined subway, drop being 2 metres in 10 metres linear run. Therefore, the subway could be allowed to flood to a maximum depth of 2 metres without affecting other services giving a storage capacity:

Length of inclined part of subway	20 metre
Width	2 metre
Water height	2 metre

= 80 cu metre — the required storage.

The existing submersible pumps would remain in position with the float controls being revised to accommodate the revised water level. A pump would be situated within the plant room rated at the battery/pipework requirements with exit water from the coil being passed to drain — as with the existing sump pumps.

Control

Control would be by a simple dual stage detector situated in the plant intake switching on the pump when required, i.e.:
Winter — between -1°C -10°C
Summer — between 28°C -19°C.

Complete with override switch to accelerate pumping down off the subway for maintenance requirements.

Saving

The project savings have been estimated as follows:

Winter
(M.C. Δ+)
= approx. 70 kw/hr. = 280 kw/day
Steam saved 955 lb.
Hospital cost for raising 1000 lb/steam = £3.20
Winter period 36 week @ 6 day/week
= Maximum saving £691.20

Summer
Approximately 55 kw/hr = 220 kw/day
Electricity saved (125% factor refrigeration) = 275 kw/day
Hospital cost per unit 2.8p = £7.70
Summer period 16 week @ 6 day/week
= Maximum saving = £739.20
Total yearly saving = £1,430.40.

Installation Cost

Linking 2 sumps, 20 metre run	£120
New pump & control	£300
Revised float control	£175
Pipework & fittings sump to battery	£600
Battery cost & installation	£1,700
Setting to work	£100
	£2,995

Payback Period = 2.1 years.

The author, who is Market Manager for Honeywell Control Systems, gave this paper last October at the Royal Festival Hall as part of the Institute's 3rd Symposium on Hospital Energy Conservation.

Building Management Systems in the Hospital Environment

A P GRAY

The problems of efficient management of energy in hospitals, particularly for older sites, can be somewhat different from those experienced in many other building types. The size and diversity of the plant, as well as the widespread nature of the size, the effort required to start and stop plant, gather data, monitor plant performance and check for malfunctions, as well as to perform calculations and adjust plant for maximum efficiency, rapidly makes good energy management difficult.

The use of Centralised Building Control Systems has been providing an economic solution to this problem for some years, and many major hospitals constructed in the last decade have incorporated a centralised system in one form or another.

Centralised Energy Management Systems

There is nothing new about the concept of centralised control systems for building services. First intro-

duced in the early 1950's in the USA and in the UK just a few years later, such systems, known initially as Building Automation Systems, have been installed in an increasing number of hospitals. Until the early 1970's, these systems were considered viable only for large new construction projects, where the relatively bulky wiring required was easily installed during building construction and the building maintenance staff had not yet been hired. Installation costs in the existing hospitals were much higher and labour savings not so easily realised. Energy was so low in cost, that saving it was not a consideration.

Two factors have completely altered this situation. The first is the escalating cost of energy and the resulting high financial reward from reducing consumption. The second is the emergence of the microprocessor, which has significantly reduced the costs of centralised systems, whilst greatly increasing their power and flexibility.

Today's Building Management System makes extensive use of micro-electronics and digital transmission techniques and, by its energy saving potential alone, is now a viable proposition in many hundreds of hospitals.

Typically, the Building Management system can be broken down into six basic hardware elements:

Sensors and Actuators

Data Gathering Panels

Transmission System

Central Processing Unit

Man/Machine Interface

Peripheral Devices

Sensors are the eyes and ears of the central system. They need to be carefully selected and applied to be sure that the computer system is being supplied with meaningful and accurate data. Sensors can be categorised as being of two types, binary, and analogue. Binary sensors respond to a change from the normal condition by either opening or closing a set of contacts. This contact operation provides input information to the data gathering panel. Analogue sensors provide a signal in the form of a voltage, current or frequency, which is proportional to the actual value of the sampled medium. As opposed to binary sensors, which can provide only two discrete pieces of information (open or closed), analogue sensors can theoretically transmit an infinite number of signals, each representing a specific value of the measured variable.

