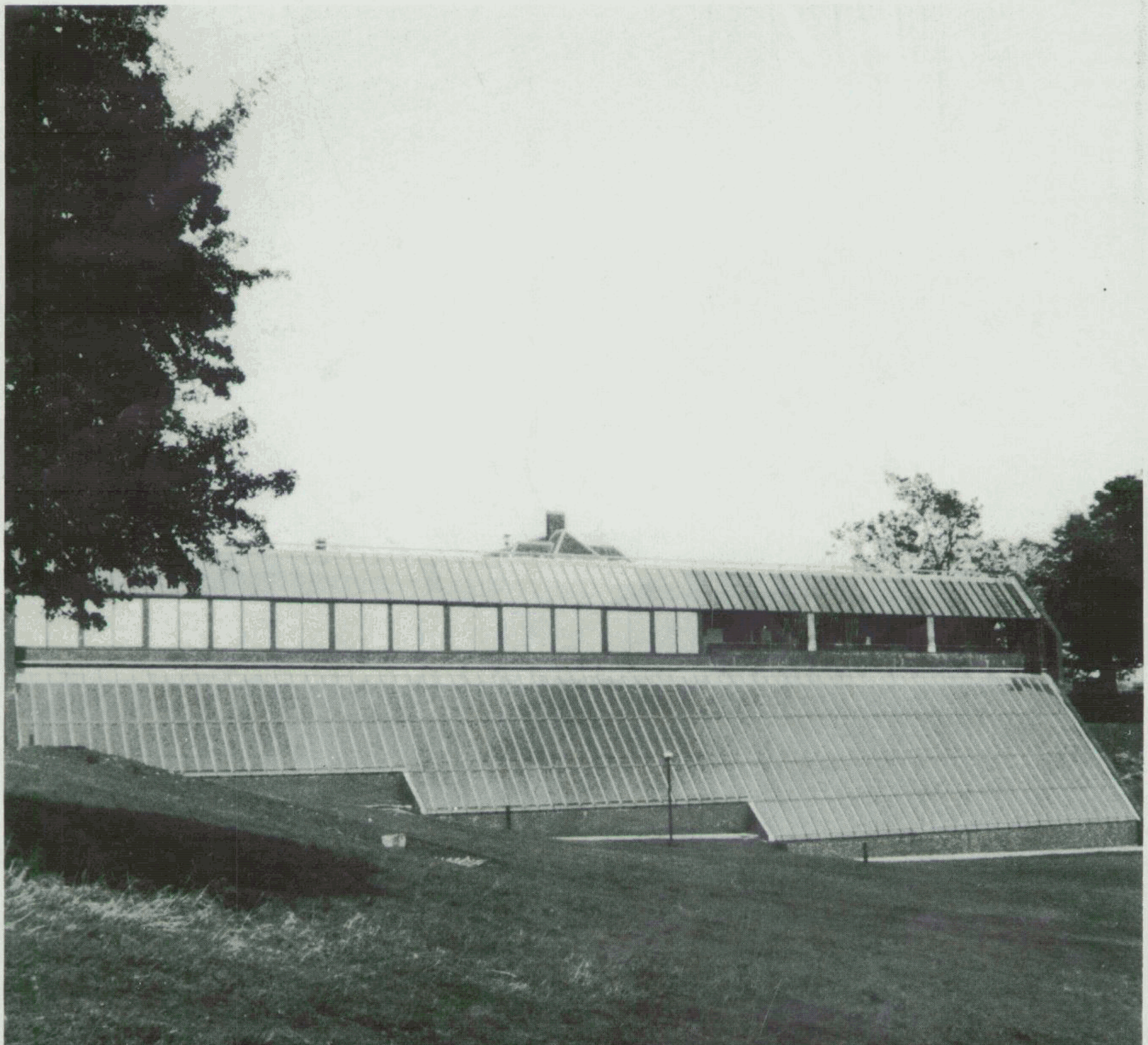
The Journal of The Institute of Hospital Engineering November 1984

HOSPITAL ENGINEERING



Torbay Hospital – its solar energy project

Systems separation is perhaps not the first thing that springs to mind when considering a central heating installation.

The **Ideal Challenger** vertical water heater could be selected for its **fuel saving economy;** its **simple installation, maintenance** and **easy controllability;** or its **outstanding performance.**

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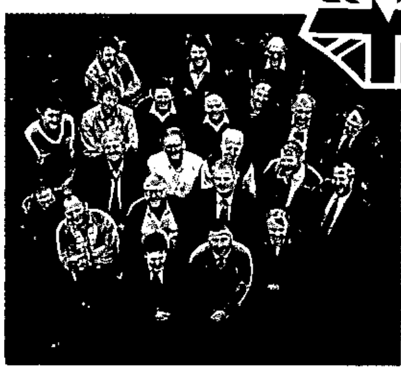

Substantial savings can be achieved as well. A pay-back period as short as one year for the entire system installation is possible.

But when there's no requirement for the boiler to be heated – 'though hot water is needed instantly – that's when the cost-saving advantages of the **Ideal Challenger** with all the benefits of **systems separation** are really appreciated.

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HOSPITAL ENGINEERING

The Journal of The Institute of Hospital Engineering

Volume 38 No 11 **November 1984**

Front cover: Solar energy project at Torbay Hospital

· CHANGE OF ADDRESS ·

As from **Monday 15th October** 1984, the **editorial/management** offices have moved to:

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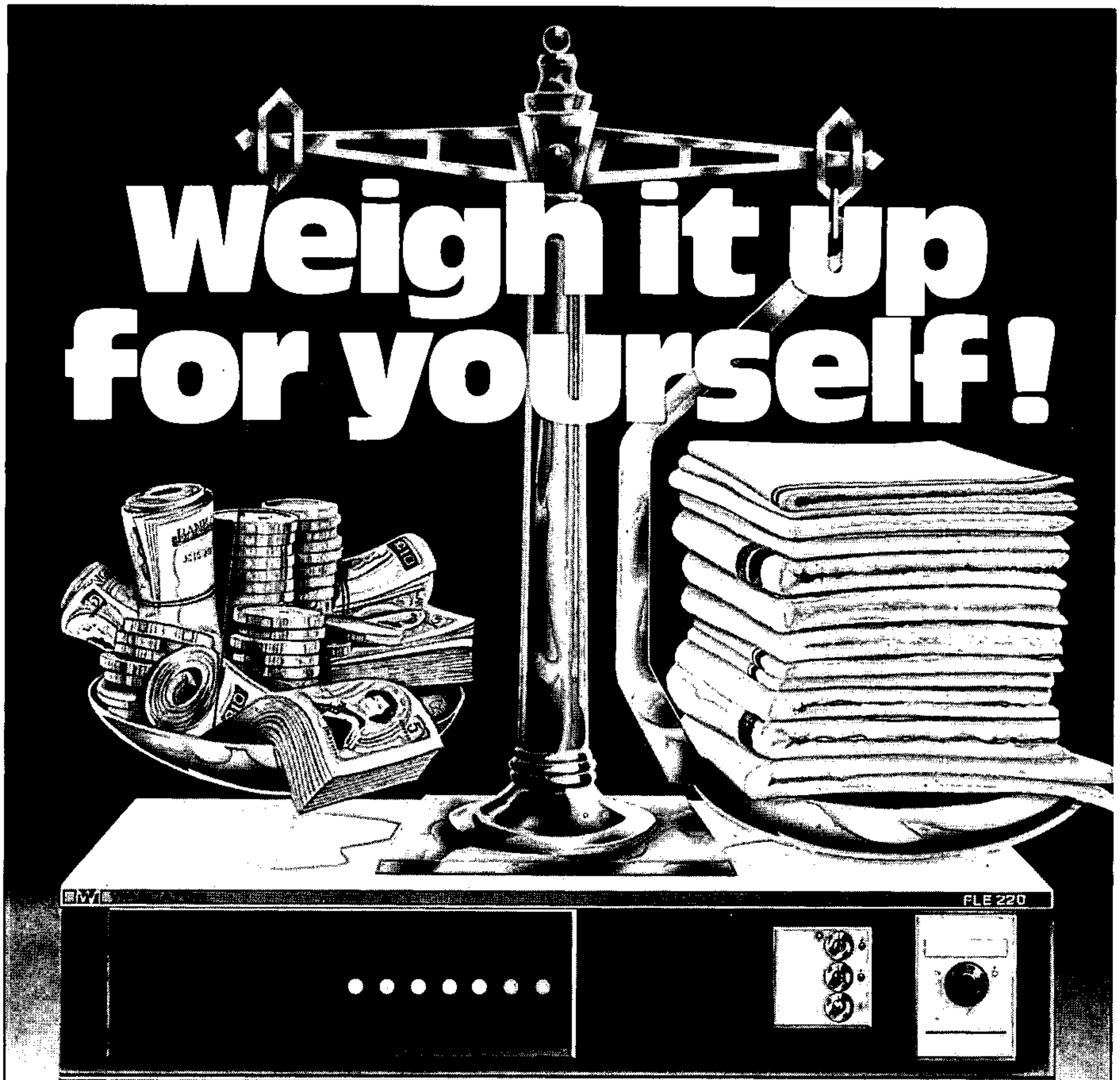

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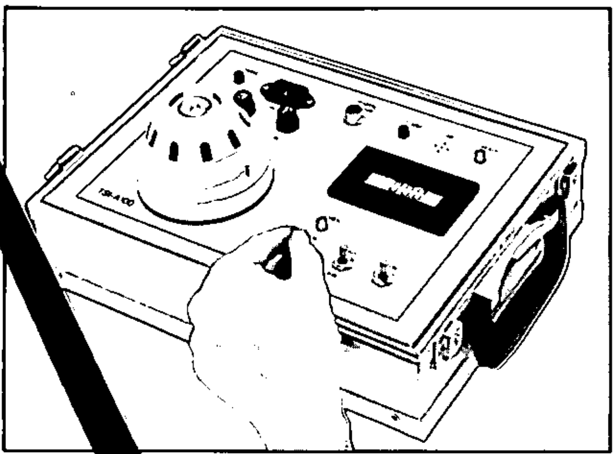
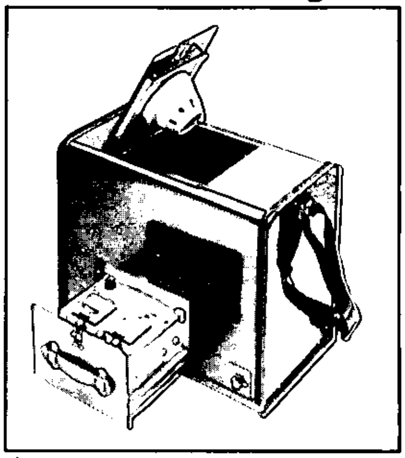


▲ *TSI A100 Smoke Detector Test Meter*



▲ *TSA B220 Smoke Sensitivity Test Unit*

◀ *TSE A100 Smoke Pole*

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Gives service engineers the ability to quickly confirm that the electronic performance of the detector has not changed from original setting. Either ionisation or photoelectric detectors can be tested on this portable unit powered from rechargeable batteries.

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Hakuto — the wisest choice

Talking Point

HENRY WAUGH
Council Member for Scotland MI Hosp E

In April 1973, I joined the Health Service as an Assistant Engineer of a large general hospital in Scotland and within a week the Group Engineer informed me of the Institute and also presented me with details of 'The Keele Course' telling me that I was booked to go in July. Anyone who has been on the course will appreciate how beneficial it is – especially to someone who has only recently joined the service. The organisation of such a fine course is a credit to all involved and it showed me what the Institute could do to benefit its members.

The Keele Course was an obvious introduction to the Institute and I have enjoyed my membership ever since. However I now find that two questions keep being raised both at Council and local Committee level.

These are:–

1) How do we get young people to join?
2) Once members how do we encourage participation?

In this article I am going to dwell more on the second question and it may be helpful to expand the issue.

What is the incentive behind young people joining?

What happens after they join?

Should we re-think our methods?

What can they do for themselves?

The answers to the first part are many and varied and include reasons such as 'my Works Officer is on the Committee and I thought it would be wise to join' 'The company pays the fees anyway' 'I thought everyone joined' and 'I wanted the letters after my name.'

Motivating the above members is obviously a very difficult task but there still remains a large section who appear to be content to receive their certificate of membership and sit back waiting on the journal to arrive. I said 'appear to be' but are they really?

Let us look at what the Institute actually does do. The structure like most organisations is based upon a pyramid with President, Council, Branches, and Members being layers of the pyramid. The main functions of Council are as a governing body and an administrative base for all national items, and as such it organises and co-ordinates activities like the national conference, one day seminars and the production of the Journal. I appreciate that not everyone can attend Conferences and Seminars, no matter how beneficial they may be but the papers presented are reproduced in the Journal. However, The Lucas Scholarship, a fund of which all young members should be aware (details are sent directly to everyone eligible), gives a chance to visit Conference without suffering financially.

The Journal is the main vehicle of the Institute for distributing information to its members. Producing a journal of the quality that the Institute enjoys is no easy task and a lot of effort goes into ensuring a correct balance of content with particular emphasis given to articles which are of benefit to younger members.

To most members the local Branch constitutes the Institute. Technical meetings, lectures and visits are all arranged by them as are various social events. All these events help create a forum for members to mix, exchange ideas and experiences in a less formal atmosphere than may exist at the workplace. The local Committee endeavour to produce a programme of events which will attract as many members as possible, unfortunately they do not see as many young members as they would wish so where do they go wrong and what can be done about it?

Two years ago, an article about the Sorcerers Apprentice was published in the Journal. In this article the author made the observation that it was 'The younger element, the lower echelon that stands to gain most from sitting at the feet of their elders and betters'. The young obviously can gain a lot from other members but they in turn can do a lot to help themselves and the Institute. The Branch Committees are there to represent the members wishes but can only do so if the membership tells them what their requirements are. They need your views, you will be unable to voice an opinion unless you participate and your opinion is needed if the organisation is to be of benefit to you. Presumably that was your reason for joining in the first place.

So if you feel that with some changes your branch could be of more benefit to you, do not just talk about it, do something. Phone your colleagues and get a car load along to the meetings, start talking to people, suggest new ideas and why not get yourself elected on to the Committee where you can start to make constructive changes to mould the organisation to suit your needs.

Remember its your Institute and the younger you are the longer you will be a member, so is it not worthwhile making sure it suits your needs.

Institute News

The Watt Committee

The seventeenth Consultative Council Meeting on passive solar design will be held on Thursday, 6th December 1984, at the Royal Geographical Society, 1 Kensington Gore, London SW7 2AR. It is intended that subject to discussion at the meeting, the informally presented papers will form part of a Watt Committee Report to be published in 1985. The registration form is available from the Secretary, Watt Committee on Energy, 18 Adam Street, London WC2N 6AH. Telephone: 01-930 7637.

Prince of Wales Award

This important award which is given for industrial innovation and production is organised by The Engineering Council, and will be televised by BBC TV's *Tomorrow's World*. The aim of the award is to identify promising new products or processes and encourage the inventor or entrepreneur to get them into production and on to the market as soon as possible. Certificates will be awarded to the finalists chosen in the 'innovation' stage of the competition for the best ideas which make a significant contribution to industrial innovation. The overall winner of the 'production' stage will receive a certificate, and trophy and a cash prize of £10,000. Application forms are available from The Engineering Council, Canberra House, 10-16 Maltravers Street, London WC2R 3ER. The closing date is 31st January 1985.

Subscriptions by direct debit

Members have been advised direct

that Council has agreed to introduce the Direct Debit System in relation to the payment of annual subscriptions.

This system offers the convenience of knowing that your subscription will be paid on time and that you will be spared the constant reminders which are sent to members who overlook the due date. It will also avoid the inconvenience, for those who already pay by standing order, of having to amend the authority when subscriptions change as the system we are introducing allows for variation in the amount without having to issue a fresh authority.

In addition members will be pleased to know that any charge to them made in respect of the Direct Debit System is less than that which pertains to a Bankers Standing Order or cheque.

Council hopes most sincerely that the great majority of members will agree to annual subscriptions being collected in this way. It will greatly facilitate their collection thus reducing the Institute's costs. Council is always anxious, of course, to minimise the Institute's costs in all respects which obviously is to the ultimate benefit of the membership.

Branch officers

Branch Officers, 1984/85, for the Mid Scotland Branch are as follows – Chairman: P Carson, Secretary/Treasurer: S Roberts MIHospE, 4 Cattofield Place, Aberdeen. TN Aberdeen (0224) 29901.

Midlands Branch opening meeting

The Midlands Branch held its first meeting of the 1984/5 season on Wednesday 19th September 1984 at the Post Graduate Medical Centre, Queen Elizabeth Hospital, when Mr L F Turner OBE, PPI Hosp E, Chairman of Static Systems Group, presented a paper entitled 'Bed Head Services – The Start of a New Era'.

The presentation was divided into two sections, firstly giving a brief résume of the history of Static Systems Group, followed by a technical presentation of the new micro-processor controlled patient/nurse call system.

Commencing the technical paper Mr Turner explained that he was currently a member of a study group, formed by the DHSS, the object of the study group being to submit a report on bed head services. The report should ultimately result in a new HTM devoted to bed head services.

