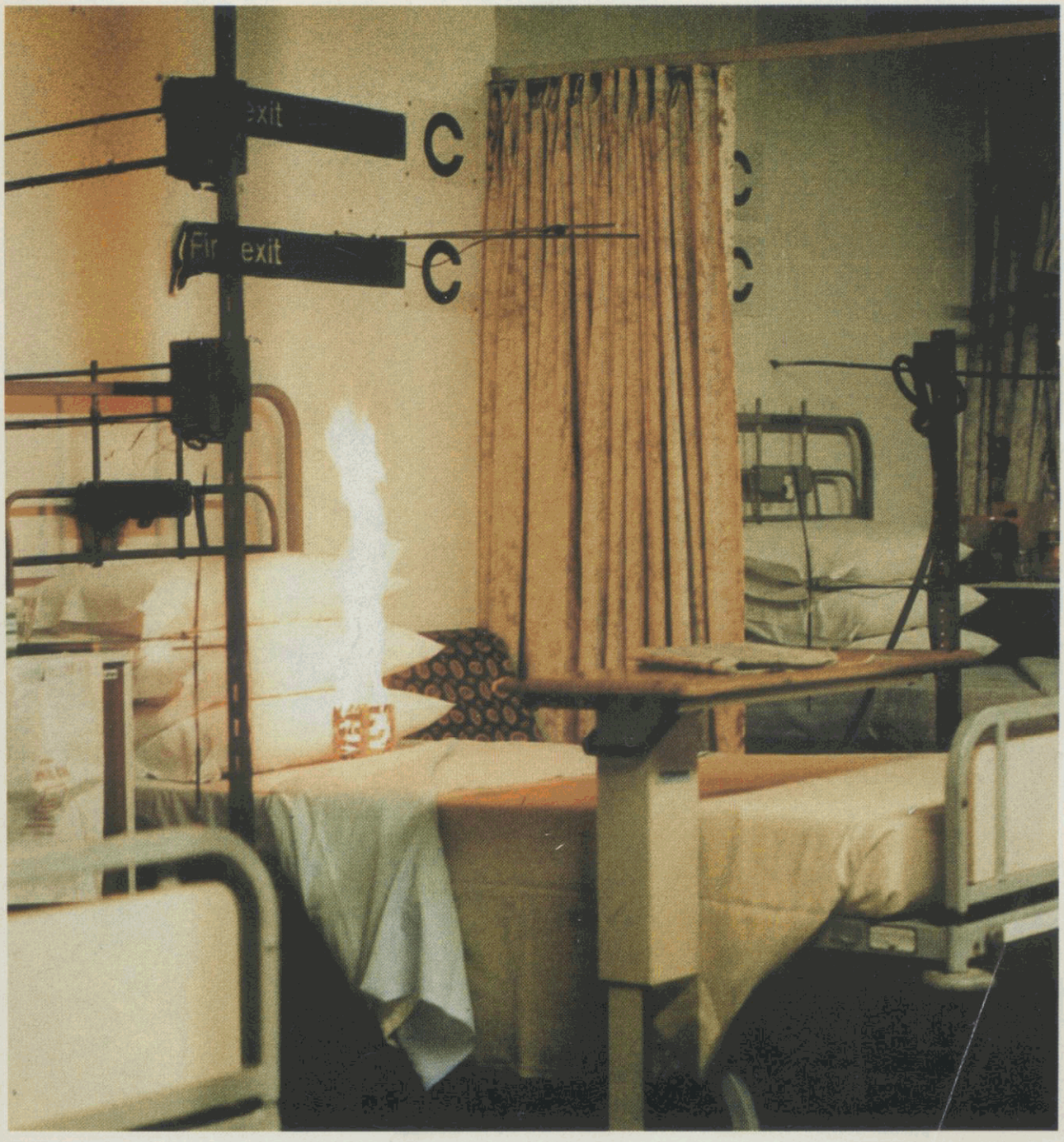
The Journal of The Institute of Hospital Engineering October 1985

HOSPITAL ENGINEERING



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□ **Planning for fire precautions at Regional level**

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HOSPITAL ENGINEERING

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Front cover picture: Two minutes after ignition — a typical fire test. (See feature on Research into Fire Prevention on page 6). ©Building Research Establishment.