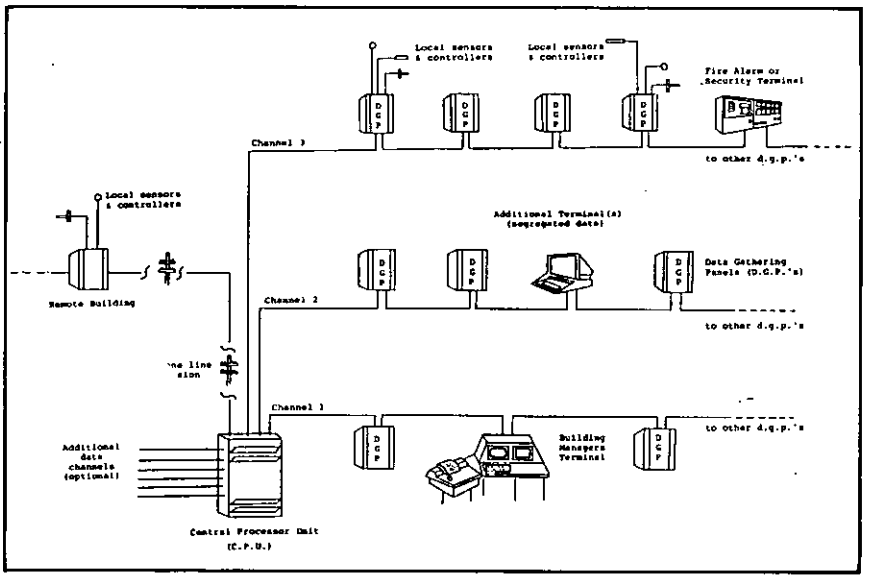


Figure 1. The structure of a typical centralised Building Management System.

Binary sensors are used primarily as alarm or status sensors, for example, to indicate plant trip conditions. Typically, analogue sensors would be used to measure temperature, pressure, humidity, flow, KW, etc.

In addition to sensor inputs, the remote elements of the central control system must also be capable of operating and adjusting the hospital plant and services in response to commands issued by either the central computer or the system operator. Actuating devices of various types are used to provide these output signals from the central system. The most common of these is the output relay, which provides a 2-position or 3-position output to cause plants to start or stop, valves to open or close, and so on. Other output devices, such as motorised potentiometers, are often used for resetting control point settings and positioning valves, for example.

The next hardware element is the data gathering panel, which provides the interface between the input and output signals and the transmission line. The remote sensors and actuators are connected to the data gathering panel using conventional wiring techniques. These signals, which are being received by the data gathering panel in parallel, must be sorted and arranged in some sequence in order that the data can be sent over the transmission line, since this normally consists of a single pair of wires or a telephone circuit. This is called paralled/serial conversion. Data Gathering Panels are increasingly microprocessor-based in today's Building Management Systems.

The transmission system serves as the communication link between the central processor unit (CPU) and all remote data gathering panels. Serial transmission methods are usually employed, to allow the use of a 2-wire line, thus greatly reducing wiring costs as well as making the system compatible with telephone transmission methods.

The central processing unit (CPU) is now frequently built around a microprocessor. The CPU is the heart and brains of the system, and continuously gathers information from all of the data gathering panels via a scanning technique and then processes the collected information. It extracts raw data from the transmission line and converts it into information that is meaningful either to the operator or to some automatic program in the CPU. The central processor consists of three major elements, the transmission interface, the micro-computer and the random access memory. The transmission interface is used for communication with the outside world, whilst the random access memory stores the operating system software and data file. The operating system software (OS) is really the 'brains' behind the system, and today standard, proven software packages are available for many applications, including:

Plant Monitoring
Data Logging
Energy Management
Plant Efficiency Profiles
Meter Reading and Auditing
Maintenance Programming
Fire Management
Security Surveillance
Card Reader Access Control
Patrol Tour

and many more, with new programs continuously being developed. The data file portion of the memory is used to store specific information about the points connected to the system. It includes times at which plants should be started and stopped, occupancy patterns for the buildings, targets for maximum demand control, etc. etc. All this information is stored in the data file, with current data regarding plant performance as collected by the CPU in its scan mode. The microprocessor itself is controlled by the operating software, which continuously draws on information stored in the data file to perform its allotted tasks.