The study group consists of:
One DHSS Engineer (Chairman)
One Senior Nurse
Two Engineers from Region
Three Representatives from industry (Static Systems Group, Wandsworth and Cass Electronics)
One Ergonomist

The new micro-processor controlled patient/nurse call system, shortly to be available will comply in all respects with the anticipated HTM and will consist briefly as follows:

a. New power pack

Will be a standard production item for all systems including a micro-processor in the power pack. This will be programmed to cater for each individual system.

b. Bed head unit

Will be rationalised to two standard units; the main difference compared to existing type is that the front plate will be split into LV and ELV sections. This will enable the ELV section to be completely removed for servicing, whilst leaving the LV section completely safe and operative.

ONE DAY SYMPOSIUM
HOSPITAL DEVELOPMENTS – PLANNING PROCEDURES AND CODE OF PRACTICE FOR NHS COMMISSIONS (Capricode/Concode)

at The Institute of Marine Engineers, 76 Mark Lane, London EC

Thursday 6th December 1984

This Symposium affords an opportunity to review the Hospital Planning Procedures (Capricode) and to consider the recently published DHSS document CONCODE and related matters such as Fee Competition, Professional Indemnity Insurance, Certification of Design, etcetera.

PROGRAMME

10.00 Coffee

10.30 OFFICIAL OPENING by L. G. HADLEY ESQ, CEng, FIMechE, FInstE, FCIBS, MConsE, FIHospE, President, The Institute of Hospital Engineering
CHAIRMAN for the day: JOHN BOLTON ESQ, LLB(Lond), CEng, FICE, FIMechE, PPCIBS, FInstE, FCIArb, Hon FIPHE Hon FIHospE, Chief Works Officer and Director General of Works Department of Health and Social Security

10.40 HOSPITAL PLANNING PROCEDURES
A REVIEW OF CAPRICODE – THE NEED FOR CONTROL AND CHANGES LIKELY TO BE INTRODUCED
Speaker: B. K. GILBERT ESQ, BSc, ARICS
Superintending Surveyor Department of Health and Social Security

11.30 AN INTRODUCTION TO CONCODE
INCLUDING APPOINTMENT OF CONSULTANTS
Speaker: F. J. SPEECHLEY ESQ, FRICS, FCIArb
Regional Quantity Surveyor North West Thames Regional Health Authority

12.30 Lunch

14.00 CONTRACTUAL PROCEDURES
FORMS OF CONTRACT, TENDERING PROCEDURES AND DOCUMENTATION
Speaker: B. W. EAST ESQ, CBE, FRIBA
Regional Works Officer North East Thames Regional Health Authority

14.30 FINANCIAL AND CONTRACT CONTROL
FINANCIAL CONTROL AND RESPONSIBILITIES
Speaker: DR. MARTIN BARNES BSc(Eng), PhD, CEng, FICE, FCIOB, MBCS, ACIArb
Martin Barnes and Partners

15.00 PROFESSIONAL LIABILITY
PROFESSIONAL LIABILITY OF CONSULTANTS
Speaker: DR J. F. UFF QC, BSc(Eng), PhD, CEng, FICE, FICArb

15.30 DISCUSSION

16.00 Close

TICKET APPLICATIONS

To: The Secretary, The Institute of Hospital Engineering, 20 Landport Terrace, Southsea, PO1 2RG.

Please send me .... ticket(s) for the ONE DAY SYMPOSIUM entitled 'Hospital Developments – Planning Procedures and Code of Practice for NHS Commissions' to be held on Thursday 6th December 1984.

I enclose £ .... to cover the cost. Ticket to include morning coffee, lunch and VAT.
Member: £40.25. Non Member: £46.

No fees will be returned for cancellations (in writing please) received after midday on Friday 30th November 1984.

VAT Registration No. 339 3963 20

NAME (in capitals please) ....

ADDRESS ....

....

Position ....

Non member (please tick) ....

NB. Please note that tickets are available ONLY from The Institute of Hospital Engineering (TN: Portsmouth (0705) 823186).

c. Patient hand unit

There will be three types:

i) Conventional updated handset
ii) Advanced multiplex handset
iii) Simple 'call only' unit

Mr Turner demonstrated the new multiplex handset; it was interesting to note that the 'ergonomically' designed unit is completely push button controlled for Nurse Call, Radio Selection, Radio Volume and Bed Light Control, and now utilises only a four core cord for connection to the bed head unit and thereby replaces the 19-pin 'painton' plug and socket which has caused many problems in the past. The four core cord requires no more than a standard PO 4-pole jack plug and socket.

Overall the new concept appears most exciting and one can look forward to receiving 'on site' comments following the installation of a pilot system due shortly to be in use by the West Birmingham Health Authority.

The meeting was well attended and all those present had a most enjoyable technical and social evening.

Readers' letters

Dear Editor

Whilst reading an advertisement in the Sunday press for British Telecom shares, I asked myself if it would be seen as ethical for NHS Engineers to purchase any of these shares.

Standing Orders demand that any contracts in which an officer has a pecuniary interest must be brought to the attention of the employing Authority. Since the work conducted between NHS Engineers and British Telecom is voluminous and regular we are presented with a paradox.

Perhaps other readers might like to reply to the cautionary note which I have tried to express in rhyme.

A phoney interest

Now British Telecom at last can sell
their shares to you and me,
They're PLUGGING it in the nation's
press and also on TV.
The stockbroker will BUZZ with glee,
your business to ENGAGE,
You could be part of BT's growth in
'phones and radio page.

But pause awhile before you PAX your
TRUNK with cash for shares,
For engineers in NHS could be
DIALLING their own snare,
Declared interest laid on the LINE we
can't perchance ignore –
When reporting tenders for a job with
BT would do before.

Where do I stand, can I not be a new
BT share hoarder?
As every job I give 'my firm' will
conflict Standing Order.

A. Millington

FORTHCOMING BRANCH MEETINGS

North East Branch: *Hon Sec G Baxter TN Darlington (0325) 460100*

13th November	'Energy Conservation'. South Cleveland Hospital
14th December	Visit to Cameron's Brewery, Hartlepool.

East Anglian Branch: *Hon Sec J A Parker TN Norwich (0603) 611 233*

24th November	'Incineration/Heat Recovery'. West Norwich Hospital

Highland Branch: *Hon Sec M J Shand TN Inverness (0463) 234 151*

November	Visit to Headquarters, Northern Constabulary, Inverness

Southern Branch: *Hon Sec R P Boyce TN Chichester (0243) 781 411*

15th November	Visit to Cathedral Stonemasons and tour to see Cathedral restoration works, Chichester
12th January	Monitoring Patients in the Intensive Care Environment by Dr P L Spreadbury, Queen Alexandra Hospital, Cosham, Portsmouth

North West Branch: *Hon Sec E A Hateley TN Manchester (061) 236 9456 ext 266*

9th November	Jacobean Banquet. Worsley Old Hall
13th November	Visits to British Nuclear Fuel Establishments at Springfields and Risley
5th December	Hybrid Fuels and Specialist Services. Salford University
16th January	Asbestos Removal. St Mary's Hospital

Midlands Branch: *Hon Sec W Turnbull TN Birmingham (021) 378 2211 ext 3590*

21st November	Operating Theatre Air Conditioning 'Sepsis v Energy Conservation'. Post Graduate Medical Centre, Queen Elizabeth Hospital

West of Scotland Branch: *Hon Sec R W Gardner TN Glasgow (041) 204 2755 ext 2710*

6th November	The Low Energy Hospital. Royal Scottish Automobile Club, Blythswood Square, Glasgow
20th November	Future Prospects for Heat Pumps. Royal Scottish Automobile Club, Blythswood Square, Glasgow
13th December	The Role of Hospital Engineering in a Unit Based Estate Management Structure by Mr A Peters. Board Room, Glasgow Royal Maternity Hospital
31st January	Contribution of Clean Air in Operating Theatres and Pharmacies by Mr W White. Board Room, Glasgow Royal Maternity Hospital

London Branch: *Hon Sec P C Vedast TN 01-804 7340*

27th November	Engineering help for the Orthopaedic Patient by Mr Robin Bendall FRCS. National Hospital, Queen Square, London

Please contact the respective Branch Secretary should you wish to attend any of the above meetings.

Environmental Pollution

The Royal Commission on Environmental Pollution invited The Institute of Hospital Engineering to offer a submission to assist it in its deliberation.

The Institute's submission was prepared by E. M. DAVIES ESQ. CEng FIMechE FCIBS FIHospE, Regional Works Officer, South East Thames Regional Health Authority.

Health Care Facilities

Waste categories and their sources

There are eight main categories of health care waste: general, pathological, radioactive, chemical, infectious and potentially infectious, sharps, pharmaceutical products.

General waste includes domestic-type waste, packing materials and non-infectious animal bedding, which do not pose a special handling problem or hazard to human health or the environment.

Pathological waste consists of tissues, organs, body parts and animal carcasses.

Radioactive waste includes solid, liquid and gaseous waste contaminated with radionuclides.

Chemical waste comprises discarded solids and liquids from diagnostic and experimental work, cleaning, housekeeping and disinfecting procedures.

Infectious waste is that containing pathogens in sufficient concentration that exposure to the waste could result in disease. This category includes cultures from laboratory work, waste from surgery and autopsy of patients having infectious diseases, waste from infected patients in isolation, waste which has been in contact with patients undergoing haemodialysis (e.g. dialysis equipment such as tubing and filters, disposable towels, gowns, aprons, gloves and laboratory coats) and waste which has been in contact with animals innoculated with an infectious agent or having an infectious disease.

Sharps include needles, syringes, scalpels, saws, blades, broken glass, nails, and any other items which could cause a cut or puncture.

Pharmaceutical products are waste pharmaceuticals such as drugs which have been spilled, are outdated, contaminated or discarded because

continued on page 18

Solar energy project at Torbay Hospital

This project was the subject of three papers, and a video programme given at the 40th Annual Conference of the Institute at Bristol in May '84. We publish the two papers given by Richard Lewis, and Michael Reynell both research officers at the School of Architecture, University of Bath, and members of the Energy Monitoring and Research Group.

Monitoring – data collection and processing

RICHARD LEWIS MA (Cantab) MSc (Elec Eng) AMICE

1 Introduction

The purpose of the project at Torbay was not just to build a solar water heating system for the new catering complex: it was also undertaken to provide useful feedback for designers and potential users of solar heating systems. The Department of Energy acting through the Energy Technology Support Unit (ETSU) at AERE Harwell, selected the project as a field trial in their programme on active solar heating systems. A Field trial goes beyond a demonstration project by seeking to provide detailed performance data on the system under study to advance the knowledge of designers, so that more efficient systems can be built in the future.,

Bath University was commissioned by ETSU through the South Western Regional Health Authority to undertake the task of monitoring on the Torbay project. The monitoring task included the installation and running of a data logging system, the analysis of the results, and if possible, the mounting and running of a computer simulation model on the system. An unexpected part of the task was to commission the heating system properly. The latter, coupled with hardware faults on the data logging equipment, delayed the start of the useful data collection by 2½ months; however, the monitoring has been successful, including the computer modelling work, and it has produced useful results which are discussed in the accompanying paper entitled Results of Monitoring and Computer Modelling. In addition, other information not directly related to the solar energy study, e.g. water consumption patterns, see figure 1.

2 Monitoring objectives

The primary objective of the monitoring was to produce accurate and useful data about the performance of the solar water heating system at Torbay. This objective encompasses the whole flow of information from the sensors installed in the heating system, to the printed results in reports and papers. If any one part of the data collection and processing function does not match the other parts, then the monitoring objective cannot be fully achieved. But it is also necessary for the solar heating system plant to function properly; so correct commissioning and efficient maintenance of the plant, although not directly part of the monitoring task, is of great importance to the achievement of the monitoring objectives.

In the process of achieving the primary monitoring objective it is necessary to fulfill a number of secondary objectives:

(a) to select and install sensors;

(b) to run a data logging system;

(c) to provide data analysis facilities;

(d) to undertake a computer model simulation.

3 Description of the data collection and processing systems

The sensors (transducers) mounted in the heating system provide the raw data input to the data logger, which

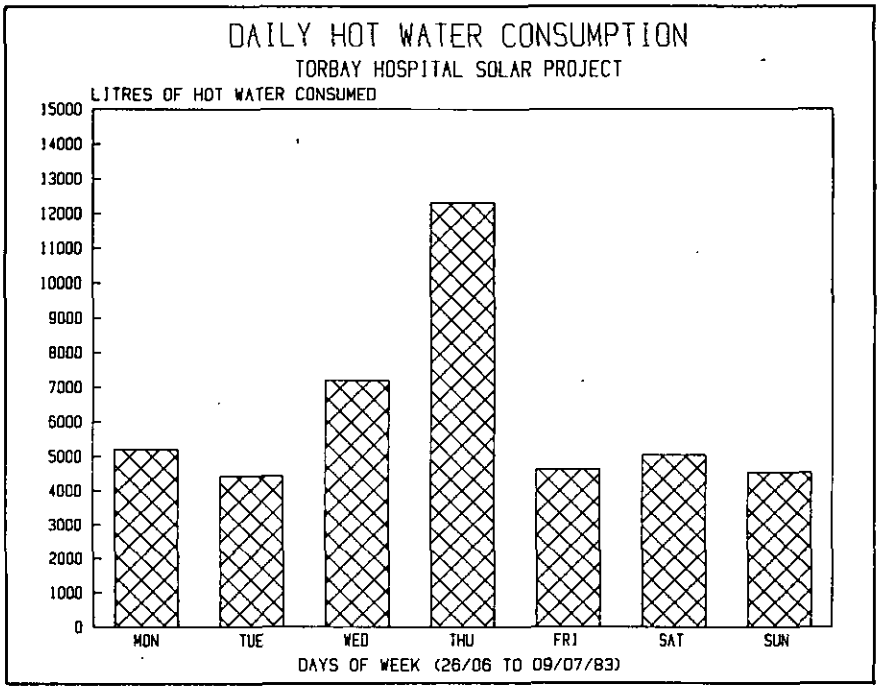


Figure 1. Average daily hot water consumption

performs the basic data collection function. Processing of the data can start at any stage after the measurement of the sensor output signals; in this project the data logger included some powerful data processing features. The data logger stores the data in a machine readable hard-copy form, which can be processed off-site for extracting results for presentation and use in subsequent analysis work. The constituent parts of the whole data collection and processing system are as follows.

3.1 Sensors

On the Torbay project it was necessary to measure 6 types of physical quantity:

(1) solar radiation

(2) air temperature

(3) water temperature

(4) water flowrate

(5) wind speed

(6) plant status

Whilst the performance of the heating system is measured mostly in terms of energy flows, separate measurements of flow and return temperatures, and flowrates were logged to provide more information on the system operation, instead of using direct reading heat meters.

Temperatures were measured using Platinum resistance thermometers (Pt100), and flowrates by turbine flowmeters. Kipp and Zonen CM5 solarimeters were used for solar radiation measurement, on both horizontal and collector planes, and a Vector Instruments R100 cup anemometer was used to measure wind speed. Plant status was measured by relay or micro-switch contacts.

3.2 Data logger

The data logger was based around a micro-computer, the Hewlett-Packard 9825T, and it was principally a software driven system. The components of the system are shown in figure 2. The analogue signal measurement, temperature and solar radiation, is undertaken by means of an 80 channel analogue scanner and 5½ digit digital voltmeter. Pulse signals from the anemometer and flowmeters were measured using a microprocessor controlled unit, the Hewlett-Packard 2240 Measurement and Control Processor, which was also used to measure the plant status signals. The micro-computer controls the measurement of the signals, and it also converts the signals into engineering units, computes energy flows, reading averages, and other functions before storing the useful data onto magnetic tape cartridge. The unit used for the latter purpose was the Perex Perifile 6041.

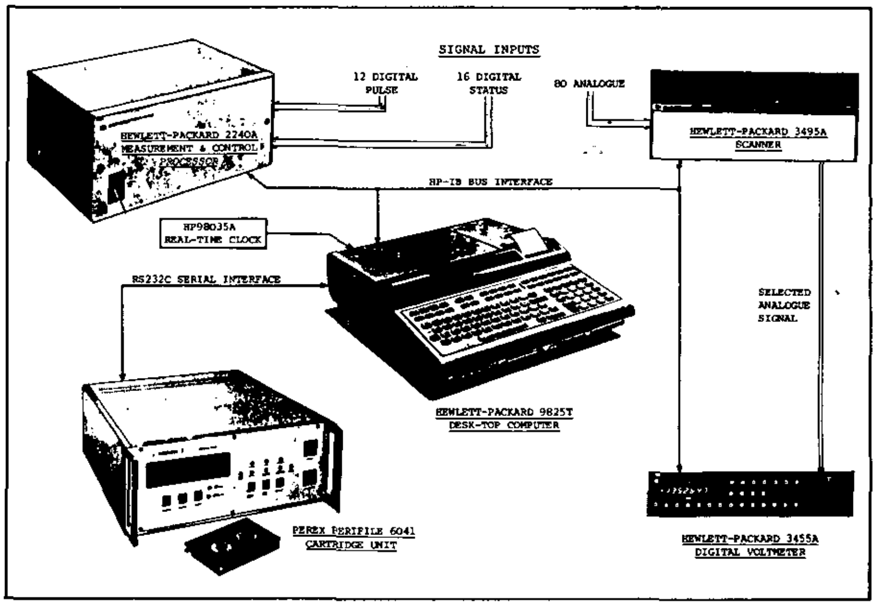


Figure 2. SABER 2 data logging system equipment

The software for the micro-computer, which was written by the author, was developed specially for use on this type of building energy monitoring project. To make the data more accurate and more useful, the system takes measurements of the sensor outputs every 30 seconds, but in order to be able to store this data it has to undertake a considerable amount of data computation after each measurement cycle. This real-time data analysis function would have been part of the normal data analysis facilities, if a conventional fixed scan data logger was used, but it has proved of great value in speeding up the output of results and aiding system maintenance. The main real-time analysis functions are:

(a) comparing readings with the previous recorded values, and only recording a reading if it has changed significantly, (with a default recording every 3 hours;)

(b) average or sum readings over a period of time, and recording the result, (the test described in (a) above can also be used on the results;)

(c) look for extreme values, and record these every so often;

(d) combine readings to produce a single quantity, e.g. combining a flowrate with two temperatures to give an energy flow.