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Talking Point

The author is DWO at the Rugby Health Authority. He is a member of the Institute's Council and also sits on the Membership and Publications Committees.

The potential for corruption with fee negotiations

R J CHATWIN CEng MIMechE MCIBS MBIM MIHospE

The present method and procedure of obtaining tenders for Building and Engineering contracts in the Health Service are generally accepted to be as a consequence of the report. "The Placing and Management of contracts for Building and Civil Engineering Work" which was the report of a committee chaired by Sir Harold Banwell between 1962 and 1964, and prior to that the Simon committee of 1944. These reports encouraged Public Authorities to seek competitive tenders from selected contractors who have been approved of being of suitable size and capability to carry out the work in question. The system has generally worked well over the years and there have only been a few isolated incidents of corruption. The method of obtaining tenders for Building and Engineering work has, provided the procedures have been followed, generally satisfied the need for Public accountability. The system has balanced the need of maintaining the quality of Building and Engineering procurement and satisfying public accountability without unnecessary delay in achieving a start or completion of a project.

In 1973 the Monopolism Merges Commission were asked to investigate whether complex monopoly provision prevailed in the supply of architects and surveyors services where the fees charged were calculated by reference to an agreed scale. In their subsequent report in 1977 the commission gave their view that monopoly conditions did exist which were against the Public interest by the imposition of rules which prevented competition when fees were determined by fee scales by the relevant professional associations.

Health Notice (83)24 of October 1983 introduced "Concode" which was a code of practice for Building and Engineering contracts and for Building and Engineering consulting commissions. Concode indicated that at that time because of the inter-departmental committee of professional fees, considering the implementation of competition on fee scales, that Authorities should take no action and that the fee scales for all three professions should continue to be regarded as the basis for fee scales for particular commissions. This effectively restricted the authorities from negotiating fees for its commissions.

Health Circular HC(84)33 introduced fee competition for consultant commissions. This circular introduced fee competition for the larger schemes and fee negotiation for lesser schemes. It is the aspect of fee negotiation which will generally cover all commissions placed by District Health Authorities, and it is this aspect which is particularly open to corruption. The tendering procedure for contracts of Building and Engineering work, following Banwell, leads to a relatively secure situation, avoiding corrupt practice. The new system of fee negotiation between an officer and a consultant is, in my view, potentially open to corruption and I am unable to understand how this can be acceptable to Public accountability. Any Works Officer who is to be involved in fee negotiation on behalf of his Authority would be well advised, for his own protection, to cause his Authority to lay down a rigid procedure for fee negotiation which involves more than one officer of the Authority, preferably where any second officer involved would be a different officer on subsequent occasions. The sums of money involved, that is, say for every million pounds spent on Building and Engineering contracts somewhere around £200,000 may well be spent on fees, can well cause corruption to occur if the fee negotiation aspect is not properly controlled.

In a recent talking point, an article was produced on the benefits of using consultants for scheme administration as opposed to in-house Direct Labour. In this age where private enterprise is considered to be more efficient that Direct Labour, Works Officers would do well to consider the benefits of in-house design and scheme control as generally, this may well be found to be better than the use of private consultants and clearly, avoids the minefield of fee negotiation.

Institute News

Institute's new secretary

Commander J. A. Blain, RN (Ret'd) joined the staff of The Institute of Hospital Engineering on 1st October 1985, and will succeed to the Secretaryship on 1st January 1986, on the retirement of John Furness.

Commander Blain was born in 1930, he was educated at the King's School, Worcester and joined the Royal Navy in 1949 as a Cadet in the Supply and Secretariat Branch. After initial basic and professional training he served in a number of training appointments ashore and afloat and later as a Leiutenant in junior staff posts in the Mediterranean, the Far East and in Portsmouth. After promotion to Lieutenant Commander in 1961 he served as the Supply Officer in a frigate on the West Indian Station where he was responsible for the management of all pay and cash accounting, feeding the Ship's Company and the logistics support and related accounts. This was followed by a further appointment in the Secretarial field this time at a large Naval Air Station where he was the Commanding Officer's personal staff officer responsible for providing all secretarial services. In 1967 he joined the

R.N. Supply School at Chatham as the Fleet Examination Officer supervising the setting and marking of all professional examinations in the Supply Branch.