The fifth element of the system is the man/machine interface. This device enables the system to communicate with the operator in a comprehensible form. Also, the operator must be able to request data from the system, to give commands to equipment being controlled, and to program or modify software in the CPU.

Finally, there are the peripherals. In reality, the distinction between the peripherals and the man/machine interface is rather a fine one. Peripherals are usually enhancements to the system which provide additional information, improve operator understanding, or provide permanent records. In this category are such devices as visual display units, printers and annunciator (pilot light) modules.

Standard Software Packages for Energy Management

Most of today's computer-based energy management systems offer a range of standard software packages designed to optimise plant performance. Typical of these is the optimum start program, where the start and stop commands to control heating plant operation are made on the basis of weather conditions and room temperature as well as the time of day.

A demand control program is also available to reduce peaks in electrical demand. These peaks can result in high demand charges by the Electricity Board, the charges often being imposed for a complete year even if the demand only occurs once. The system reduces peaks by shutting-down selected low priority equipment, whenever it forecasts that actual demand will exceed a pre-determined level.

Other standard software programs giving optimum control of refrigeration, ventilation, lighting and other plants can be incorporated to suit particular application needs.

The result is a flexible and modular system which can be tailored to suit the energy management needs of hospital buildings of varying size and complexity.

Typical Energy Management Software Programs

Fixed-time Start/stop
Optimum Start/stop
Load Cycling
Maximum Demand Control
Lighting Control
Boiler Optimisation
Chiller Optimisation
Re-Heat Control
Enthalpy Control

System Costs and Typical Payback

Centralised building control systems have been successfully applied to hospitals from 100,000 sq. ft. of floor area up to 2 million. The size and complexity of the systems vary considerably, and typical costs range between £20,000 and £250,000 depending on the number and type of data inputs and plants to be controlled, as well as the operating programs required.

Until recently, such systems were usually justified on operational and maintenance savings as well as increased operating efficiency, with typical pay-back periods of 3 to 5 years. Today, a system of centralised control can be justified on energy savings alone. Pay-back periods as short as 12 months have been experienced, but 18 to 24 months is common.

Integration of Other Services

The computer-based central system allows the integration of energy management, fire alarm, fire management (including automatic fan and damper control) and security systems into a single unit. The system remains aware of all sub-system activities and needs, assessing priorities and resolving conflicts that may arise.

All activities are synchronised as a single system. Too often, mechanical systems, fire alarm systems and security systems are designed separately with no overall co-ordination. With the central system approach however, all the building elements can work together forming an integrated system to provide a high level of comfort, safety and efficiency.

Energy Management Systems for Large Hospital Site — Economic Evaluation

Delta 1000 Energy Management System, including hardware, software, design engineering and commissioning		£60,000
Installation		£30,000
	Total installed cost:	£90,000
Annual Savings		
Electrical Energy		
Gas		
Oil		
	Total savings:	£80,000
Annual Cost		
Delta 1000 System Maintenance		£ 5,000
	Nett annual savings:	£75,000

Return on investment 85 per cent per annum
Payback period 14 months

Winner Class 3

The author is the Sector Administrator of Lancashire AHA, and his paper was the winner of Class 3 of the Institute's Energy Conservation Competition.

The case for A District Energy Conservation Policy

and a sample document

A K SMALL

Over recent years, considerable attention has been focused on the need for energy conservation, resulting in a proliferation of campaigns to "Save It", reinforced by earmarking block allocation funds for technical improvements and other schemes.

Whilst substantial savings can accrue from such measures, there is the risk that efforts might become sporadic, due to implementation on a piecemeal basis.