These functions enable the data for 2 solarimeters, 35 temperature sensors, 5 flowmeters and 11 status measurements collected over a period of 3/4 weeks to be stored on a single DC300XL cartridge. The amount and type of data stored by the data logger can be adjusted by the user between wide limits, although the activity in the heating system can be a major influence.

The major advantage of the real-time analysis facilities on the data logger is that they provide a means of calculating and storing performance parameters on a daily basis. Such quantities as total incident solar energy, total energy collected, etc., can be stored on the data tape, from which they can be extracted on site or in subsequent analysis work.

3.3 Data analysis facilities

Every data logging system must be supported by matching data analysis facilities. The facilities developed at Bath for the energy monitoring work are based on the University main-frame, as well as on micro-computers. The former has the advantage of being able to handle large quantities of data, but in general, the micro-computer is proving more flexible for off-site analysis work. The latter is mainly due to having the extensive real-time analysis facilities on the data logger.

There are three forms of output required from the data processing:

(1) overall performance parameters for the heating system, e.g. solar energy used, collection efficiency, etc.;

(2) diagnostic data for assessing the operation and performance of the system components, e.g. controller settings, store heat losses, etc.;

(3) computer simulation model input data, and data for model output comparison.

Most of the requirements can be met by directly reading data off the data tapes, in the form it is produced by the

PROJECT: Torbay Hospital

PERFORMANCE PARAMETERS FOR WEEK COMMENCING: Monday 19th March 1984

SOLAR ENERGY SYSTEM PERFORMANCE

parameter		units	mon	tue	wed	thu	fri	sat	sun	week
1	Number of hours logged	hrs	24	24	24	24	24	24	24	168
2	Average external air temperature	°C	+3.6	+3.5	+3.8	+4.1	+6.6	+5.0	+6.6	+4.8
3	Mains cold water inlet temperature	°C	+5.7	+5.6	+5.7	+5.8	+5.9	+5.9	+6.0	+5.8
4	Average internal air temperature (in solar access space)	°C	+12.9	+13.1	+13.0	+13.6	+10.9	+12.5	+11.7	+12.5
5	Average solar storage temperature	°C	+14.1	+15.9	+11.6	+15.1	+11.5	+14.7	+13.7	+13.8
6	Incident solar radiation on horizontal	MJ/m²	10.1	8.7	7.2	12.4	3.1	10.3	6.8	58.6
7	Total solar energy incident on collector	MJ	3064	2318	1612	3892	692	3143	1582	16303
8	Solar energy collected	MJ	1016	551	373	1144	327	994	321	4727
9	Solar energy input to preheat	MJ	790	366	87	907	-28	731	90	2943
10	Solar energy output from preheat	MJ	534	380	335	618	381	417	442	3107
11	Increase in heat stored	MJ	285	-86	-198	282	-321	352	-263	52
12	Storage efficiency	%	103.7	80.2	158.5	99.2	*	105.2	199.1	107.3
13	Steam energy to hot water system	MJ	2063	834	2515	1752	2657	1670	1601	13093
14	Hot water used	litres	14318	8193	15230	13980	17765	15785	13801	99072
15	Hot water load	MJ	3241	1956	3393	3320	4123	3063	3075	22171
16	Collector pump energy	MJ	24	15	3	27	0	18	4	92
17	Coefficient of performance	-	22	25	98	23	*	24	124	34
18	Solar fraction of total load	%	16.5	19.4	9.9	18.6	9.2	13.6	14.4	14.0
19	Overall system efficiency	%	26.7	12.7	8.5	23.1	8.7	24.5	11.3	19.4

Figure 3. Example of Performance Parameter sheet

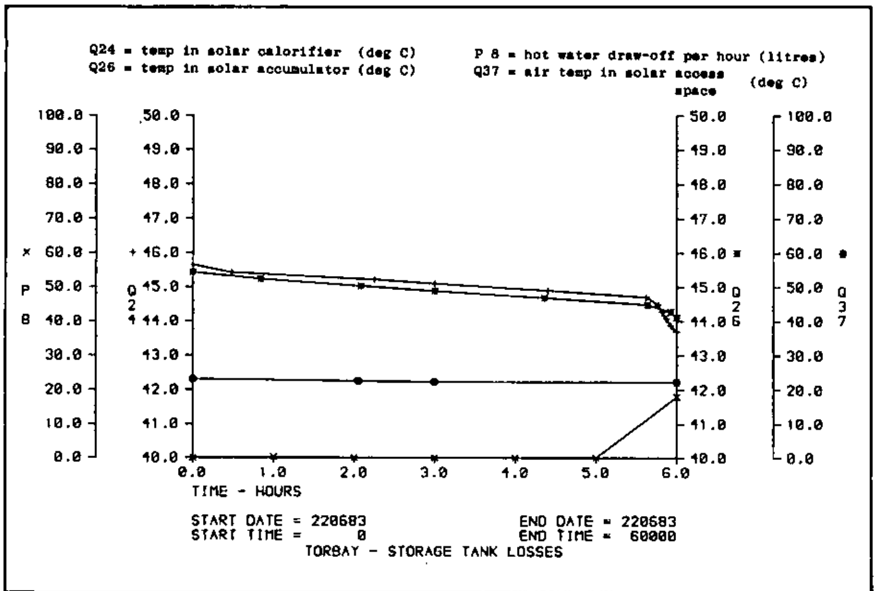


Figure 4. Example of graph plot of data

data logger, and either tabulating the data, or drawing graphs, or creating data files for computer program input. A micro-computer has been used to produce the performance parameter sheets, see figure 3, while the main-frame computer has been used for the other tasks. Graphs are useful for checking on the system operation, e.g. during commissioning, and also for qualitative assessment of component performance and a means of comparison of actual operation with computer model predictions, see figure 4.

4 Conclusion on data collection and analysis facilities

The unified approach to developing data collection and analysis facilities has resulted in being able to produce useful data quickly and accurately. Real-time analysis facilities on the micro-computer based logging system holds the main key to the success of the monitoring, and we can look forward, I believe, to this type of facility being provided by the building management systems of the future. Although there were serious problems with the logging equipment hardware at the start of the project, (the equipment was 4 years old having been used for a preceding solar field trial at Port Isaac School, Cornwall) complete 24hr data sets were collected for 79% of the monitoring period from June 1983 to March 1984. This logging record coupled with the successful operation of the other data analysis facilities and the computer modelling, has made it possible for interesting and useful results to be produced from the monitoring project at Torbay.

5 Acknowledgments

The author is indebted to the Dept. of Energy, who funded this and other associated projects, and to the South Western Regional Health Authority, who were not only responsible for the design and construction of the building, but also active in analysis of the results. The author also wishes to thank his colleagues at Bath University, for their part in the team effort on this monitoring work, and the District works department at Torbay Hospital.

Recent BRE publication

New BRE information paper

Automatic daylight-linked lighting controls can reduce building energy costs if enough daylight is available on working areas during the year. A new method which enables these energy savings to be predicted more accurately is described in Building Research Establishment Information Paper IP 14/84. **'A new method for predicting energy saving from on/off photoelectric controls'.**

Copies are available, free of charge, from the Publications Sales Office, Building Research Establishment, Garston, Watford WD2 7JR.

NEXT MONTH

Special computer issue

Results of monitoring and computer modelling

MICHAEL J W REYNELL MA (Oxon) (Engineering Science)

Synopsis

The measured performance of the solar energy project at Torbay District General Hospital is summarised, and a calibrated computer model is used to make long term predictions of system performance and energy savings. An economic analysis of the project is also carried out.

1. Introduction

This paper summarises the principal findings from the monitoring and computer modelling of the solar heating project at Torbay District General Hospital.

The installation consists of 270m^2 of flat plate solar collectors used for preheating of water for the new catering complex. The preheated water is passed to two conventional steam calorifiers, each of 3000 litres capacity, where it is boosted to the supply temperature of 65 deg C by low-pressure steam from the central boiler plant.

The monitoring of the solar heating system was carried out by the Energy Monitoring and Research Group of the University of Bath, (EMARG).

A photograph of the solar installation is shown in figure 1.1, and a schematic diagram showing the layout of the main components in the system is given in figure 1.2.

The solar heating installation, parameters monitored, data logging system, data analysis facilities and measured results have been described in detail by Reynell (1,2,3,4).

2.0 Measured results

Results have been collected and analysed for a total of 145 complete days of system operation between 15th June and 9th December 1983.

2.3 Hot water load profile

Figure 2.5 illustrates the hourly hot water demand pattern based on the analysis of 28 days' data between 13th April and 10th July 1983. It should be noted that the average daily hot water consumption for this period was 5470 litres, whereas the average daily consumption for the full period of data analysed to date is 10750 litres. Nevertheless, the shape of the histogram is not expected to have altered significantly.

There is a definite peak in the hot water demand between 06.00 and 07.00 hours, an average of 963 litres being drawn off in this one hour. There are also definite lunch time and tea time peaks from 11.00 to 12.00 and from 16.00 to 17.00, as one would expect in a catering establishment.

2.4 Storage tank performance

From figure 2.1, we can see that the storage efficiency for the full period of monitoring was 69.5%. This seems a reasonable value, until one assesses the storage tank performance from another angle, by calculating the overall effective heat loss coefficient for the tanks, which averages out at about 7.0W/m^2 degK for the full period. This is much higher than one would expect (theoretical calculations using manufacturers' quoted insulation performance data predict a heat loss coefficient of approximately one tenth this figure). The same disparity has been found on previous solar heating field trials. This is an important result, and it implies that manufacturers' quoted figures for insulation performance are extremely difficult to achieve in practice.

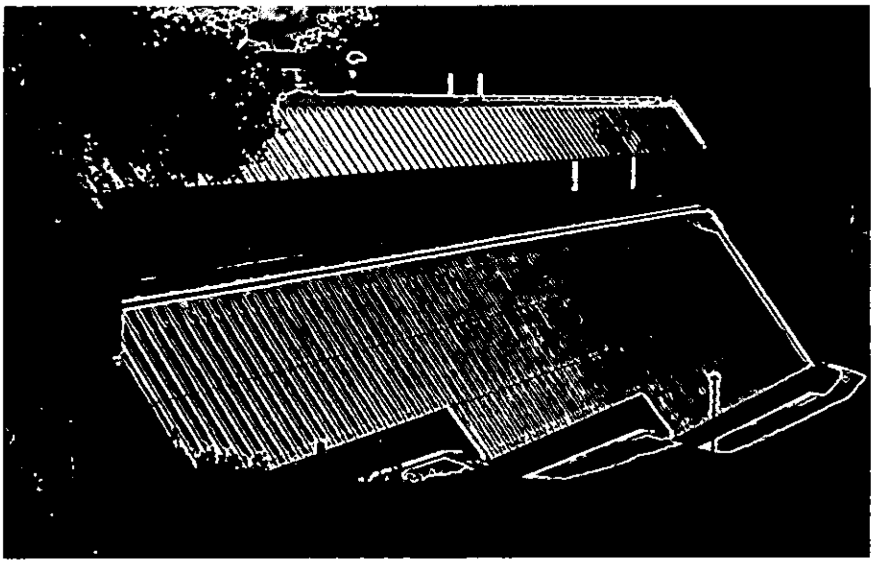


Figure 1.1 Solar installation at Torbay Hospital

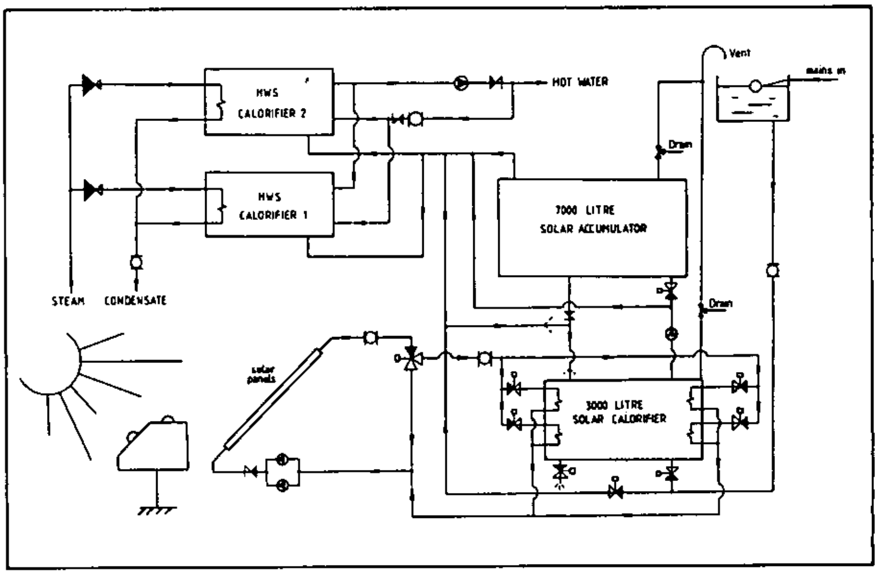


Figure 1.2 Schematic layout of solar installation

		Units	June	July	August	September	October	November	December	TOTAL
1	Number of days logged	days	14	22	21	26	24	30	8	145
2	Mean external air temperature (dry-bulb)	deg C	15.2	18.9	17.3	14.0	10.2	9.0	6.2	13.2
3	Mains cold water inlet temperature	deg C	13.8	17.0	18.5	16.2	12.3	9.8	8.4	14.0
4	Mean internal air temperature (in solar access space)	deg C	23.0	25.9	25.4	20.7	17.7	15.2	13.9	20.4
5	Mean solar storage temperature	deg C	40.8	44.3	41.7	25.6	30.8	13.9	15.9	30.1
6	Incident solar radiation on horizontal	MJ/m2	276.3	495.4	383.0	257.7	156.0	79.3	26.1	1674
7	Total solar energy incident on collector	MJ	63545	120569	104879	75885	62055	29157	15459	471549
8	Collection efficiency	%	24.9	24.1	29.1	29.2	32.9	40.4	38.7	28.8
9	Solar energy collected	MJ	15819	29083	30534	22175	20437	11789	5988	135825
10	Solar energy input to pre-heat	MJ	12978	23714	22447	13698	11696	3331	2975	90839
11	Solar energy output from pre-heat	MJ	7769	15488	14029	10579	8332	4576	2325	63098
12	Increase in heat stored	MJ	266	-130	103	-7	365	-560	-7	30
13	Storage efficiency	%	61.9	64.8	63.0	77.2	74.4	120.5	77.9	69.5
14	Auxiliary energy to HWS	MJ	12277	7628	12184	29233	24621	57509	14142	157594
15	Hot water used	litres	81488	162290	153170	271443	275374	369685	83287	1396737
16	Hot water load	MJ	16243	24614	26073	52347	55285	74818	16921	266301
17	Collector pump energy	MJ	561	951	-	-	330	120	108	* 2070
18	Coefficient of Performance	-	13.8	16.3	-	-	25.3	38.2	21.6	* 18.6
19	Solar fraction of total load	%	47.8	62.9	53.8	20.2	15.1	6.1	13.7	23.7
20	Overall system efficiency	%	12.6	12.7	13.5	13.9	14.0	13.8	15.0	13.4

Notes: HWS = Hot Water System   1 MJ = 0.278 kWh

* Values for August and September are NOT included in these figures.

Definitions: (13) = ((11)+(12)) / (10)
(18) = (11) / (17)
(19) = (11) / (16) x 100%
(20) = ((11)+(12))/(7) x 100%

Figure 2.1 Performance data sheet

3.3 Mains cold water inlet temperature

The mains cold water inlet temperature will have a significant effect on the solar energy output, hence it is an important parameter which must be defined by the computer model.

A standard equation was used to define the seasonal variation in mains cold water inlet temperature as follows:

$$TCW = 12 - 3\cos(2\pi/365)(D - 11.25)$$

where:

D = day of year (Jan 1st = day 1, etc)

This agrees with the measured cold water inlet temperatures given in figure 2.1, and so allows for incidental heat gains in the cold water storage tank.

3.4 Hot water consumption

The hourly hot water demand profile used in the modelling was that shown in figure 2.5.

Torbay Hospital is to be expanded during the next six years with the addition of various new departments which will increase the number of beds from the present total of 377 to 631 by 1990. The corresponding number of meals produced in the catering complex will increase from 700 to about 1250 mid-day meals per day. This is an increase of about 79% in the number of mid-day meals produced, which it is estimated will lead to an increase of about 50% in hot water consumption, from the present measured average of 10750 litres/day to about 16000 litres/day by 1990. This will affect the useful solar energy output. The model has therefore been used to predict solar energy savings at both levels of hot water consumption.