He was promoted to Commander in 1969 and went to Gibraltar as Base Supply Officer with responsibility for managing the Supply Department in the shore accommodation base, for logistics support for visiting ships and was in addition the Staff Supply Officer to the Flag Officer Gibraltar. Two further appointments as Supply Officer followed in the assault ship HMS INTREPID and HMS HAMPSHIRE, a guided missile destroyer.

Commander Blain was next appointed as Staff Personnel Officer to the Commander-in-Chief, Naval Home Command providing staff support and policy advice to the Command on personnel matters for all Naval Shore Establishments in the UK. After a further appointment as a Supply Officer, this time at the School of Maritime Operations near Portsmouth, he went to the NATO Headquarters in Brussels for two years as Senior Staff Officer in a Military Standardisation Agency where he was responsible for servicing regular Board meetings as well as conferences attended by representatives of nations in the Military Alliance. On return to the UK Commander Blain spent two years carrying out manpower audits for the Ministry of Defence in Naval Establishments throughout the UK. His final appointment in the Royal Navy was as the Support Manager at the R.N. Hospital Haslar, near Portsmouth where he was responsible for managing all non-clinical and non-nursing activities.

When he left the Navy at the end of 1983 Commander Blain joined Marconi Underwater Systems as the Administration Manager in the Marketing Department

providing administrative support to the Marketing Director and Marketing Executives. He joined the Institute directly from Marconi.

He is married with one adult son and lives in Droxford, Hants. His interests are gardening, golf, music appreciation and reading.

The Engineering Council

New fees

The Engineering Council has announced new annual registration fees for Chartered Engineers, Technician Engineers and Engineering Technicians, which will take effect from January 1, 1986. The registration fee for Chartered Engineers will be increased to £7, Technician Engineers to £4.50 and for Engineering Technicians to £2.50. In explaining why the new scale of fees is necessary The Engineering Council invites the continued support of registrants for the Council. The fact that the initial Government grant of £1m per year fo the Council would end on June 30, 1985, has been known since the Council was set up three years ago. Government support for specific projects will continue, but it is now necessary to gain increased financial support from registered engineers and from employers of engineers to maintain the Council's impetus and to fulfil the aims for the engineering profession embodied in the Council's Charter.

The Engineering Assembly

The election process is now complete and the final figures for representation of the Executive Group Committee fields of engineering are:-

	EGC1	EGC2	EGC3	EGC4	EGC5
Chartered Engineer	16	17	18	12	13
Technician Engineer/ Engineering Technician	6	8	14	8	1

The Watt Committee

Passive solar building design

Mr David Hunt, MP, Parliamentary Under-Secretary of State for Energy, will be the opening speaker at the Eighteenth Consultative Council meeting on Wednesday, 23rd October 1985 at the Cafe' Royal, London. The theme of the meeting is 'Passive Solar Energy in Buildings: Realising the Opportunities', and is concerned with the effective harnessing of heat and light from the sun.

Air pollution and acid rain

A second phase of study by a working group led by Prof Kenneth Mellanby CBE will culminate in a meeting to be held at the Institution of Mechanical Engineers, London, on Wednesday, 4th December 1985, when the working group will present its assessment of the problems connected with air pollution originating from various fuel uses, especially those that are loosely termed 'acid rain', and will make recommendations.

Watt Committee Report No. 14 *Acid Rain*

Continued on page 4

LETTERS TO THE EDITOR

Ultraclean operating theatres: Dr Schict replies

I wish to acknowledge Mr Tuson's interest in my article 'Ultraclean operating theatres: cost efficiency and energy saving aspects', published in *Hospital Engineering*, April 1985. Permit me to comment briefly on the points he raised in his 'Letter to the Editor', published in the July/August issue.

I fully agree with Mr Tuson that the operating cabin in a technically and hygienically convincing proposition. It is a fact, however, that its acceptance in the medical world remains extremely restricted, due to its considerable investment and operating cost. The principal aim behind the new concept presented in my article was to achieve significant reductions both in investment and operating cost, while maintaining the concentrations of airborne contamination at a very low level, but only where this really matters, i.e. in the wound area and at the instrument table.

To maintain low contamination levels, the displacement flow principle offered the greatest merits, and to achieve economy, the ceiling field for establishing displacement flow had to be of the very minimum size compatable with the contamination requirement. This means doing away with side panels.