The attached document is an attempt to consider the issues in a comprehensive manner, by means of a District policy for energy conservation. It is not suggested that the contents lend themselves to adoption as a "package" throughout the NHS, as local factors must always be fully recognised, but it is argued that the method has the following advantages:

A policy agreed at District Management Team level should ensure that due priority is given to energy conservation, and should enable a consistent approach to the topic;

Emphasis is placed upon multi-disciplinary involvement;

There is an attempt to clarify the responsibilities of all staff, both from an individual and collective aspect;

Attention is focused on energy conservation at a number of different levels, and the need to earmark both manpower and financial resources is highlighted;

A return-on-investment system is advocated, to emphasise the importance of incentives, involving the publicising of savings and identification of improvements to patients services which can accrue as a consequence.

It would be naive to suggest that a policy provides more than a framework for a successful approach to energy conservation measures, and results will be dependent upon conscientious and efficient implementation. However, in the author's view a comprehensive policy is a prerequisite to specific action, and whilst particular points might be considered contentious, it is hoped that the method in general will be afforded support.

Introduction

The District Management Team recognises the importance of energy conservation, both in the national interest and as a means of obtaining financial savings for diversion into patient care.

Aim

To endeavour to consume minimum levels of energy, both in terms of quantity and cost, compatible with an adequate service to patients and staff.

Method of Approach

Responsibilities

To clearly identify responsibilities:

It is extremely desirable that one person have specific duties on energy conservation from the technical aspect and to stimulate and oversee progress in related areas. The case for such a post of Energy Conservation Officer is described later;

Other specific staff, e.g. Works Department from a technical aspect; District Works Officer/District Planning Officer in respect of new developments; and particular staff involved in 'good housekeeping' checks, e.g. 'security' porters and evening domestics;

Sector Energy Teams comprising engineering, nursing and administrative representatives as a 'core group' with co-option as appropriate to initiate and monitor a 'Save It Campaign' and increase staff awareness to energy factors;

All staff, including the possibility of 'Energy Wardens' if considered appropriate, for all departments.

Energy conservation responsibilities will be incorporated in job description as applicable.

Planning

A high priority will be given to energy conservation schemes which will be subject to detailed cost benefit analysis including consideration of 'payback period';

Full consideration will be given to alternative sources of energy and cost implication at planning stage of appropriate schemes;

Due regard will be given to energy conservation matters in designing patterns of work and departmental policies;

An approved list of energy conservation fittings and equipment, e.g. double glazing, radiator valves, spray taps etc., will be incorporated in all schemes. A 'special case' will need to

be demonstrated to amend recommendations;

Energy consequences of change in use or redundancy of rooms or buildings will be considered in advance. Agreement will be reached regarding suitable forms of heating etc. and steps will be taken in respect of isolation or reduction.

The District Energy Savings Campaign

This will be mounted in the following form:

Implementation will be delegated to Sector Officers in formal teams comprising Engineering, Nursing and Administrative staff acting within policy guidelines with District support as required;

Staff interest and commitment will be harnessed via existing channels, e.g. District and local Newsletters; suggestion schemes (possibly exclusive to energy savings); heads of department; Staff Representatives and appropriate District meetings;

Education of staff will take place by providing information on achievements to date, future proposals, financial costings, usage summaries, appropriate visual displays of consumption and basic 'Save It' details;

All staff (possibly complemented by departmental Energy Wardens) will be requested to identify areas of perceived wastage for reporting as below;

An 'Energy Audit' should be initiated in all departments, with special emphasis on corridor and circulation space including:

Local agreement of acceptable temperatures for specific areas based on national recommendations;

Attention to feasibility of heating adjustment to ensure a prompt response to changes in external conditions;

Identifying source of energy loss, e.g. doors and windows;

Consideration of 'out of hours' energy requirements, taking into account health and safety factors and ensuring adequate 'switch off' arrangements.

Heads of Departments will collate findings for transmission to the Sector Team for action. Local minor items will be processed within existing systems but more significant points will be submitted in the form of a report to the Planning Executive.

Manpower

It is recognised that increased attention to energy conservation matters will affect the workload of many staff. In general it is hoped that this will be absorbed within existing staffing arrangements but it is imperative that prompt managerial attention and action be given to identified deficiencies. Consequently, any exceptional manpower implications should be considered by the Manpower Review, if necessary.

It is vital that manpower resources be allocated to:

Provide basic details for staff information and education;

Act upon feasible and economically viable recommendations from all users; and

Monitor progress and maintain a stimulus to on-going effort.