2.1 Overall system performance

The measured results are summarised on a monthly basis in tabular form in figure 2.1. The same results are presented in the form of a Sankey diagram in figure 2.2. The measurement of steam energy supplied is suspect, as indicated in figure 2.2, due to problems associated with condensate flow metering. However, this uncertainty does

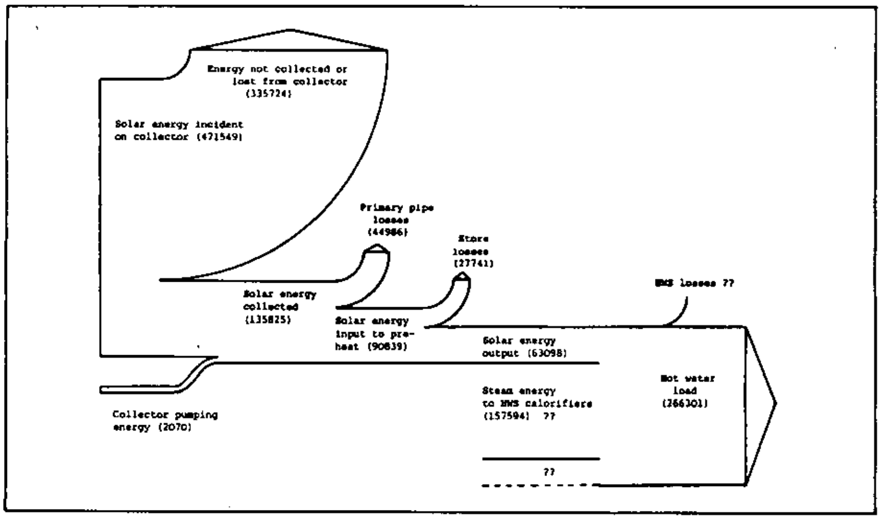


Figure 2.2 Measured performance of solar system

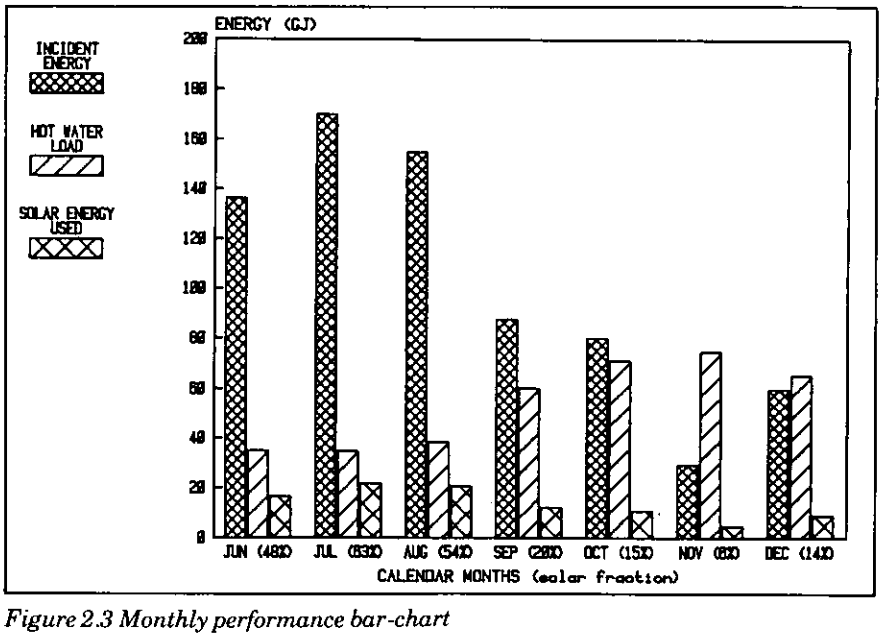


Figure 2.3 Monthly performance bar-chart

not affect the accuracy of any of the solar measurements.

Figure 2.3 is a monthly bar chart which shows the solar energy incident on the collector plane, hot water load, solar energy used and solar fraction for each month. High solar fractions were recorded in June, July and August when the incident solar radiation was above average and relatively little hot water was being used. The solar fractions were much lower during the winter months when the hot water load was higher and the incident solar radiation was below average levels. (Note: Figure 2.3 shows 'normalised' results, that is to say that the measured energy totals for each month have been multiplied up to compensate for missing days' data.)

2.2 Instantaneous collection efficiency

Figure 2.4 shows a graph of instantaneous collection efficiency plotted against the operating characteristic (Ti-Ta)/I, where:

I = solar radiation intensity (kW/m^2)
Ti = fluid inlet temperature (degK)
Ta = ambient air temperature (degK)

The performance is fairly typical of that one would expect from a single glazed, back insulated, flat plate collector of this type, though the maximum efficiency of 60% at zero operating characteristic is rather low (70-80% can be achieved). This may be due to the lower than optimum flow rate through the collector array (0.0137 l/m^2). Nevertheless, the graph shows that collector arrays of this size, if properly designed and well balanced, can achieve a level of collection efficiency close to that for a single collector under laboratory conditions. This is an encouraging result.

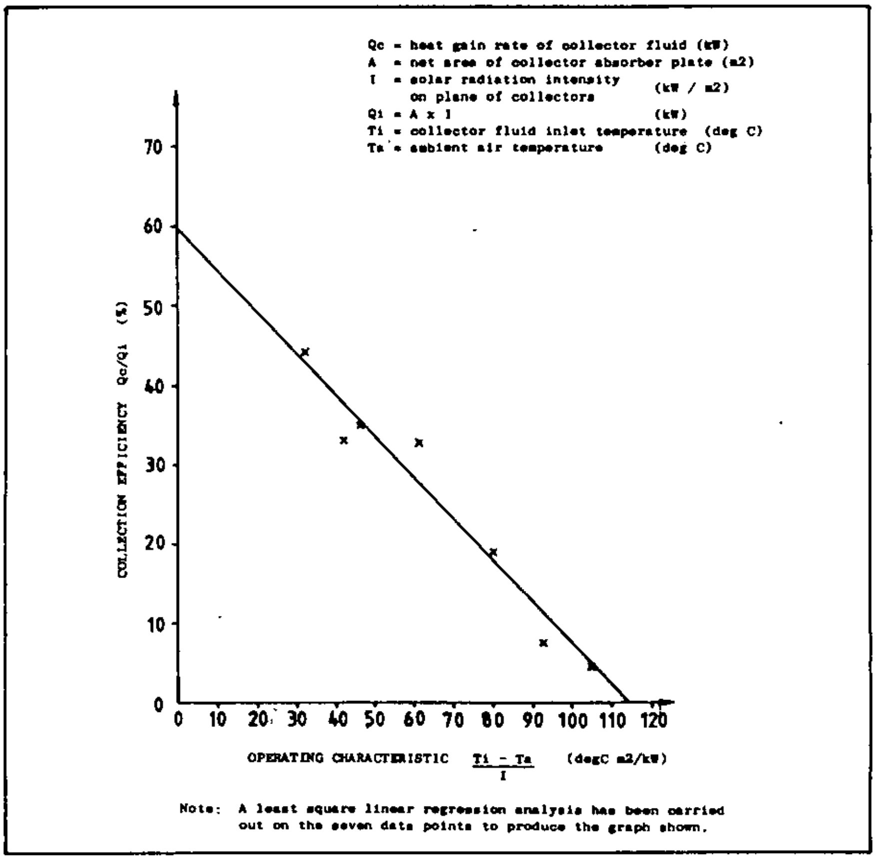


Figure 2.4 Instantaneous collection efficiency curve

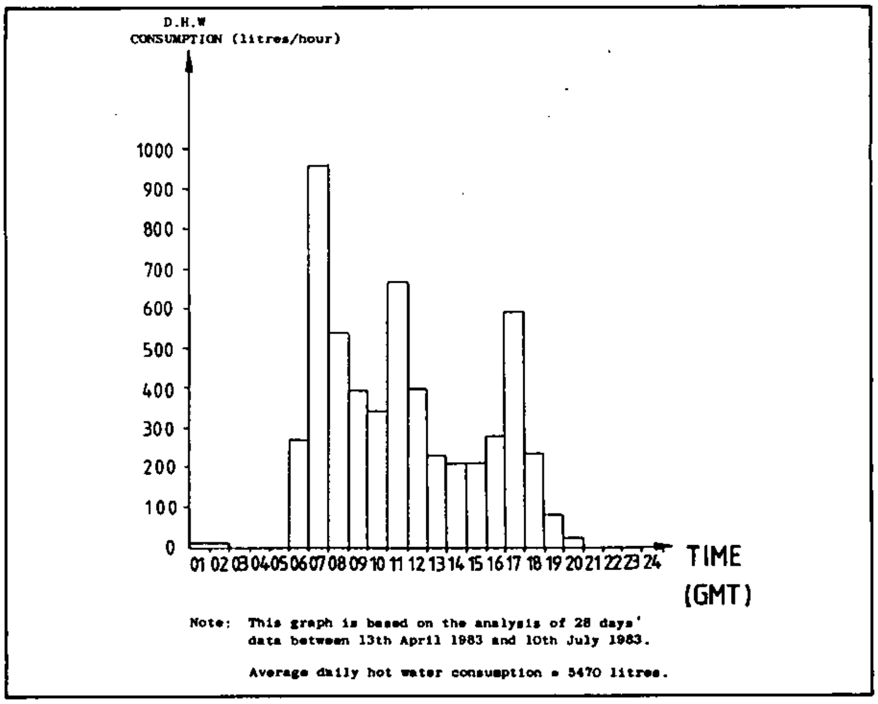


Figure 2.5 Hourly hot water consumption pattern

3.0 Computer modelling

The measured results summarised in section 2 have revealed interesting and valuable information regarding aspects of the solar heating system performance such as instantaneous collection efficiency, storage efficiency, flow distribution and hot water load profile.

However, this information is of little value in terms of predicting the overall system performance and energy savings in the long term. Even if the monitoring had been continuous for a year, the results would still be sensitive to that particular year's weather conditions and load profiles. Unless the monitoring is continued for 20 years or more (which would be prohibitively expensive) the long term energy savings cannot be assessed by measurement alone.

In order to solve this problem, and produce the numbers which are of primary interest to all the parties involved in this solar heating field trial (namely, long term energy savings), a parallel task to the monitoring exercise was the development of a computer model which accurately simulates the performance of the real system.

3.1 Calibrating the computer model

The model was calibrated using measured data from two separate weeks of operation. Figure 3.1 and table 3.1 show the degree of agreement achieved between the model and the measured results for the first calibration run. Evidently the model was overestimating the solar energy collected and used at this stage. Heat loss coefficients and

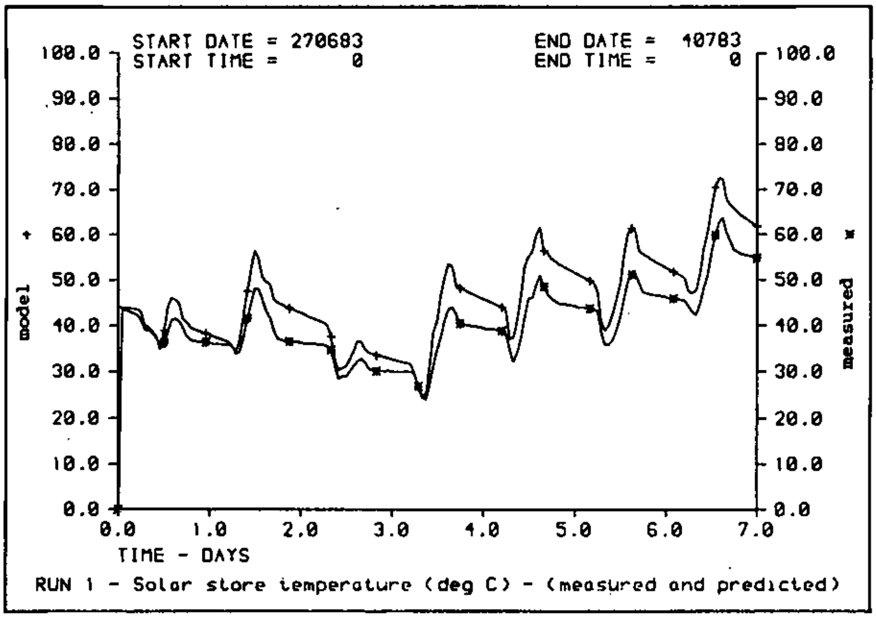


Figure 3.1 Measured vs predicted store temperature – calibration run 1

RUN NUMBER: 1 WEEK COMMENCING: 27th June 1983

PARAMETER	UNITS			ERROR
SOLAR ENERGY INCIDENT	kWh	measured predicted	9515 9966	+5%
SOLAR ENERGY STORED	kWh	measured predicted	2049 2368	+16%
SOLAR ENERGY OUT OF STORE	kWh	measured predicted	1188 1477	+24%
HOT WATER LOAD	kWh	measured predicted	2730 2460	−10%
MEAN SOLAR STORE TEMPERATURE	deg C	measured predicted	40.5 45.9	+5.4%

Table 3.1 Results of model calibration run 1

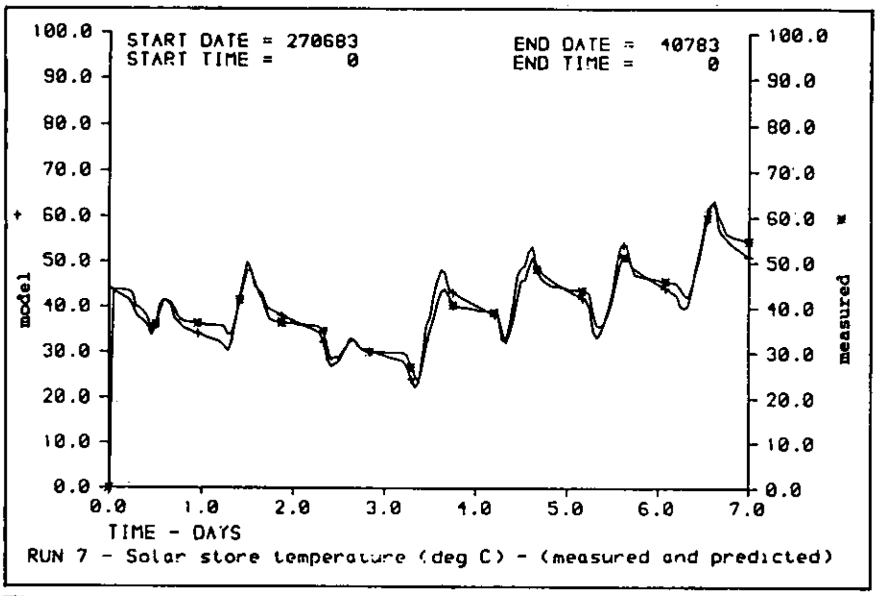


Figure 3.2 Measured vs predicted store temperature – calibration run 2

RUN NUMBER: 7 WEEK COMMENCING: 27th June 1983

PARAMETER	UNITS			ERROR
SOLAR ENERGY INCIDENT	kWh	measured predicted	9515 9966	+5%
SOLAR ENERGY STORED	kWh	measured predicted	2049 2105	+3%
SOLAR ENERGY OUT OF STORE	kWh	measured predicted	1188 1231	+4%
HOT WATER LOAD	kWh	measured predicted	2730 2695	−1%
MEAN SOLAR STORE TEMPERATURE	deg C	measured predicted	40.5 40.4	+0.1%

Table 3.2 Results of model calibration run 2

other parameters on the model were adjusted until a closer representation was achieved, as shown in figure 3.2 and table 3.2. This adjustment was a fairly lengthy procedure due to the interdependence of certain parameters such as store temperature and collection efficiency.

As a check to ensure that the fit achieved was not merely a fluke, a second calibration week was considered without altering any parameters on the model. The excellent degree of fit achieved is shown in figure 3.3 and table 3.3. The model can now therefore be considered to be a faithful representation of the performance of the real system, and can be used to make accurate predictions regarding long term system performance.

3.2 Weather data

The predictions of the model will obviously be sensitive to assumptions about future weather conditions. Figure 3.4 is a map showing the variation over the UK of annual solar radiation figures. It can be seen that Torbay lies on the highest contour, where the annual mean daily global solar irradiation on a horizontal surface is 11.0 MJ/m^2. However, the computer model requires input of hourly data for global solar radiation and air temperature, and the closest meteorological recording station for which such data is available is Aberporth, on the Welsh coast (also marked on figure 3.4). This area receives slightly less solar radiation than Torbay (10.5 MJ/m^2) but is likely to have a similar micro-climate, being on the coast, and is certainly the most representative of the available meteorological recording stations. Therefore, the year's weather data used in the initial computer simulations consists of monthly data from Aberporth, each month's data being chosen to conform most closely to the average solar irradiation for that month.

3.5 Long term performance predictions

The first and most important questions to answer are:

1) How much energy will the solar heating system save in an average year?

2) What is the economic analysis of the project?

The first step, therefore, is to use the calibrated model (in conjunction with the appropriate weather and water load data described in sections 3.2 to 3.4) to predict the average annual solar energy output from the system.