I quite understand Mr Tuson's uneasiness with the mixing zone separating the undirectional displacement flow in the core area from the turbulent flow in the peripheral area. Let us therefore discuss how the flow patterns establish themselves in the critical area. Three effects help to explain the very satisfactory cleanliness levels achieved by our concept:

1. The mixing zone separating the displacement flow core from the turbulent surroundings is deflected outwards by the massive obstacle presented by the operating team, the operating table and the instrument table.
2. Displacement flow is maintained at practically constant velocity until it meets the horizontal surface of the operating table. The flow lines are then deflected outwards, shielding the wound area and the instrument table quite effectively from the contamination set free by the operating team.
3. As it sweeps along the surface of the operating table, the flow is accelerated. This helpsd in preventing dead zones with stagnant air, so that the upper surface of the operating table is shielded against contamination set free below it.

I agree with Mr Tuson that the members of the surgical team are furious emitters of colony forming units and that much of this contamination originates from the arm pits, and from the hips downwards. Due to the flow behaviour discussed earlier, most of this contamination is swept away to the periphery. The wound area and the instrument table are therfore very little affected by this source of contamination, due to the aerodynamic shielding described. It leads to increased contamination in the turbulent surroundings, but due to the diluting effect of return air capture excessive concentrations are avoided there.

Also, there is practically no risk of this contamination being recirculated into the operating area, as the sterile air distributor with its extremely thin framing effectively inhibts the entrainment of peripheral contamination into the displacement flow core.

Besides the hospital application, with well above 100 operating theatres worldwide already equipped with the ceiling system described, and another 100 or more on order, there are many other clean rooms in the pharmaceutical industry, in electronics and precision engineering etc. successfully employing the same principle.

To any reader interested in more details of the contamination situation in operating theatres as described in my article, I am happy to send a copy of the report on a detailed investigation performed by an independent expert.

Dr Hans H. Schict
Dr sc techn
Zurich, Switzerland

DWO's under pressure

I was interested to read 'Talking Point' in the July/August, 1985, issue of *Hospital Engineering*. Mr Smith's article will, hopefully, strike a chord with those District Works Officers presently wavering under the pressure put on them by the General Management doctrine, particularly the pressure to permit autonomy at Unit level.

The point Mr Smith makes about the economies of scale are probably quite valid, and I am sure it would be helpful if someone were able to support his contention by statistical evidence.

The point he does not make, which is perhaps just as valid as those he does, is that the delegation of too much maintenance and maintenance money to Unit level could well result in inequality of provision at Unit level, e.g. I can well remember in the early days of the National Health Service that the quantity and quality of maintenance provided by the then seprately run Units varied considerably.

In supporting Mr Smith's article, I would recommend to all District Works Officers that they look again at the Griffiths' circular and stress to respective Authorities that one of the main objectives of the enquiry was to make managers aware of the importance of the estate as one of the primary resources of the National Health Service. It takes a long time to build something worthwhile. It takes only a short time to destroy it.

K. Wright
Works Officer
Salford Health Authority

is available, price £14.80 net, from the address below (details of additional charges for posting and packing to overseas destinations will be supplied on request).

Further details from The Watt Committee on Energy, Savoy Hill House, Savoy Hill, London WC2R 0BU. Tel: 01-379 6875.

Award winner

Edwin Hodson of the Engineering Division of the Northern Regional Health Authority, Newcastle upon Tyne, has been awarded the Sir William Lee Research Prize. The award also carries a prize of £200. His work was published in the February 1985 issue of this journal under the title 'Factors in the determination of vehicle replacement policies'. It is for this particular piece of work that Mr Hodson won the award.

THE INSTITUTE OF HOSPITAL ENGINEERING ONE DAY SYMPOSIUM

'THE CHOICE IN SELECTING CONSTRUCTION AND MAINTENANCE CONTRACTS'

on Thursday 5th December 1985
at The Institute of Marine Engineers
Mark Lane, London EC3

New construction contracts within the National Health Service are usually in the JCT format. Outside the NHS there are a number of other different types of construction contract in use, all with particular advantages and disadvantages. Additionally there are a number of types of contract which are used for the operation and maintenance of plant and buildings, some of which encompass capital injections.