At the end of this paper I outline a recommendation for a post of Energy Conservation Officer to initiate action and includes a proposal for longer term involvement by Technical Officers.

Financial Considerations

It is acknowledged that to effect substantial savings a financial investment is required. Cost reduction can be achieved by a 'Save It' or 'Switch Off' campaign but there is a need to:

Respond speedily to staff suggestions;

Have a budget for equipment consequences of recommendations;

Earmark specific funds for schemes including the block allocation for energy conservation;

Provide literature associated with campaign;

Give an incentive to staff whereby a proportion of saving can be identified as contributing to particular aspects of service rather than absorbed in a general budget.

A Recommendation for an Energy Conservation Officer

Considerable short-term energy savings can be achieved by a publicity and 'Save It' campaign. However, it is suggested that such efforts tend to lose impetus unless there is:

Continual attention focused on the issue;

Efficient co-ordination and dissemination of information to users;

An incentive to staff;

A mechanism for prompt evaluation of suggestions from whatever source.

Whilst it is extremely desirable that 'good housekeeping' practices are observed it must be conceded that more significant savings are achieved by technical in-put at planning stage and on day-to-day improvements. To some extent such duties are associated with existing Works Department posts but inevitably the holders are diverted into other areas of priority with limited time devoted to energy conservation.

It is argued that energy conservation lends itself to an accurate assessment of financial viability which does not appertain in other disciplines. Bearing in mind that the aim is to effect savings with a view to the extension of services in other areas, i.e. investment in an Energy Conservation Officer should enable expansion of direct patient services, it is recommended that consideration be given to the creation of such a post on a short-term contract with specific financial targets. It is hoped that such an appointment would be funded for an adequate period to enable the establishment of an information system, undertaking major audits, the production of a good practices manual and response to initial energy conservation suggestions. A twelve month contract is regarded as a minimum for this purpose.

Following withdrawal of this post an existing member of the Engineering staff should assume on-going monitoring functions etc.

Under both methods of staffing, a six monthly report for the District Management Team will be prepared outlining achievements, financial consequences and problem areas.

Conclusions

Continuing energy savings can only be achieved by all staff becoming aware of the importance of this issue and being committed to effecting economies. Strong direction is required to change attitudes, supported by adequate information systems and monitoring devices. The possibility of a short-term impact declining into a loss of interest must be avoided by means of preventive measures being incorporated into the system.

The author is the Market Development Manager of Fibreglass Limited. He gave this paper at the second Symposium on Hospital Energy Conservation, held in June last year at the Institution of Mechanical Engineers.

Insulation of Mechanical Services

J GILLETT BSc MBIM

Insulation standards today receive more professional attention than formerly. No longer is it necessary to engage upon a tortuous justification of the need to insulate properly, and the approach to specification can therefore be made in a dispassionate manner.

The successful insulation application depends both on correctly specifying and supervising the installation. A number of factors can affect the end result fundamentally, and must be borne in mind in the early stages. Computer-aided calculations have produced tables which can give rapid answers for the full variety of temperatures, fuel costs, heating regimes and evaluation periods in question. For hospital work the 1979 standards are thoroughly up to date and easily modified if circumstances change.

Having allocated insulation thickness to an individual pipe or duct is now much more important than before that the consequence of this is allowed for in service drawings. A space of 50mm must be left between finished, insulated pipes if application and maintenance are to be satisfactory. Service ducts, hangars and fittings must all be designed with this in mind.

Fire Requirements

Non-combustibility, spread of flame, and very low smoke and fume emission can all be provided by specifying the right products. For hot and cold services, for thermal and acoustic insulation on ducts, pipes or boilers, mineral fibre (made from glass or rock) can provide the base material. In combination with metal cladding in plant rooms and aluminium foil based laminates for other areas, a consistent standard can be maintained throughout the hospital.

In order to reduce the need for cavity barriers it can be worth specifying insulation finishes which achieve Class 'O' of the *Building Regulation 1976.* The applicability of such a requirement varies with fire authorities according to region but should be checked at an early stage.