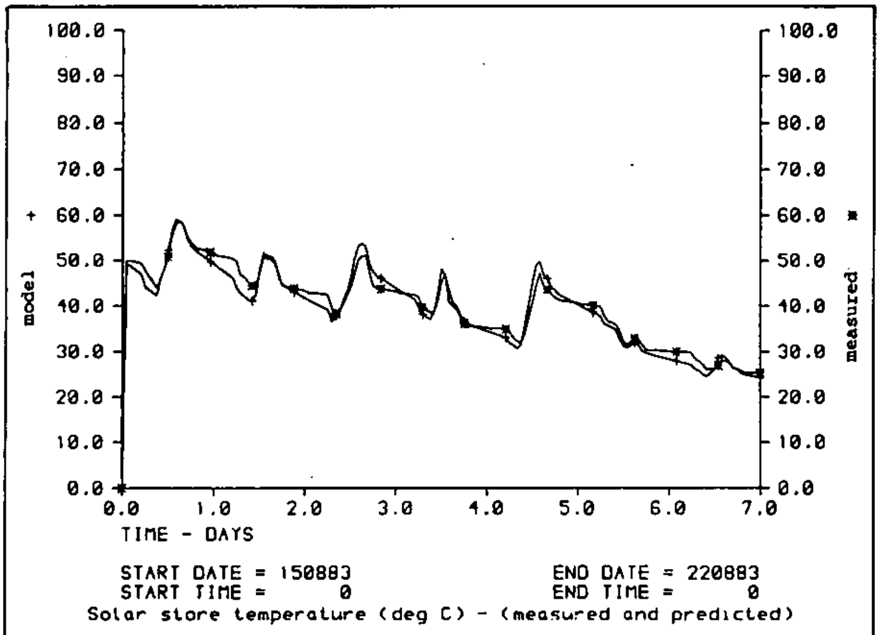
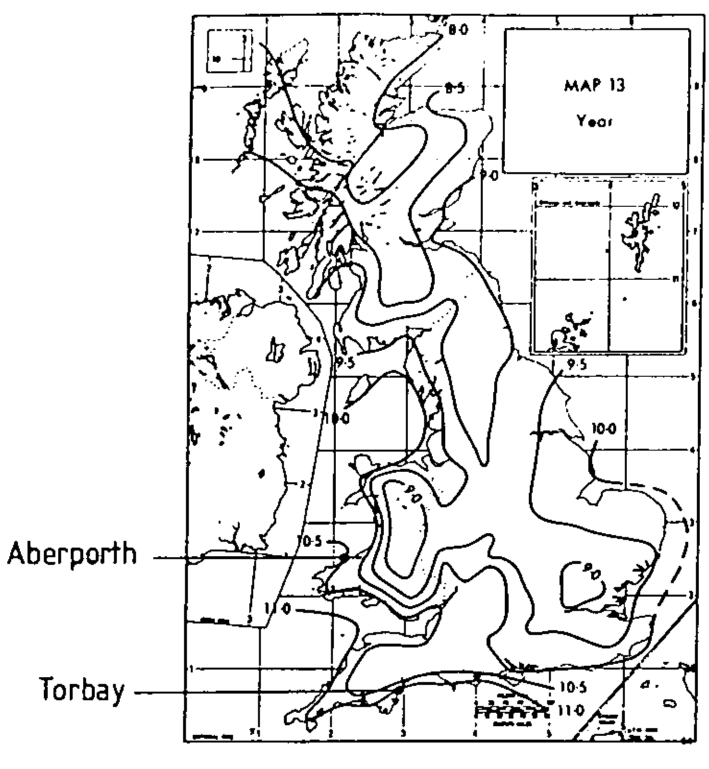


Figure 3.3 Measured vs predicted store temperature – calibration run 3

RUN NUMBER: 8 WEEK COMMENCING: 15th August 1983

PARAMETER	UNITS			ERROR
SOLAR ENERGY INCIDENT	kWh	measured predicted	7689 7864	+2%
SOLAR ENERGY STORED	kWh	measured predicted	1534 1612	+5%
SOLAR ENERGY OUT OF STORE	kWh	measured predicted	1117 1128	+1%
HOT WATER LOAD	kWh	measured predicted	2439 2426	−0.5%
MEAN SOLAR STORE TEMPERATURE	deg C	measured predicted	40.3 39.7	−0.6%

Table 3.3 Results of model calibration run 3



Map 13. Variation over the United Kingdom of the annual mean daily global irradiation on a horizontal surface (in MJ m^{-2})

Figure 3.4 Solar radiation in the UK

3.5.1 Model run 1 – Base system

The results of the first set of model runs are illustrated in figure 3.5. Seven different values of daily hot water consumption were used, ranging from 500 to 16000 litres/day, in order to assess the sensitivity of the performance to this parameter. The curve shows that the useful solar energy output per year increases with increasing hot water consumption, as one would expect, though not in a linear fashion. The curve is asymptotic, so there will come a point where the maximum useful solar energy is being obtained, and further increases in hot water consumption have a negligible effect. The graph shows that the average solar energy used per year will be 56 MWh at the present hot water consumption rate of 10750 litres/day. At the predicted 1990 hot water consumption rate of 16000 litres/day, the annual solar energy used will be 67 MWh.

3.5.2 Model run 2 – Collector area = 405 m^2

Initial design calculations (5) suggested that a collector area of 405m^2 would be appropriate for the solar heating installation, but practical architectural considerations meant that only 270m^2 could be incorporated into the building structure. It is of interest, therefore, to see how an array of the original size would perform under the same weather and load conditions.

Figure 3.6 shows the results of the second set of model runs. On this and subsequent graphs the base system results are shown by a solid line, while the results for the system variation are shown by a dotted line.

The larger collector area has little effect at low hot water consumption levels, as one would expect, since the limiting factor here is the operating temperature. At higher levels of hot water consumption the extra collector area has a considerable effect. The annual solar energy used is increased from 56 to 68 MWh at the current consumption rate (10750 litres/day) and from 67 to 84 MWh at the 1990 consumption rate (16000 litres/day).

3.5.3 Model run 3 – Half store loss

Reducing the store heat loss coefficient by a factor of 2 to 3.5 W/m^2 degC has a less significant effect than might be expected, as shown in figure 3.7. In percentage terms, the improvement in performance is more marked at low consumption levels, since average operating temperatures (and hence store temperatures) are higher.

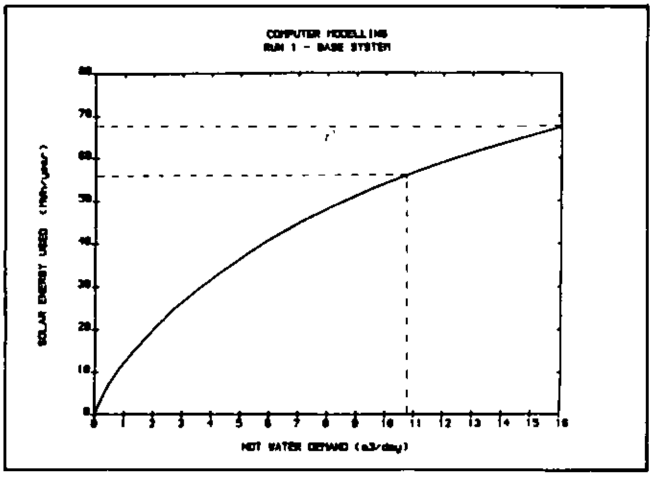


Figure 3.5 Model run 1 – Base System

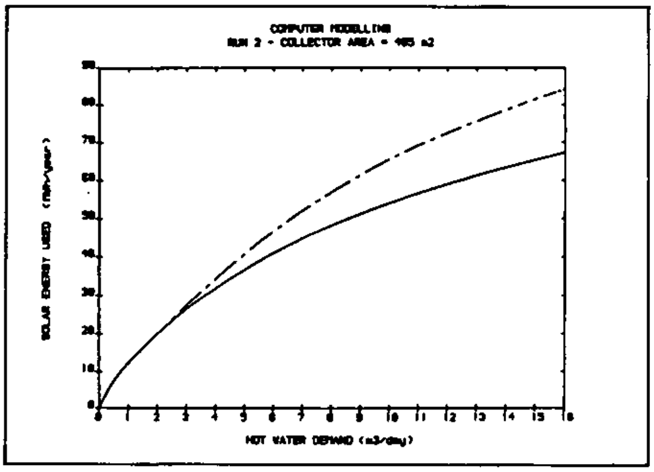


Figure 3.6 Model run 2 – Collector area=405 m²

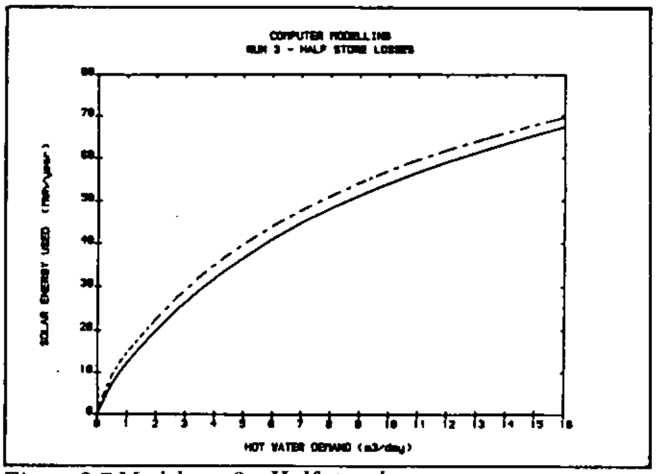


Figure 3.7 Model run 3 – Half store loss

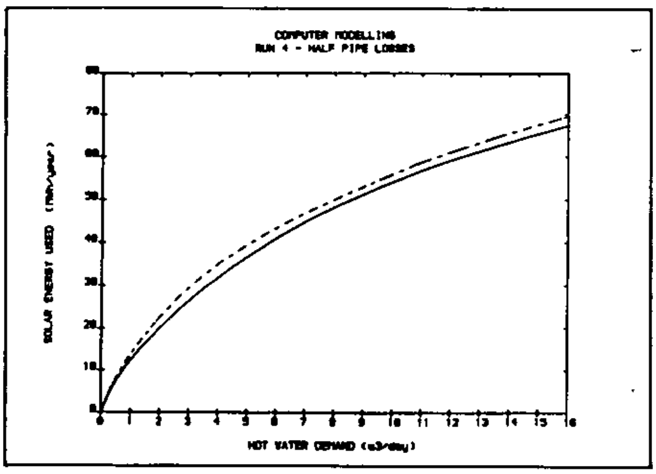


Figure 3.8 Model run 4 – Half pipe losses

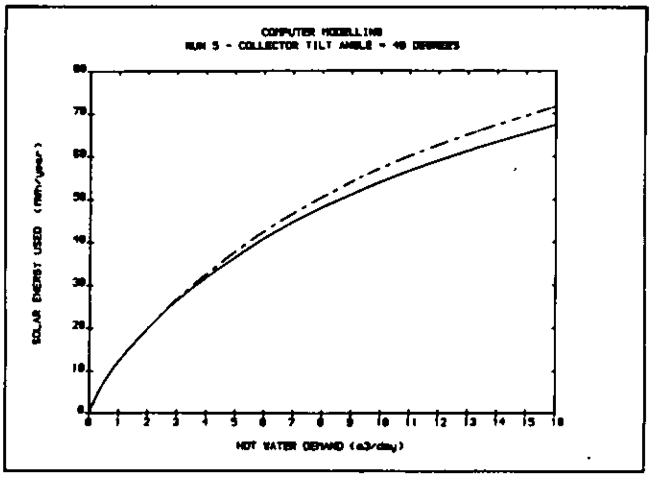


Figure 3.9 Model run 5 – Collector tilt angle=40 degrees

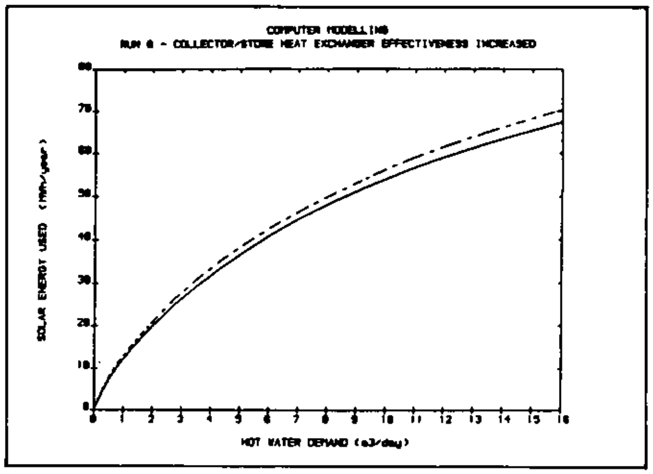


Figure 3.10 Model run 6 – Increased heat exchanger effectiveness

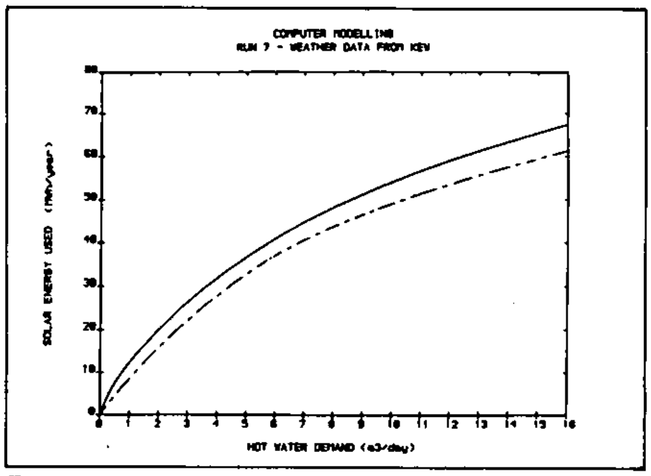


Figure 3.11 Model run 7 – Kew weather data

Table 4.1 Economic analysis

	TORBAY	KEW
Capital cost of solar heating installation (as at December 1980)	£77,810	
Capital cost inflated to May 1984	£97,262	
Current cost of steam energy (at point of use)	£ 23.00 per MWh	
Average solar energy used per year		
(1984 to 1990)	56 MWh	51 MWh
(1990 onwards)	67 MWh	61 MWh
Present value of solar energy used per year		
(1984 to 1990)	£ 1,288	£ 1,173
(1990 onwards)	£ 1,540	£ 1,403
Net present value of solar savings		
(1984 to 1990)	£ 8,001	£ 7,287
(1990 to 2020)	£89,682	
(1990 to 2022)		£90,555
TOTAL	£97,683	£97,842
PAYBACK PEROD:	36 years	38 years

3.5.4 Model run 4 – Half pipe losses

Reducing the primary circuit pipe losses by a factor of 2 has a similar effect to that described in section 3.5.3 above (see figure 3.8).

3.5.5 Model run 5 – Collector tilt angle = 40 degrees

Original design calculations (5) suggested an optimum tilt angle for the collector array of 40 degrees from horizontal. However, as described in section 3.5.2, architectural considerations made it necessary to use a tilt angle of 53.5 degrees from horizontal. It is of interest, therefore, to investigate how the collector array would have performed at the original angle.

Figure 3.9 shows that the effect of using a different tilt angle is considerable at higher hot water consumption levels. Annual solar energy output increases from 56 to 60 MWh (7% increase) at the current consumption rate, and from 67 to 72 MWh at the 1990 consumption rate.

These results show that collector tilt angle is an important variable in the design of a solar heating system for hot water preheating in the UK.

3.5.6 Model run 6 – Increased heat exchanger effectiveness

Figure 3.10 illustrates the effect of increasing the effectiveness of the heat exchange between collector and store from 15 kW/degK to 45 kW/degK.

Whilst there is a slight improvement in performance, it is unlikely that the extra cost of installing the large heat exchange batteries necessary to achieve such a heat transfer would be justified. The heat exchange area provided would appear to be adequate.

3.5.7 Model run 7 – Kew weather data

As mentioned in section 3.2, Torbay lies on the highest UK contour for average daily incident solar radiation, being on the south coast of Devon. It is of interest to investigate how the same solar heating system would perform at a typical UK inland site. Kew is such a site, where hourly solar radiation and air temperature measurements have been recorded.

A year of 'average' weather data for Kew was built up in the same manner as described in section 3.2.

Figure 3.11 shows the effect of the Kew climate on the performance of the solar heating system. There is a significant reduction in the annual solar energy output from 56 to 51 MWh at the current hot water consumption level, and from 67 to 61 MWh at the 1990 consumption level. In percentage terms, however, this represents a reduction of only 9% in useful solar energy output.

4. Economic analysis

All solar energy installations are capital intensive, which means that a large initial investment is made in order to produce savings over the lifetime of the equipment. Many different methods and criteria have been suggested to determine whether a solar energy system is economically desirable, and it is beyond the scope of this report to deal with all the various methods.

'Discounted cash flow' and 'Net present value' techniques are generally held to be the most appropriate for the economic evaluation of ambient energy schemes. The discounted cash flow technique uses a market discount rate which represents the after-tax rate of return on high security investments such as bank deposits. This takes account of the income which could have been generated by investing the original capital instead of building a solar heating system. The net present value technique involves assuming a future scenario for inflation and fuel price escalation rates, and hence calculating the 'present value' of future energy savings.

Another useful concept in this sort of economic analysis is the 'payback period', the time taken for the net present value of future cumulative fuel savings to equal the net present value of the original investment. Using a payback period (as opposed to life cycle costs) type of analysis usually requires a shorter period over which it is necessary to estimate (or guess) a future scenario for interest, inflation and fuel price escalation rates. The results can therefore be expected to be more accurate.