This Symposium is to review and discuss all these various types of contract so that their strengths, weaknesses and suitability for particular situations may be clearly demonstrated.

PROGRAMME

1. REVIEW OF THE FIELD
2. MANAGEMENT CONTRACTING
3. JOINT VENTURE/TURNKEY PROJECTS
4. CONTRACTS FOR MAINTENANCE AND OPERATIONS
5. PROFESSIONAL VIEW OF ALTERNATIVE FORMS OF CONTRACT

The full programme details will appear in the next issue of the Journal. Tickets and further information available from the Institute Office.

FORTHCOMING BRANCH MEETINGS

West of Scotland Branch: *Hon Sec: R. W. Gardner, 12 Middlehouse Court, Carluke, Lanarkshire. TN (041) 204 2755 ext 2710.*
November 28th 'Mains Communication for Monitoring and Control' by Mr G. Walsh, Burgess Control. The Board Room, Glasgow Royal Maternity Hospital.

Southern Branch: *Hon Sec: A. J. Styles, 11 Rufford Close, Boyatt Wood, Eastleigh, Hants. SO5 4RU. TN Southampton (0703) 777222 ext 4109*
November 14th Visit to IBA Crawley Court, Nr Winchester.

East Midlands Branch: *Hon Sec: E. A. Hall, E. G. Phillips Son and Partners, 26 Annesley Grove, Nottingham. TN Nottingham (0602) 475783*
November 6th Coffee 5.30. 'Magnetic Resonance Imaging — A Presentation on Principles and Application' by Prof B. Worthington. Lecture Theatre, MR1 Suite, Queens Medical Centre.

Welsh Branch: *Hon Sec: M. J. Back, 10 Nant-y-felin, EFail Isaf, Nr Pontyprid, CF38 1YY. TN Cardiff (0222) 499921 ext 163.*
October meeting Visit to BBC Studios, Llandaff, Cardiff — please contact Hon Secretary for exact details.
November 5th 2pm A second visit to the Control Tower at Rousse Airport.

Should you wish to attend any of the above meetings, kindly notify the Honorary Branch Secretary by completing the slip below.

ATTENDANCE AT BRANCH MEETINGS

Members who intend attending any particular branch meetings are urged to complete this return slip and send it in to the relevant Branch Honorary Secretary so that anticipated numbers for each meeting are known in advance.

To: The Hon. Secretary,_____Branch

I would like to attend the meeting on _____

Name: _____

Tel. No:_____

New Council member

Robert John Chatwin, CEng, MIMechE, MCIBSE, MIHospE, MBIM, is the Member of Council for the West Midlands Branch. He first became a Midlands Branch Member in the early 70's and has served as Chairman and Vice Chairman. He served an engineering apprenticeship in industry and joined the Health Service at Selly Oak Hospital Management Committee in 1968 moving to the post of Deputy Group Engineer at Dudley Hospital Management Committee in 1970. He moved on to the post of District Works Officer to the Rugby District of Warwickshire Area Health Authority in 1982. St Cross Hospital at Rugby is at present undergoing major development in order that it can provide the services of a District General Hospital from that of a Local Acute Hospital. In his first year on Council he will serve on the Publications Committee and Membership Committee.

NEXT MONTH

December/ January '86

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Fire Precautions Symposium

Fire and the precautions to be taken against it were the subject of a successful one day symposium organised by the Institute on 26th June, 1985. John Bolton, Chief Works Officer of the DHSS, officially opened the conference, the first since his inauguration as President of the Institute. Drawing the attention of the audience to this most important topic which always excited the interest of the public, he said that the purpose of the symposium was to explore the policies which have been developed and look at research and development for the future — in other words, to examine the state of the art of fire precautions. A wide range of speakers from the Home Office and all levels of the Health Service provided a most interesting and useful day.

First, Mick Kemp of the DHSS pointed to the problem of maintaining a constant level of safety consciousness in relation to fire. Emphasis was always given to precautions after a major fire but memories soon fade. There was often the feeling that "it can't happen here", combined with much crossing of fingers, rather like the man who jumped off a skyscraper and said after passing each floor — "so far, so good".