Maintenance

For surfaces in hospitals easy maintenance is vital. Modern insulation finishes, whether site-applied sheet metal or factory aluminium foil based laminates, are washable and need no painting. Where services run in vulnerable positions, finishes must be upgraded in mechanical strength to avoid damage.

Condensation Control

Water vapour in the atmosphere will readily condense on cold pipes or ducts, causing damage and health risk. A vapour barrier on the warm side of the insulant is essential. Again, aluminium foil based finishes provide the solution, with additional mechanical protection if necessary.

It is most important to correctly specify sufficient width of a reputable tape to seal the inevitable joints in the finish. For duct insulation 100mm wide tapes are necessary, for smaller pipes 75mm is acceptable. 50mm width, when allowing for site practise, does not provide sufficient adhesive area except on bends where considerable overlap occurs. The tapes may either be 'dry' laminates, to which adhesive is brush applied, or they can be dead soft aluminium with a self-adhesive coating. Recommendations should only be accepted from manufacturers prepared to back up their claims in writing.

Application

Having prepared a reliable specification it is necessary to monitor its interpretation by the contractor carefully. If alternatives are offered do they fully match the intended performance? Two aspects are worth particular attention.

Firstly some imported insulation materials are offered. Whilst being satisfactory in their home markets, which traditionally combine a 'soft' insulant with a rigid or semi-rigid site applied finish for all areas of a building, they may not be very suitable when combined with the laminate/tape applications in the UK.

Secondly, there are many self-adhesive tapes available, variously suitable for sealing anything from Christmas presents to leaks in oil tankers. The sealing of joints in insulation facings is a specialist problem, frequently undertaken in adverse conditions. It is advisable, having ensured the initial specification of a reputable material, to view cheaper alternatives later presented with some caution.

Supervision

The correct application of the correct thickness of the specified material is a comparatively straightforward, if sometimes tedious, matter. A frequent source of trouble is again in connection with tapes. Even with the best tape of the correct width, the operative is vital in ensuring a satisfactory job. Surfaces to which tapes are to be applied must be clean and dry. If dust is present, as is often the case, then the finish may need cleaning before taping. Simple remedies such as vinegar or lemon juice provide useful and safe cleaning aids, provided the surface is then allowed to dry. Finally, when applying self-adhesive tape to its intended surface, it must be **pressed down firmly**, since the adhesives are pressure sensitive.

This article has attempted to provide some guides to pitfalls which await the unwary. Insulation is a continually developing field, with new products appearing regularly, many being improvements whilst others may just be commercial alternatives. By keeping in mind the simple objectives which determine the standards and types of materials to be used, a pattern emerges which can lead to the best all-round specification. Reference to the membership list of *The Thermal Insulation Manufacturers and Suppliers Association* can provide many contacts worth following up for the wide variety of materials involved.

Classified Advertisements

APPOINTMENTS AND
SITUATIONS VACANT

DEPARTMENT OF HEALTH AND SOCIAL SECURITY
COMPONENT DATA BASE (CDB)

STORAGE SYSTEMS FOR HEALTH BUILDINGS

The Department's advertisement of June 1980 invited submissions of trade literature relating only to proprietary units of board construction in Group A below, and those firms which responded have been informed of the outcome.

This advertisement relates to a second stage, foreshadowed in the June advertisement, based on the Department's outline design and specifications.

Firms who are interested in being listed in the CDB as manufacturers of any of the groups of components set out below are invited to apply for the necessary enquiry forms.

Group A: **Enclosed storage units in board and/or sheet metal construction, comprising:**
specially designed cupboards for general storage: drug cupboards: lockers and wardrobes: underbench mobile cabinets.

Group B: **Open storage units in plastic coated wire comprising:**
shelves: racks: baskets.

Group C: **Open container units in plastic, comprising:**
trays: tote boxes: tubs.

Group D: **Services appliances comprising:**
worktops in steel, aluminium, wood and laminates: mobile work benches in wood or metal: gondolas in wood or metal: stainless steel sinks: flexible plastic water and waste services: metal control valves.

Applications should be made not later than 31 January 1981 to the address shown below, stating the Group(s) in which the applicant is interested.