Current treasury guidance is to use a discount rate of 5% pa and a fuel price inflation rate of 3.5% pa in real terms (ie over and above general inflation). This allows for fuel costs to double in real terms by the year 2000.

The economic assessment is carried out using current (May 1984) price levels as a basis. The analysis is carried out both for the project as it stands at Torbay and also, for interest's sake, for the project as it would perform at a typical inland UK site such as Kew. The results are shown in table 4.1.

There are three important points which should be made regarding this analysis:

1) The capital installation costs of £97,262 (as at May 1984) works out at £360 per square metre of collector. This is close to the current commercial cost of installing a domestic scale system of 4 to 6m^2 collector area. Virtually no economy of scale has been achieved with this installation, therefore. Current estimates from the Solar Energy Unit, University College, Cardiff indicate that it should be possible to build a large scale solar heating installation such as this for a net cost of about £200 per square metre. Given the same results, this would give a payback period in the order of 20 years.

2) The economic assessment is naturally highly sensitive to assumptions regarding future fuel price escalation rates. Table 4.2 illustrates this point.

FUEL PRICE INFLATION	PAYBACK PERIOD
3.5%	36 years
5.0%	29.5 years
10.0%	21 years
15.0%	17 years
20.0%	14.5 years

Table 4.2 Effect of fuel price inflation on economic analysis

3) The payback period of 36 years is well under the probable working life of the system. On this basic criterion, therefore, the system may be judged economically desirable.

However, there may of course be other more attractive forms of investment open to future designers of energy-saving schemes.

5. Conclusions

This chapter summarises the lessons learnt during the monitoring of the project.

5.1 Solar heating system construction

Overall experience to date regarding the construction of the solar heating system has been excellent, and maintenance costs have been minimal. This is a testimony to both good design and a high standard of workmanship.

5.2 Solar heating system design

The main features of the solar heating system design are evaluated in the following paragraphs.

5.2.1 Flow distribution

The lengths of the riser pipes varies considerably from one end of the collector array to the other, due to the slope of the site and the 'landscaping' of the building. This leads to unequal system resistance through the various panel banks, and hence the need for artificial flow regulation to obtain equal flow per unit panel area. The system adopted used diaphragm regulating valves at the inlet to each sub-header. The use of such valves inevitably presents a small extra system resistance, however, the results have shown that the flow through the collector array is well balanced. This method of flow regulation can therefore be recommended.

5.2.2 Three-way valve control method

This installation uses a sophisticated control system, in which a three-way valve is used to divert the primary circuit flow back to the collector inlet unless the flow temperature off the panels exceeds the store temperature by a set amount (currently set at 1 deg C). The complexity of the control system overall is increased by the addition of an extra controller and two sensors, but it has several major advantages, and has worked well throughout the monitoring of this project. The three-way valve control method is therefore highly recommended.

5.2.3 Storage tanks

The installation was deliberately designed to enable a storage volume of either 10000 or 3000 litres to be used. These figures give storage volume to collector area ratios of 37 and 11 litres per m^2 respectively. Usual design rules for solar water heating systems in the UK (6) suggest that the value of this ratio should be around 50 litres per m^2. Original design predictions (5) suggested that a lower than standard storage volume to collector area ratio could be used for this installation, due to the expected hot water load profile being more in phase with incoming solar radiation than for most systems. However, this hypothesis is not supported by either the measured results or the results of the computer modelling, both of which suggest that using the lower storage volume to collector area ratio (11 litres per m^2) will have a considerable adverse effect on the long term performance of the system.

The performance of the heat stores in terms of storage efficiency and overall heat loss coefficient has been worse than expected. From figure 2.1, we can see that the storage efficiency for the full period of monitoring was 69.5%. This seems a reasonable value, until one assesses the storage tank performance from another angle, by calculating the overall effective heat loss coefficient for the tanks, which averages out at about 7.0 W/m^2 degK for the full period. This is much higher than one would expect (theoretical calculations using manufacturers' quoted insulation performance data predict a heat loss coefficient of approximately one tenth this figure). The same disparity has been found on previous solar heating field trials. This is an important result, and it implies that manufacturers' quoted figures for insulation performance are extremely difficult to achieve in practice.

5.3 Solar heating system short-term performance

This section presents conclusions drawn from the measured results.

5.3.1 Collection efficiency

Results have shown that collector arrays of this size, if properly designed and well balanced, can achieve a collection efficiency profile close to that for a single collector under laboratory conditions (see section 2.2). This is an encouraging result.

5.3.2 Hot water load profile

The hot water load profile for this typical Health Service building has been recorded. The overall hot water consumption has been lower than predicted. Figure 2.3 suggests that there is a seasonal variation in hot water load which is more than can be accounted for by the variation in mains cold water inlet temperatures. It appears that less hot water is used on hot, sunny days. The reason for this may be quite simply that patients and staff prefer to eat cold meals such as salads on hot days, which generates less washing up, or the reasons may be more complex. Further work would be required to determine the exact extent of these influences on hot water demand patterns.

5.4 Solar heating system long-term performance

The long-term performance of the solar heating system has been assessed by the use of a calibrated computer model. The main conclusions from this study are outlined below.

5.4.1 Performance of basic system

It has been demonstrated that, in the present configuration, the system will save an average of 56 MWh of energy per year between 1984 and 1990. After 1990, increased hot water consumption will result in increased energy savings of 67 MWh per year. A full analysis of the sensitivity of the system performance to hot water demand has been carried out.

There is an inverse relationship between annual solar energy output and solar fraction. As the hot water demand increases so the annual solar output and overall system efficiency increase (see figure 3.5), but the solar fraction of the hot water load is reduced. There is, therefore, a play-off between system efficiency and solar fraction, and one cannot achieve a high value of both. An annual solar fraction of 23% with an overall system efficiency of 20.7% has been attained by this installation. When the increased 1990 hot water consumption is applied, the solar fraction is reduced to 19%, while the overall system efficiency is increased to 23.6%.

5.4.2 Variations on basic system

Original design calculations (5) regarding the optimum values of quantities such as collector area and tilt angle were modified by practical architectural considerations. Some analysis has been carried out to determine the effect of these and other design variable changes on the long-term performance of the system.

The design variable changes investigated were as follows:

a) Collector area increased

b) Store heat loss coefficient reduced

c) Pipe heat loss coefficient reduced

d) Collector tilt angle reduced

e) Collector/store heat exchanger effectiveness increased.

The results may be summarised by saying that all the above design variable changes improved the system performance, the most significant improvements being obtained by increased collector area and reduced collector tilt angle. However, individual economic analyses have not been carried out to determine the cost-effectiveness of each of the above measures.

5.4.3 Weather data from Kew

The computer model was also used to predict the long term performance of the system if it had been situated at Kew. This is of interest because the climate at Kew is typical of inland sites in the UK, and this area receives only average amounts of solar radiation. The annual solar energy output is reduced by about 9%, and the payback period increases to 38 years.

5.5 Economic analysis

An economic analysis of the project using current treasury guidelines regarding future fuel price rises and interest rates has yielded a payback period of 36 years. This is considerably less than the probable working life of the system, and on this basic criterion the project may be judged an economic success. The capital installation costs for the system were high (£97,262 or

£360 per m²), and recent estimates from the Solar Energy Unit at University College, Cardiff suggest that current construction costs for an installation of this size should be around £200 per m². This would bring the payback period down to about 20 years. However, there may of course be other more attractive forms of investment open to future designers of energy-saving schemes.

6. References

1. Reynell, M. J. W., **'Torbay District General Hospital. New Catering Complex. Building and heating system description'** Technical note BU/SABE/EG11, Bath University, September 1982.
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3. Reynell, M. J. W., **'Software for mainframe computer analysis of data from solar heating field trials.'** Technical note BU/SABE/EG15, Bath University, August 1983.
4. Reynell, M. J. W., **'Torbay District General Hospital. New Catering Complex. Results – April to December 1983.'** Technical note BU/SABE/EG20, Bath University, January 1984.
5. James, B. J., **'A solar energy scheme for Torbay District General Hospital Catering Complex.'** SWRHA, July 1977.
6. Wozniak, S. J., **'Solar heating systems for the UK.'** BERG Report, 1979.

continued from page 6

they are no longer required.

The foregoing wastes can arise at a wide range of health care facilities: hospitals, clinics, long-term health care premises, support services.

Impact of health care waste on human health and the environment

In addition to occupational and patients' health risks, consideration must be given to the impact of health care waste on human health and the environment outside the boundaries of health care facilities. In particular, attention should be paid to possible effects on the general public, including aesthetic factors, and to the risk of pollution of air, water and soil. In order to minimise such external health and environmental risks, action should be taken to deal with environmental risks, action should be taken to deal with pollutants at their source. To this end, waste should be segregated and concentrated within health care facilities to simplify its management and, wherever feasible, waste should be recycled so that it does not enter the waste stream requiring disposal.

To safeguard against water pollution, source measures should be taken to reduce the quantity and strength of pollutants.

Chemicals used in health care facilities are a potential source of pollution, mainly to water via the sewerage system. Any hazardous chemical waste generated should be dealt with by a proper chemical waste management system – waste chemicals should be recycled whenever possible.

The grinding of solid wastes for disposal to the sewerage system is not recommended unless the sewerage and sewerage treatment systems are designed to cope with them.

Faecal and urine waste from patients in source isolation wards should be disinfected before disposal to the sewer.

General waste and properly treated infectious waste can safely be disposed of in a landfill, but special measures may be necessary for aesthetic reasons.

Incinerator emissions are a potential source of air pollution. Incinerators for health care wastes should be designed specifically for the purpose and must be able to comply with air pollution control standards.

Waste handling, storage and transport

General waste, as already defined, needs no special measures and can safely be dealt with in the same way as general municipal waste. As a precaution, it is advisable to segregate large quantities of aerosol cans and glass to ensure proper disposal. Recycling should be practised where feasible. Paper, glass, metal and plastics may be saleable, depending upon local conditions.

Sharps should be packed in puncture-proof containers for disposal as general waste or for further packaging and handling with hazardous waste.

Pathological and infectious waste must be segregated. High-risk infectious waste may be autoclaved, to reduce risk to staff and patients, prior to packaging.

Pressurised containers, e.g. aerosol cans, must not be placed in waste disposal bags destined for incineration.

Waste to be segregated should be put into single-use, moisture-proof bags which are hung in special holders or used as liners for plastic or metal containers. The bags should be strong enough to resist internal or external mechanical damage. Colour-coded bags or containers should be used to identify pathological and infectious waste, and all bags and containers should be in accordance with prevailing occupational weight and size limitations.

Transport

The movement and transport of waste internally and externally requires special precautions. Internally, waste is usually transported from its initial storage point to an assembly or on-site incinerator by means of trolleys or handcarts. Such equipment should be cleaned regularly and used only for waste transport. Waste being transported externally should present no public health risk provided it has been suitably treated, but its physical appearance or identifiable colour-coded contained may give rise to objection on aesthetic grounds. The transport vehicle should, therefore, have an enclosed leak-proof body. It should be cleaned after each use and disinfected when necessary.

CROSS REFERENCE

Picked from the journals of professional colleagues, articles and news items of interest to hospital engineers.

ELECTRONICS & POWER

Engineers as Managers – an article from the Crosstalk page raises the question 'Why is it that so many engineers are bad managers?'. By Norman Foulsham. *September, page 670*

NEW CIVIL ENGINEER

Hot Water Technology – a feature that looks at several developments in space and water heating and storage which may have major long term effects on the industry. *October, page 51*

· CHANGE OF ADDRESS ·

As from **Monday 15th October** 1984, the **editorial/management** offices have moved to:

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NOW!

In this year of Women into Science and Engineering we look at the careers of women working in the field of hospital engineering.

WISE '84

Deborah Ratcliffe

Deborah Ratcliffe is an Apprentice Maintenance Fitter on the works staff at Park Hospital, Davyhulme, Manchester. On leaving school with 6 O Levels, she took the Engineering Industrial Training Board Course at Salford Technical College.

Engineering first appealed to me as a career in secondary school. Two of my options which I chose were metalwork and technical drawing of which I was able to take only one, and I had to fight to study technical drawing.

Technical drawing and physics were my favourite subjects. A few of my teachers tried to talk me out of studying engineering which made me more determined to succeed.

However, there was a careers teacher who helped me a lot whilst at school and afterwards. She advised me about the Engineering Industrial Training Board course at Salford Technical College. I applied for this course and was accepted. It was a full-time, 2 year engineering course and I really enjoyed it, learning basic engineering – welding, electronics, fitting and turning.

I applied for many apprenticeships whilst at college all of which I was refused simply because I was a girl or because I was not a higher standard than some of the boys. Then the Engineering Industrial Training Board sent me an application form for the North Western Regional Health Authority as an apprentice fitter. I applied and was accepted. I finished off my first year at college and then started work at Park Hospital in Davyhulme. I enjoy it very much and I am glad to be working for the Health Authority. At present I study one day and one evening a week on a Plant Technology course. I hope eventually to get into the drawing office and work on the designing side.

Margaret Berry

Margaret Berry is a Member of the Chartered Institute of Building Services. Having studied at the National College for Heating, Ventilating and Refrigeration she spent many years as a building services designer in the private sector and with the SW Metropolitan RHB. Miss Berry is now the Commissioning Adviser with the SW Thames RHA.

The 'Commissioning Adviser' is defined in Hospital Technical Memorandum No 17 as 'the person appointed by the Health Authority to advise whether the installation meets the requirements specified by the Health Authority'.

During the design stage I advise the Design Engineer and can warn of problems which may be encountered on site. One fairly common failing is that although the ventilation ductwork is set out in some detail with dampers and test holes suitably positioned, pipework is often installed underneath, making the test points inaccessible.

I advise on the time to be allowed in the Contract for commissioning and proving the system and this can vary between a few days and several months, the most time consuming usually being the air conditioning system.

The Site Engineers employed by the Region come under my control and I allocate them to projects; but when the projects become contracts they are responsible to the project Engineers for the satisfactory installation in accordance with the specification and drawings, but they are responsible to me for all Commissioning. We meet periodically, with the Regional Engineer present, to exchange views and try to resolve specific problems.

When a project goes out to tender I receive a copy of the Engineering Specifications and Drawings and subsequently additional information which is also supplied to the Contractor to enable him to carry out the required commissioning.

This usually comprises:—

1. System descriptions and flow diagrams
2. Required room conditions such as temperature and relative humidity
3. Pressure differentials with surrounding areas
4. Ventilation requirements
5. Sound levels
6. Lighting levels
7. Control Schematic Diagrams
8. Control Setting Points
9. Special equipment requirements.

It is essential that the Design Engineer has these criteria in mind during the course of design and presents the information in a suitable form. To assist in this, a set of standard documents, together with Final Acceptance Record sheets is in the process of being introduced on which reference is made later.

I do not normally attend site meetings, until Commissioning is involved, prior to this I rely on the Site Engineer to keep me informed. The most difficult part at this stage is ensuring that the time shown in the programme for commissioning and witnessing is maintained and not eaten away due to contractual delays.

After a system has been balanced the figures are submitted to me for comparison with the design figures to ascertain whether the results are satisfactory. If they are not and there is the possibility of a design problem, the Design Engineer is informed so that he can if necessary instruct the Contractor to carry out modifications before witnessing if he is unable to accept the results obtained.

If the results are not satisfactory for other reasons, ie ventilation not adequately balanced, I discuss it with the Contractor, advise him of my requirements and recommendations and await his revised figures.

If the Contractor has any problems or queries during the course of setting the plant to Work and Commissioning I am available for advice. It is not possible for me to witness everything on every contract so once I am satisfied

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The Engineering Council has issued a Policy Statement on the proposed Engineering Assembly and Regional Structure. The document was presented by Professor J C Levy, OBE, CEng, Director – Professional Institutions, to the final meeting of the Engineering Regional Organisations, which operated under the old CEI system, held at the University of York on 9/10th July 1984.

The Engineering Assembly and regional structure

It is proposed that The Engineering Assembly should be established as a forum to receive and discuss The Engineering Council's activities and progress. It should also provide a channel of communication between the 'grass-roots' of the profession and the Council. Various areas of the Council's work could be debated and motions proposed for action on which there would be feedback at subsequent Assemblies. The presence of Council Members, the Director-General and senior Council staff will assist informed debate to take place.

The Engineering Assembly will meet annually, probably a 2 day meeting, and will be chaired by the Chairman of The Engineering Council, there will be no non-elected members to the Assembly.

Elections to the Assembly will be conducted on a regional constituency basis, there will be about 20 constituencies covering the whole of the United Kingdom with the regional boundaries being determined by geography, demography, established centres of organisation and ease of communication.

Each region will elect 4 Chartered Engineers and 2 Technician Engineers or Engineering Technicians to the Assembly.

Detailed procedures for the elections are currently being prepared, however, candidates will have to be registered on the appropriate section of The Engineering Council register and the electoral system will ensure a spread of members from all fields of engineering.

In addition to The Engineering Assembly there will be Constituency Regional Committees which will ensure that engineering activities dovetail with the programme of The Engineering Council. Regional Committees will play an important role in cultivating the necessary interfaces with the Community, with employers, with industry, with academic institutions and with local government.

The Regional Committees will comprise the six members elected to The Engineering Assembly, nominated members representing the Engineering Institutions and other co-opted members, the Committee will elect its Chairman, Vice-Chairman, Secretary, Treasurer and Public Relations Officer.