He said we cannot afford to be complacent. There are 2,000 hospital fires annually involving fire brigades and 11 to 13 people die every year from fire. Each new incident illustrates the apparently inexhaustible number of ways that fire can breach our defences. Mick went on to describe what the Department are doing abouit fire safety but reminded the audience that the essence of safety is in the collaboration of all disciplines and all levels of the Health Service. DHSS guidance is a distillation of many sources of wisdom with the objectives of achieving safety at reasonable cost without reducing the effectiveness of the hospital in its primary purpose of healing the sick. He emphasised the importance of staffing levels and vigilance. The Moston tests had shown how little time was left to evacuate patients after automatic detectors sounded the alarm. The watchword is CARE, i.e. Commitment, Awareness, Response and Expertise.

Gordon Ayres, Assistant General Manager responsible for estate management in the North Western Region returned to the theme of cost effectiveness of fire precautions. He felt that they must be compared with the cost and benefits of other means of saving life, which is what the Health Service is all about. They key should be that people are not put at greater risk in hospitals than they face at home or at work, and that property of strategic importance such as Regional specialities and multi-District laundries be protected. Whilst accepting the need for common national standards in its application and lacking a sense of real costs and benefits. He called for the production of comprehensive Fire Precautions Plans which integrate and illustrate to staff the protection arrangements and evacuation policy.

Mr Lomax, a Principal Engineer of Trent RHA reviewed all the guidance on engineering aspects, pointing out the real dangers of engineering services, spreading like arteries through a hospital, breaching fire barriers. Early planning and collaboration by all designers was essential for success.

In a fascinating talk, Nick Pearce of DHSS illustrated the research being done by the Department and the Fire Research Station in the search for safer bed assemblies and reduction in the frequency of false alarms from automatic detection systems. Trials of sprinkler systems were looking very promising; at £30 per head for an installation which detects *and* extinguishes fire could be the most cost effective precaution of all.

After a review of the Home Office Draft Guide: Fire Precautions in Hospitals by T. Greenwood, an H.M. Inspector of Fire Services, the symposium was concluded with a rousing talk by Roy Cox, District Fire Officer from Preston Health Authority, about problems at District level. In his own inimitable and forthright style he shattered some illusions about what actually happens compared with what is planned. He suggested that the argument about the alternative to spending on medical equipment was all very well until a fire destroys that as well! He called for the return of special capital allocations and in referring to commitment from management, he hoped that the era of General Managers might bring considerable improvement.

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This paper was presented at the Institute's Fire Prevention symposium. The author is Principal Professional and Technical Officer at the DHSS.

Research in fire prevention

N PEARCE CEng MIMechE

Introduction

This paper reviews some of the fire research currently being done by the Department. It covers our main fields of research in broad terms rather than reporting in depth on any particular project. The first question to consider is why do we need to do fire research at all? A lot of other organisations do research into fire, the 1983 directory of UK Fire Research lists 178. Well the provision of health care and the buildings and services that entail presents rather special fire problems.

In a hospital patients for either physical or mental reasons cannot evacuate themselves and are reliant on staff. A building which is the ultimate in fire safety might be incapable of providing good patient care. A sensible compromise must be made between the often competing factors of fire safety and the essential operational practices of the health building. Through our research programme we must provide the health service with a framework of guidance that results in fire safe designs whilst allowing maximum flexibility to allow designers to produce buildings that function well as hospitals.

Technology is moving apace. In some cases this has increased the fire hazard and research effort is needed to understand and control or mitigate the hazard. A prime example is the increasing use of plastics and foam materials. Although they can offer advantages in many respects they can be disastrous in a fire and may give rise to large quantities of heat, smoke and toxic fumes. On the other hand technology can also provide us with the tools to improve fire safety, and give us fire safety at reduced cost. Computing power unheard of a few years ago is now available on a small microchip. This technology is transforming fire detection equipment and new techniques are continuously being developed. Through our R and D effort we need to harness and utilise advancing technology to give us better fire safety systems.

It is vitally important that the real needs of the service are taken into account in initiating, planning, and setting priorities for research. For this reason the group responsible for organising fire research is very much an interdisciplinary one. Its membership includes medical and nursing representatives as well as architects, engineers, supplies people and so on. I should also mention the invaluable contribution to the group from the Home Office, Fire Research Station and consultants.

Fire and smoke tests

Smoke and toxic fumes are well known to be killers in fires and I will start by looking at recent Fire and Smoke tests. I am sure most of you will be familiar with the series of fire tests on beds carried out at Moston hospital in Cheshire in 1980. The results of those tests have had a large influence both on present fire policy and on our current research programme.