DHSS, CDB Office, Room 614, Euston Tower, 286 Euston Road, London NW1 3DN.

Applicants will be invited to attend a presentation and discussion of the new storage system to be held in London early in 1981.

Napsbury Hospital Near St Albans Herts
Senior Engineer

(Male/Female) at this 1000 bedded Psychiatric Hospital

You will be responsible for the operation & maintenance of all electrical and mechanical services including a modern steam raising plant and laundry.

You must have completed an apprenticeship in mechanical or electrical engineering and possess a Higher National Certificate in mechanical or electrical engineering, together with 5 years relevant experience preferably in the hospital service.

Salary scales £7,349 — £8,423 p.a. including London weighting, plus incentive bonus.

Application form & job description from Personnel Department, 1 Wellhouse Lane, Barnet, Herts. Herts. 01-440 5111 ext 450 or 01-441 4568 (24 hour answering service).

BARNET/FINCHLEY
Health District
Barnet Area Health Authority

Haringey Health District

Senior Engineer

For Prince of Wales and St Ann's General Hospital

Only mature applicants with a minimum of 5 years experience in heating, ventilating, electrical work and those services normally found in a busy general hospital will be considered for this appointment. The successful applicant will be responsible for managing the direct labour force at 2 hospitals, with their associated clinics etc, and will also assist the District Works Department in the control of minor capital work schemes.

Qualifications required are as laid down by the DHSS and are as follows:

HNC in either electrical or mechanical engineering with ans endorsement in industrial administration or a City & Guilds certificate 293, 255, 281 or 57 also with similar endorsement.

In addition to this, the successful applicant will have a proven record in administration and man management as well as practical engineering.

Salary £7349 rising to £8423 inclusive with a percentage of the staff bonus scheme (currently 10%) plus extra payment for any on-call or overtime commitments.

Application forms and job description from District Works Officer, Haringey Health District, Mountford House, The Green, Tottenham, London N15 4AN.

ESSEX AREA HEALTH AUTHORITY
BASILDON & THURROCK DISTRICT

SENIOR ENGINEERING OFFICERS (2)

Vacancies exist for 2 Senior Engineering Officers, one at Orsett Hospital and one at South Ockendon Hospital, responsible to the District Engineer for the operation and maintenance of these hospitals and their associated properties.

Applicants should hold an HNC in Mechanical or Electrical Engineering, or an acceptable equivalent, together with a recognised qualification in Industrial Management.

Salary scale £6,822 rising by five increments to £7,896, plus £141 per annum Outer London Weighting, plus bonus allowance as applicable.

Application form and job description are available from the District Personnel Officer, Basildon Hospital. Tel: Basildon 3911, Ext. 3606. This is a re-advertisement, previous applicants need not apply. Closing date, 23rd February 1981. Unsuccessful candidates will not be notified.

Munich invites you

The Largest Medical Equipment Fair in the World

Interhospital '81

Munich, 19-22 May 81

Exhibits:
Medical technology, Technical supplies, Hospital facilities and equipment, Large-scale kitchen facilities, Laundry and drycleaning, Institutional supplies, Foodstuff, Textile goods, for hospital usage, Services

11th German Hospital Meeting with the general theme "The hospital in the 80s"

Interhospital '81 - please send information to:

Name:

Address:

Information: Münchener Messe- und Ausstellungsgesellschaft mbH, Postfach 12 10 09, D-8000 München 12, Tel. (089) 51 07-1.
ECL (Exhibition Agencies) Ltd., 11 Manchester Square, GB-London, W1M 5AB, Tel.: 486-1951

Institute of Hospital Engineering 1981 Seminars

The Institute will be holding several seminars this year. Brief details of the first two are given below:

JCT Contract 1980 and the Engineer

Wednesday 18th March 1981
Institution of Civil Engineers,
Great George Street,
Westminster, London SW1

Accommodating the Disabled

A Symposium to mark the International Year of Disabled People
Royal Festival Hall, London SW1
Wednesday 29th April 1981

Full programme details of the first were given in our December 1980 issue, and full details of the second will be given in our March 1981 issue.

Application forms from the Secretary of the Institute.