Each Regional Committee will be responsible in its region for organising and enthusing the following, and any other relevant, activities remembering that the theme for regional activity is the projection of 'The Engineering Dimension' within society as a whole. Activities should not impinge on learned society activities and other specialised functions of the Engineering Institutions, unless by arrangement, and co-operation with Institution branches must be fostered.

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British Standard Institution

BSI is expanding

From November 1st 1984 three BSI departments will move to the following addresses at Milton Keynes:

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PO Box 391
Milton Keynes
MK14 6LW
Telephone for both addresses: Milton Keynes (0908) 3155555

The Test House remains at Maylands Avenue, Hemel Hempstead, Herts.

Recently published standards of interest to hospital engineers:

BS 308 A revision of BS 308 *Engineering drawing practice* Part 1 *Recommendations for general principles* has updated a major British Standard which reflects established conventions and also takes account of both national and international developments since the 1972 revision which is now withdrawn.

BS 6759 is the final stage of a programme to update and combine all requirements for safety valves in a single British Standard designated BS 6759 *Safety valves* which will itself comply with ISO 4126, produced by the International Organisation for Standardisation (ISO). The latest addition to this series is Part 2 *Specification for safety valves for compressed air or inert gases,* which specifies appropriate design, construction, inspection, testing and flow certification requirements and associated capacity calculations.

BS 6521 Guide for proper use and maintenance of calibrated round steel link lifting chains recently published by the British Standards Institution, gives the main principles for use, inspection, in-service testing and maintenance of these chains operating over chain wheels. The principal applications include manual and power driven hoists. The new standard is identical with ISO 7592: 1983 *Calibrated round steel link lifting chains – Guidelines to proper use and maintenance* published by the International Organisation for Standardisation (ISO).

Copies may be obtained from the Sales Department, British Standards Institution, Linford Wood, Milton Keynes MK14 6LE. Tel: 01-629 9000.

Aiming for hospital water treatment market

Water and effluent treatment specialists Fospur Limited have joined the Institute of Hospital Engineering and are aiming for increased involvement in hospitals with a comprehensive range of chemicals and associated equipment.

Fospur are part of the £500 million Foseco Minsep plc group, which has a fifty year history in the supply of speciality chemicals for industries throughout the world.

In the last 20 years, Fospur have developed over 200 products together with extensive analytical and support services. Amongst the principal industries they serve, Fospur are one of the largest suppliers of chemicals to the British Steel Corporation and National Coal Board.

Two years ago Fospur acquired boiler water treatment specialists Botan Limited of Manchester to expand their knowledge and range of water treatment technology, and now believe they are ideally placed to offer a full service to hospital engineers.

Fospur general sales manager Ron Coleman explained: "We may appear to be new boys in the market, but in fact our track record and experience are second to none. We are expanding into the hospital sector with a fully developed product portfolio and excellent support facilities."

Particular interest is already being shown in two Fospur products which are fully effective in destroying organisms in air conditioning and cooling waters – including Legionella bacteria, the cause of Legionnaires Disease.

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Kortokil 2020 is a new non-oxidising biocide developed through Boots Company plc, and marketed by Fospur. Extensive tests have shown that it efficiently kills Legionella bacteria as well as controlling the growth of slime associated with water systems and air conditioning units.

Low toxicity, ease of handling and biodegradability have added to Kortokil's attractiveness, and Fospur report steady growth in demand.

As an alternative solution to harmful bacteria and particularly suitable for potable water, Fospur offer their FOSCLOR range of chlorine dioxide formulations and metered dispense equipment is offered. Again, Legionella bacteria are effectively eliminated together with other organisms.

Fospur's boiler and cooling water treatment chemicals include a comprehensive package of conditioners, scale inhibitors and removers, chelants (stet), anti-foams, reodorants, corrosion inhibitors, biocides, algicides, slimicides, pH controllers and fuel oil combustion aids, plus associated equipment.

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At their two acre headquarters in Derbyshire Fospur have full facilities for research and development, and using their own technical staff they offer detailed surveys of water and boiler systems.

Said Mr Coleman, "Our background has given us a superb range of proprietary products with which to serve hospital engineers, but we also have the depth of experience to come up with new answers to problems."

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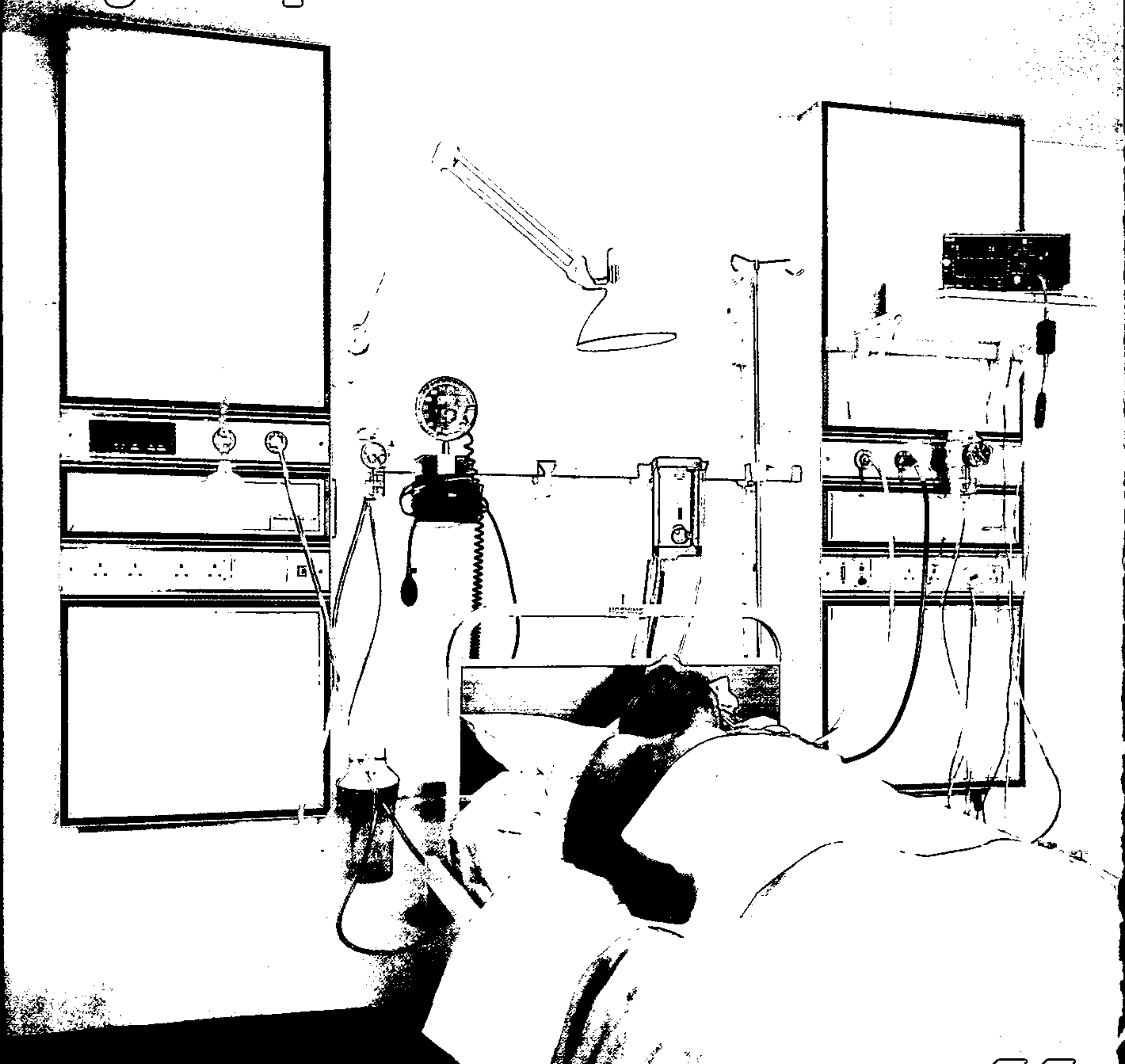

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Staveley Derbyshire S43 3PF
Telephone: (0246) 474242
Telex: 547444 OHMEDS G
Cables: Medipl Staveleychesterfield

BOC Health Care

Product News

New concept in sensors

Now available for the Testoterm range of portable anemometers, Testovent 4000 measures instantaneous and mean average readings in airflow, metres per second or feet per minute. At the flick of a switch you can measure the temperature also.

Further details and data sheet from: Testoterm Ltd, Old Flour Mill, Queen Street, Emsworth, Hampshire PO10 7BT. Tel: (024 34) 77222. Telex: 869352.

Boilers on the move

The Technical Services department of Cornwall County Council faced with the increasing frequency of shutdowns in critical installations throughout the county decided to design and build a mobile boiler house that could cope with such emergencies as a standby system. A mobile boiler house was built in a caravan shell so that it could cope with oil or gas firing for heating and/or hot water services and that could be put into operation within eight hours of an emergency call.

The selection of heating equipment was left to Sellick Nicholl Williams and after detailed consideration of the most suitable heating boilers for the purpose they selected a Chappee CM3 10 distributed by Commercial and Industrial Boilers Ltd of Winchester, Hants.

The CM3 10 rated at 870.000 btu/hr was to provide both the heating and hot water service for any of the sites requiring this back up.

A Chappee CM3 10 boiler was selected firstly because of its compact dimensional configuration taking up the minimum amount of floor space in a small overall area and secondly because the boiler design allowed suffient space for proper maintenance of the boiler itself and associated equipment.

Further details are available from: Commercial Industrial Boilers Ltd, 20a Jewry Street, Winchester, Hants SO23 8RZ. Tel: (0962) 56176.

Major cost saving chance for the NHS

There has long been a need within the NHS for component spares, service tools and test equipment which will allow qualified hospital technicians to effectively maintain and repair gas based therapy equipment.

Medipart Ltd was established in March 1984 to provide this valuable service to hospitals and undertakes to design, manufacture and supply a comprehensive range of high quality, reasonably priced spare parts, service tools and related test equipment. The product range is based initially on BOC Oxygen Therapy, Suction and Pipeline equipment but it is hoped in the near future to expand the range to include other leading makes of similar equipment as well as other equipment within the BOC range.

Further details from: Medipart Ltd, 9 Colts Croft, Great Chishill, Nr Royston, Hertfordshire SG8 8SF. Tel: (0763) 838683.

Air conditioning for mobile operating theatre

Recently, Ductwork Engineering Systems Limited designed and built a complete air conditioning system, with full temperature humidity control for a relocatable operating theatre suite. It comprises three metal containers which can be shipped to site on the back of a lorry. The unit is completely fitted out as an operating theatre suite with anaesthetics, scrub, disposal and preparation rooms as well as a main operating theatre. When it arrives on site, all that is necessary to render it fully operational is for power and water connections to be linked up.

Further details from: Ductwork Engineering Systems Ltd, Airport Trading Estate, Biggin Hill, Kent. Tel: Biggin Hill 71211.

Portable filter cleans mains

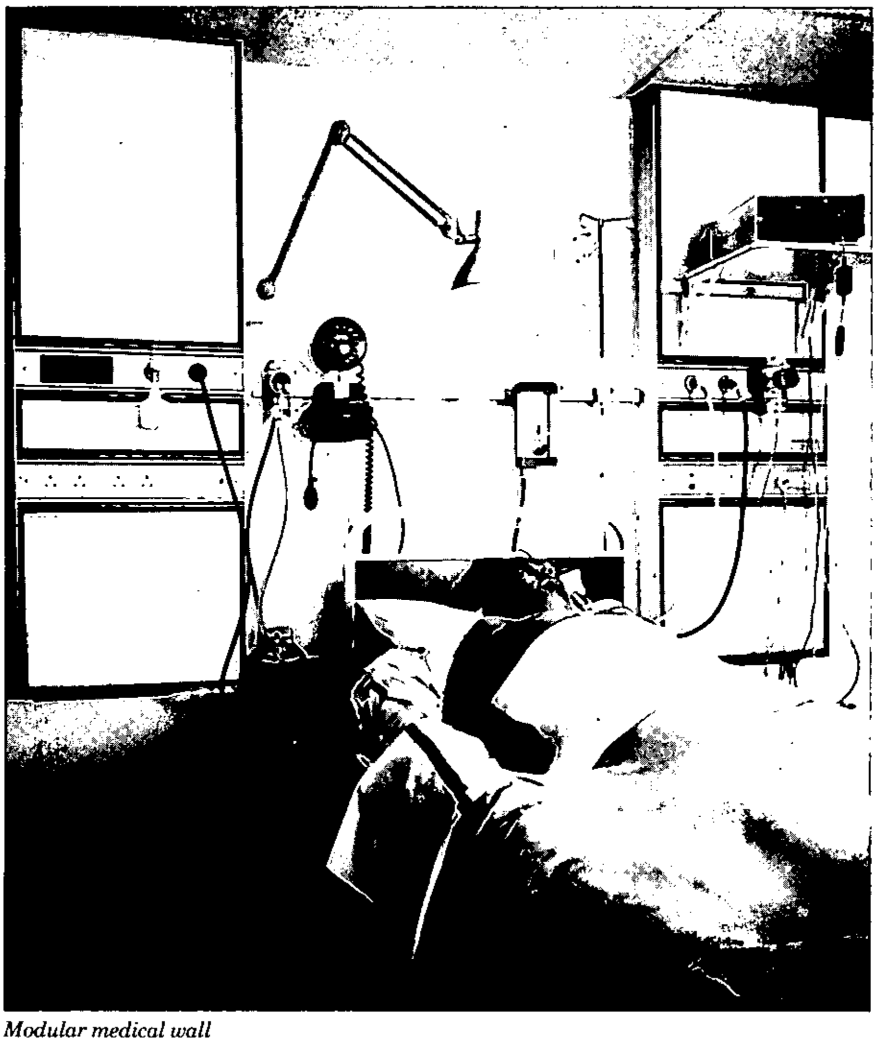
This portable mains filter has been designed for use where voltage spikes can damage equipment such as VDUs, computers, Hi-Fi, EPROM programmers, microprocessors and digital and analogue instruments. Acting as a filter between the mains and equipment, it is rated conservatively at 13A and incorporates an earth line choke and ZNR Varistor for protection against mains transients as well as radio frequency interference. A discharge resistor is provided to prevent shocks when handling the 13A plug. The LF13, which measures 170mm long x 120mm wide x 55mm deep, is supplied ready to use with a 2m cable set and moulded 13A plug.

Further details from: Roxburgh Suppressors Ltd, Haywood Way, Ivyhouse Lane, Hastings, East Sussex TN35 4PL. Tel: (0424) 442160.

Modular medical wall

A factory-built, pre-wired and pre-piped modular medical wall – with practically all communication, electrical and mechanical equipment needed by nursing staff and patient – is now available from Ohmeda, the BOC Health Care company. It can be 'plugged in' to main services during the final stages of construction or decoration and can be re-located if a rearrangement of the ward is required.

Further details from: J Burrell, Ohmeda, Telford Crescent, Staveley, Derbyshire S43 3PF. Tel: (0246) 474242. Telex: 547444 OHMEDS G.



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Address ____________________

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continued from page 19

that the figures are reasonable the Site Engineer is often able to witness the results. He keeps his own record of readings which I assess and submit a report to the Engineer responsible for the project.

On very large Contracts it is sometimes necessary to employ outside commissioning specialists to witness results and submit them using our standard documentation.

Witnessing of anti-confusion tests, total flow rates, delivery pressure tests, etc on piped medical gases is carried out by the Site Engineer or myself together with the 'Responsible Officer' who is appointed by the relevant District Health Authority but the identity, quality and purity is the responsibility of the Pharmacist who is nominated and known as the 'Suitably Qualified Person'.

Other specialised equipment such as sterilizers and X-Ray equipment is commissioned by the Regional Sterilizing Officer, or Regional X-Ray Officer. Items such as Boilers, Chillers, Generators, etc are witnessed by myself or the Site Engineer.

The District Health Authority is always invited to have a representative present when tests are witnessed; this is often an ideal opportunity for the plant to be demonstrated to the hospital staff who will have to operate and maintain it. The Insurance Company's representative is also involved in tests on boilers, lifts, etc to meet the requirements of Health and Safety legislation.

Quite often performance tests cannot be carried out until after completion of the contract and these are sometimes done using our own staff and instruments, including suitable recorders.

I investigate problems on existing systems and submit a report detailing my findings and recommendations. I carry out field surveys in an endeavour to trace cables or pipework on an existing hospital site where it is proposed to build.

I am a member of the DHSS/NHS Working Group responsible for producing documentation to be used as a guide for the commissioning content of the 'Model Engineering Specifications for Building Services in Health Care Buildings'.

This Group is preparing papers which are meant to complement standard publications such as those produced by the Chartered Institute of Building Services and Building Services Research and Information Association etc.

Each paper will relate to a specific section of Work and will form an aide memoire to the Design Engineer and guidance to the Contractor.

The Final Acceptance Record Sheets are used to record the Design Engineer's requirements and the final test figures form part of the record documents.

The role of the Commissioning Engineer is increasing in importance. As schemes become more sophisticated satisfactory commissioning with tabulated results is essential to ensure that the Client obtains the scheme which has been specified.

continued from page 20

(a) Publicising the profession

- (i) An annual talk or lecture relating to engineering as a whole and preferably of local interest to which the general public, schools etc. are invited.
- (ii) Invitations to municipal officials, industrialists, trade unionists and academics to participate in conventions, conferences and other similar events including, for example, any arranged visits to the Branch by the Chairman of Council, Council members or Council officers.
- (iii) Interface with local press and radio. For this purpose each Regional Committee would be expected to appoint an honorary Public Relations Officer and maintain active communication with the Director, Public Affairs, at The Engineering Council.
- (iv) Generally promote the image of 'the profession'.