To remind us of some salient points, the tests demonstrated that a bed, comparising a standard polyurethane foam mattress as found in nearly every hospital in the country, if involved in a fire could generate a lot of heat and large volumes of smoke and toxic gas. A film of one of the tests, appropriately titled 'seven minutes to flashover', has been given wide publicity. The message was clear, a bed fire in a hospital ward would pose a serious threat to the occupants.

The Moston tests and follow up tests at Cardington in 1983 showed that a bed assembly comprising a prudent choice of fire resistant materials might be safer, but there were question marks. How much safer, and would they permit more open planning of wards without putting large numbers of patients at risk from a fire? There were warnings too of a possible adverse trade off in excessive smoke production under some circumstances.

Before moving on to more recent research, it is worth noting that some tests were carried out using sprinklers. The results were encouraging. A bed fire could be controlled by a small amount of water and it was clear that the use of sprinklers for ward protection was a topic that warranted further investigation. So the search was on to find a safe bed assembly, and could we quantify the real hazard to staff and patients in a ward from a bed fire?

What I will do now is describe in a bit more detail the tests that the Department carried out last year, 1984.

A bed is quite complex. There is the bed base itself, the mattress, mattress covers, sheets, blankets, counterpane and pillows. There are different types of each component; solid, wire mesh or wooden bed bases for example, sheets may be polyester, polyester cotton, mod acrylic, flame retardant cotton, and so on. The permutations we could test were enormous.

We were particularly interested in the barrier foam type mattress as an alternative to the normal polyurethane foam. Barrier foam is a standard pu foam impregnated with resin bonded hydrated alumina. The effect is to coat the pu foam bubbles with hydrated alumina, this decomposes in a fire to produce water. A mattress composed entirely of barrier foam would be too hard for patient use in hospitals (althoug barrier foams now being developed may have better comfort characteristics). We were interested in a mattress made-up of a standard pu foam inner core with a thin layer of barrier foam bonded to the outside.

Our problems didn't end with selecting bed assemblies to test. How and where do we ignite the bed, how is it made up, and so on.

We eventually decided on a research programme with three discrete parts based on a proposal put forward by the Fire Research Station. The first stage was to involve tests on individual beds in a fully instrumented test chamber to assess whether or not there were significant differences in first performance between beds comprising different materials. If there were differences, to rank beds in terms of their fire performance. The second stage was to establish the hazard to life in a six bed ward using the best beds as selected from the first stage. The third stage was concurrent mathematical modelling studies.

As a strategy this three pronged approached had much to recommend it.

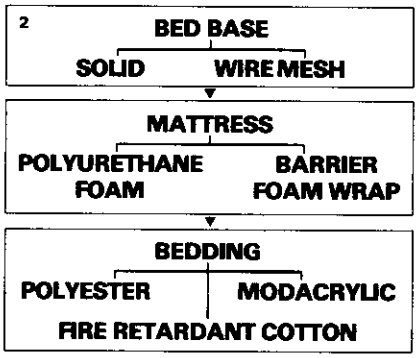
Stage 1 would give us a data base of information on the fire performance of selected bed assemblies which could be developed in future as new material became available. Mathematical modelling, if successful, would enable the hazard to life in a variety of building layouts presented by a range of materials and fires to be assessed and would minimise full scale fire simulations that might otherwise be necessary in the future. Full scale fire tests are very expensive. A crucial first step was to set up test criteria. For staff and patient safety, the smoke, heat and toxic products from a fire must remain within safe limits for the time necessary for evacuation. After taking advice from fire researchers and toxicologists, the criteria set out in Figure 1 were developed. The stage 1 tests were carried out in May 1984 by the Rubber and Plastics Research Association at Shawbury. RAPRA set light to 36 beds in all in their instrumented test chamber.

LIFE SAFETY CRITERIA 1
LIMITS UP TO 1.75m ABOVE THE FLOOR

Smoke Density	**0.18 OD/M max**
Temperature	**50°C max**
Radiant Heat	**0.2 W/cm max**
Carbon Dioxide	**50,000 ppm max**
Total Halogen Halides	**100 ppm max**
Hydrogen Cyanide	**50 ppm max**
Acrolein	**10 ppm max**
Carbon Monoxide	**500 ppm (20 min) max**
	1000 ppm (8 min) max
	3000 ppm (2 min) max
Oxygen	**15% min**

In statistical terms, stage 1 was a factorial experiment with twelve treatments and replication of size three. The twelve bed assembly composites tested are shown in Figure 2.