(b) Professional affairs

- (i) Regional meetings providing a forum for engineers of all branches to discuss problems. The topics covered might include the future of the code of conduct, registration and licensing as well as the organisation of local events and the development of consensus views.
- (ii) Regional conferences and symposia to discuss matters of concern to the profession.

(c) Careers and education

Contact with local authorities, schools and industry to establish a greater understanding in schools of the significance of technology and the importance of productive industry. There seems to be a need to simplify, organise and re-define the approach to schools made by the profession and for the regional organisation to work with the SATROs.

Under this heading the activities of the Regional Committees could include the following:

1. organisation of Engineer-Teacher links to assist the teaching of technology in schools, colleges, polytechnics and universities
2. organisation of exhibitions and conferences to present engineering to school children
3. organisation of special lectures (eg Christmas lectures) for school children
4. operation of the 'Opening Windows on Engineering' schemes
5. co-operation with teachers in curriculum development and provision of illustrative material showing engineering applications of their science teaching
6. representation of the profession on governing bodies of schools, colleges, polytechnics and universities
7. participating in schools/industry liaison with training boards, government offices, industrialists and educationalists

(d) Other activities

- (i) To encourage engineers to participate in public life including standing for nominations in local and national elections
- (ii) the publication of a composite programme of Institution Branch meetings and activities leading to co-ordination of these
- (iii) maintaining and distributing the lists of officers of the Institution local associations, branches, centres etc.
- (iv) circulation of information on Institution activity likely to be of interest to engineers generally

· CHANGE OF ADDRESS ·

As from **Monday 15th October** 1984, the **editorial/management** offices have moved to:

TGV PUBLICATIONS
41 EARL STREET
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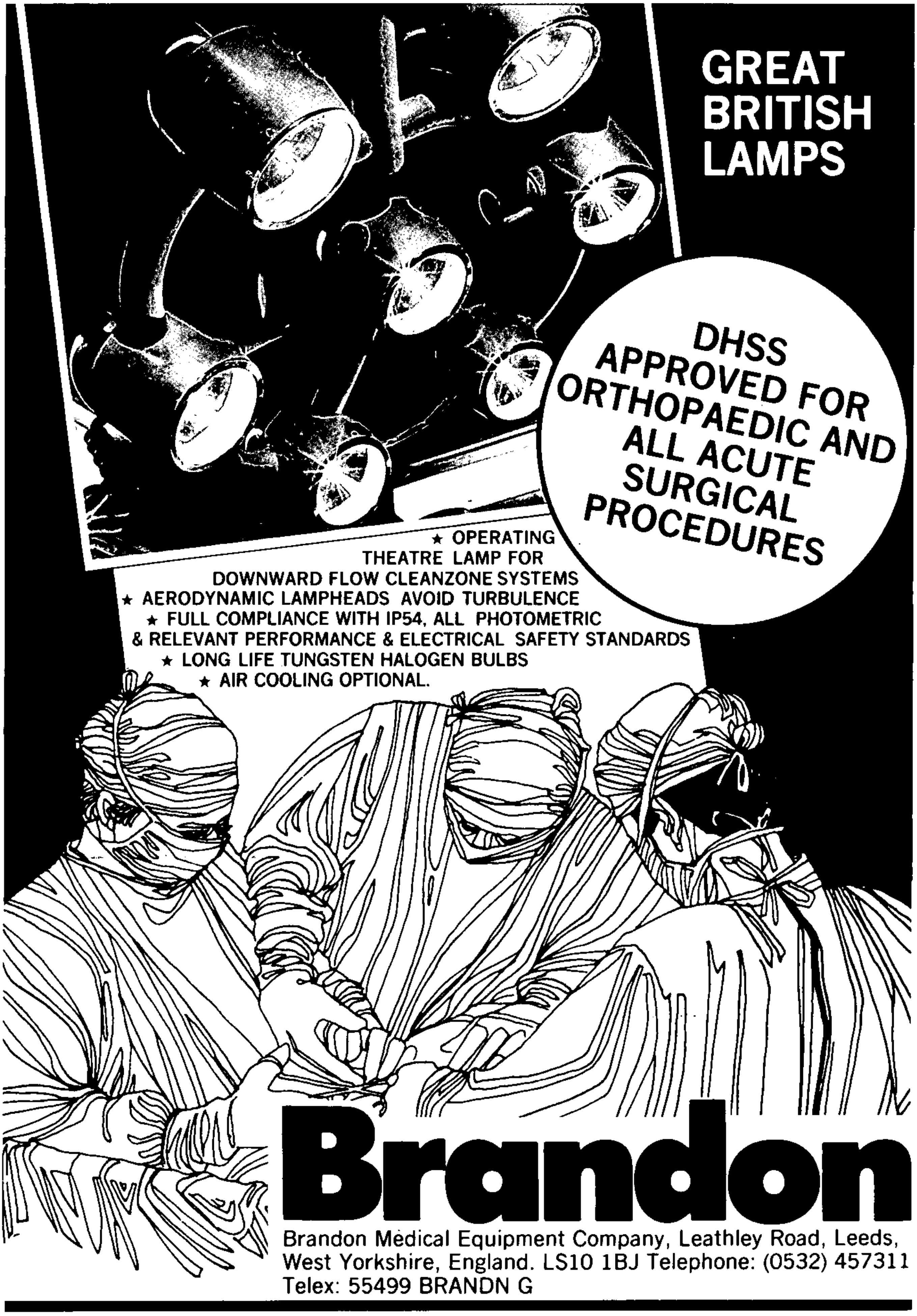
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North West Hertfordshire Health Authority

Unit Works Officer Grade 5

Salary: £11,825 – £14,069 p.a. (increase pending)

An experienced Works Manager is required to be responsible for co-ordinating the building and engineering operational and maintenance services in the acute and maternity units at St. Albans City and Hemel Hempstead General Hospitals.

The ability to monitor and rationalise the PPM scheme as well as to achieve the most effective use of in-house and contract labour is essential.

Experience with bonus schemes would be advantageous.

Applicants should hold suitable recognised qualifications.

Informal enquiries welcomed by the District Engineer, Brian Deex (tel. St. Albans 66122 ext. 519).

Job description and application forms available from:
District Personnel Department, St. Albans City Hospital, 65 Waverley Road, St. Albans.
Tel: St. Albans 66122 Ext. 451

CLOSING DATE: 21 November 1984

Lothian Health Board

UNIT ENGINEERING OFFICER
(Scale 3)

Salary: £10,863 – £12,894

Applications are invited from suitably qualified and experienced Engineers for the post of Unit Engineering Officer, Works Unit 2, which is responsible for hospitals, clinics, etc. in Edinburgh and East Lothian.

The successful candidate will be responsible to the Unit Works Officer for the execution of operations and engineering maintenance throughout the Unit, design and control of works projects within the Unit and all engineering services provided by the Unit. He/she will also assist the Unit Works Officer on estate management matters and provide advice on engineering matters.

H.N.C. qualifications in mechanical or electrical engineering with appropriate endorsements or an alternative acceptable to the Secretary of State for Scotland are the minimum acceptable qualifications.

Application form and job description available from the Area Personnel Officer, Lothian Health Board, 11 Drumsheugh Gardens, Edinburgh, EH3 7QQ. Telephone: 031-225 1341 Ext. 46.

Informal enquiries would be welcomed by Mr. T. Drysdale, Unit Works Officer. Telephone: 554-4444 Ext. 375.

Closing date for receipt of applications is Wednesday, 28th November, 1984

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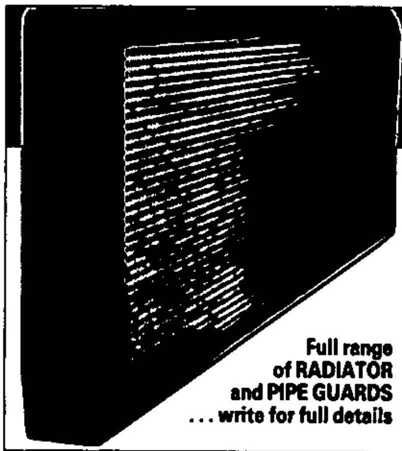

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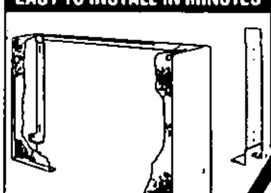

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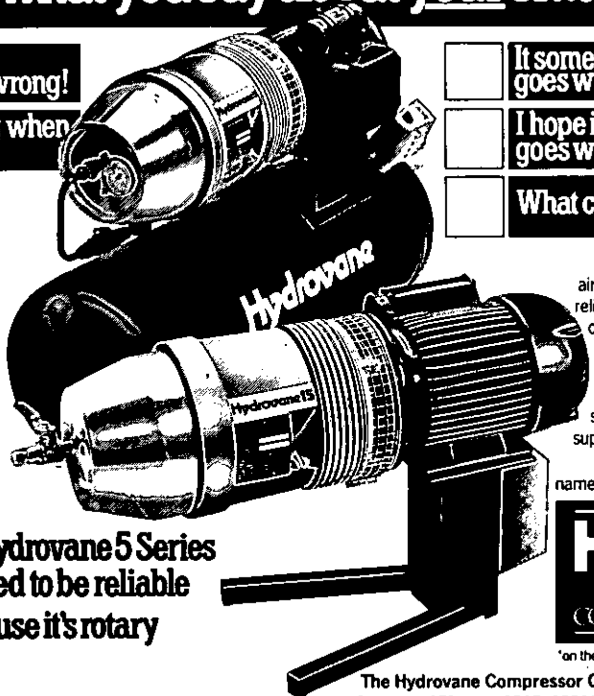

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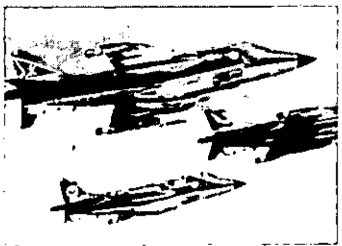

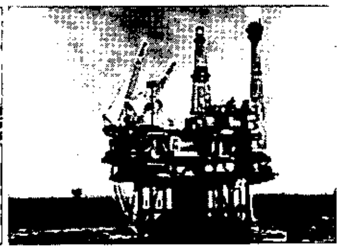

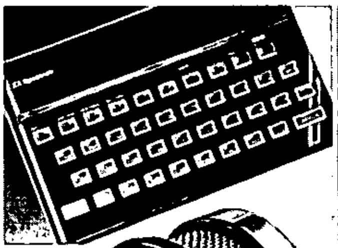

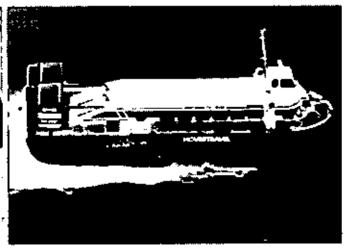

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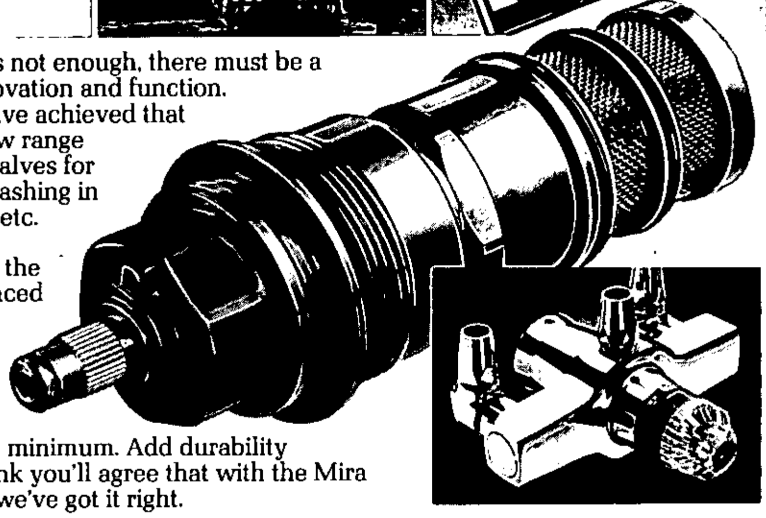

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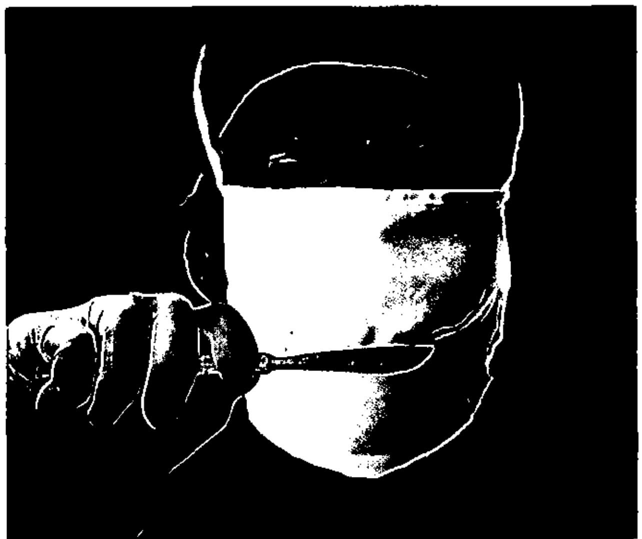

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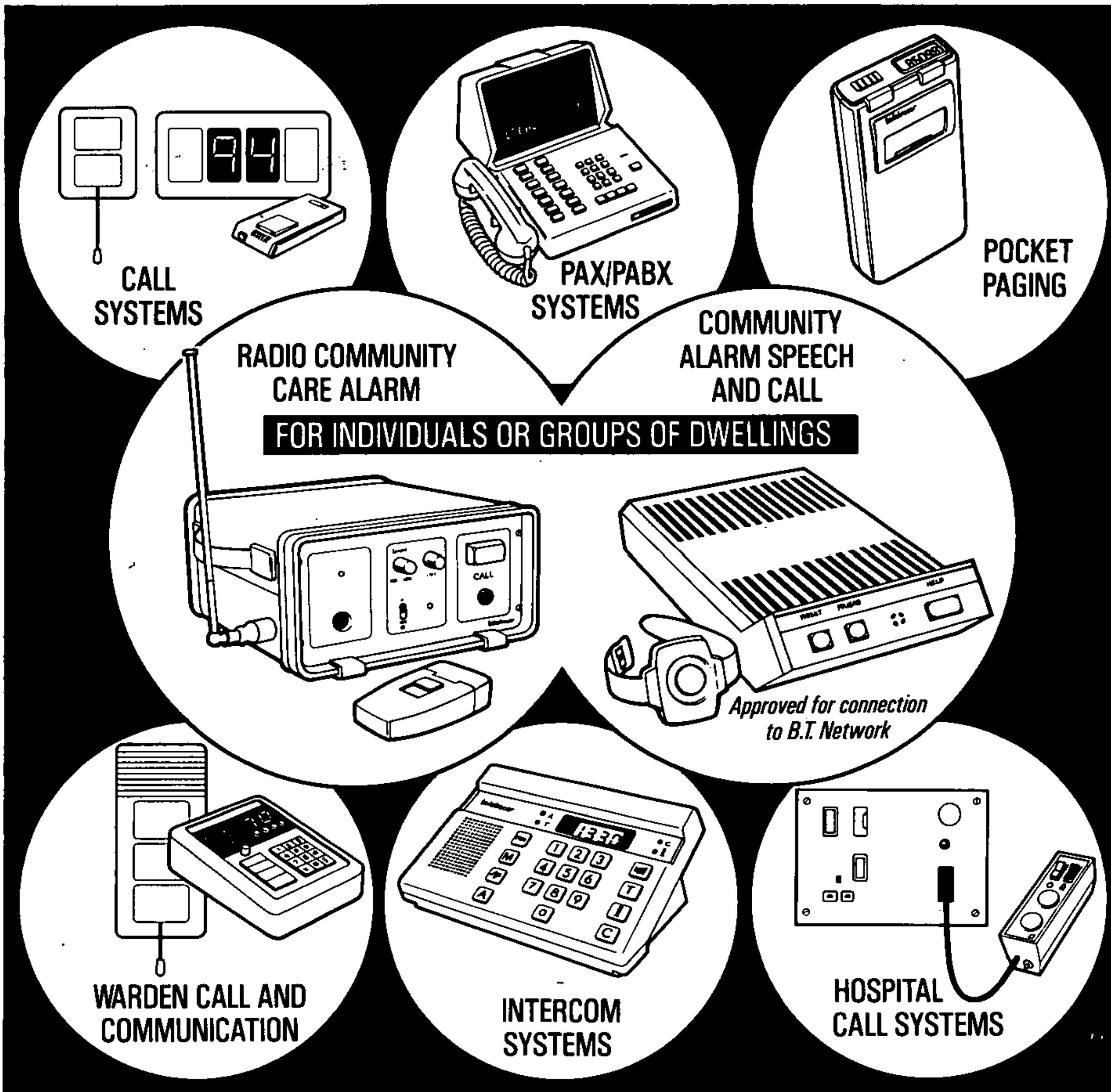

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