2



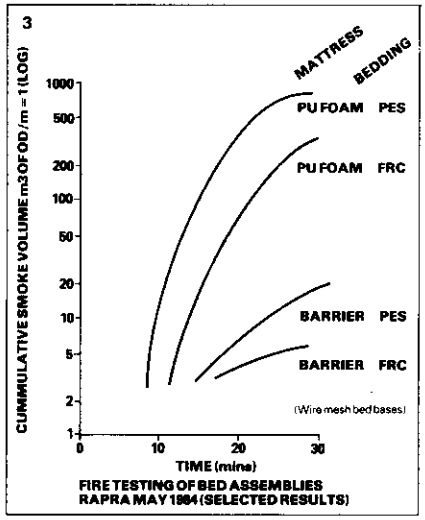
In deciding which bed assemblies to test we were advised by Supplies Division and guided by the results of the previous Moston tests. A good fire performance is not the only attribute of beds suitable for use in the health service. In selecting candidates for test notice had to be taken of comfort, launderability, wear characteristics, cost and so on. We also drew on a survey the Department commissioned in 1983 to establish the typical fire load of a bed station. Whereas in the Moston tests only one pillow had been placed on the bed we were now using three, a not altogether too unsurprising finding of the fire load study.

The results of Stage 1 were rewarding; by a strict control of test variables test reproduceability was obtained, with a questionmark over whether or not the pillows became involved. Statistically significant differences *were* measured between bed assemblies of different composition, and we were able to rank bed assemblies in terms of their fire performance. Selected results are shown at Figure 3 and clearly show the advantage of beds comprising the barrier foam mattress in terms of smoke production.

We were in a position to move on to stage 2 and carry out fire tests in the simulated six bed ward rig in the Fire Research Station hanger at Cardington. The objective of these tests was to study the fire behaviour of beds when present with other typical ward furnishings and evaluate the hazard to life.

The test rig was extensively instrumented and the tests were to be carried out under strictly controlled conditions, again with replication, in order to give credible and statistically valid information. We chose two bed assembly composites to test.

3



FIRE TESTING OF BED ASSEMBLIES
RAPRA MAY 1984 (SELECTED RESULTS)

BED ASSEMBLY FIRE TESTS, OCT 1984 SIMULATED SIX BED WARD, FRS CARDINGTON

POSITION OF IGNITION SOURCE	MATTRESS	TIME BEFORE CRITERIA BREACHED [1]
150mm FROM PILLOWS	BARRIER FOAM PU FOAM	NB[2] NB/12 mins[3]
TOUCHING PILLOWS	BARRIER FOAM PU FOAM	10 mins 5 mins

1 MEANS OF THREE RESULTS
2 NOT BREACHED
3 NOT BREACHED IN TWO OUT OF THREE TESTS

4

Each had a solid base, polyester sheets and fire retardent cotton blanket and counterpane. One had a barrier foam mattress, the other a standard polyurethane foam item with fire retardent "watchdog" cover. The test rig was fully furnished for each test to resemble or far as possible a real hospital six bed ward. Again the fire load study served as a guide to the typical ward furniture and furnishings we should use in the rig, right down to patients personal belongings.

The tests were carried out over a two week period, and we are awaiting the final report. My initial assessment is shown in Figure 4.

In the barrier foam mattress with fire retardent cotton blanket and counterpane we do seem to have a relatively safe bed. However, the weak link is the pillows and a research programme is now being set up to find a pillow that when used with this bed will given an overall assembly which is adequately safe.

Engineering systems

Turning to fire detection and alarm systems, false alarms from smoke detectors are a serious problem for many hospitals. Indeed the false alarm rate associated with conventional systems is bringing them into disrepute. Improvements are urgently required and research effort is being directed to that end.

Current norms for conventional systems in hospitals seem to be about 1 false alarm per 10 installed smoke detectors per year. In other words a hospital with 500 detectors might expect on average one false alarm per week. It also seems that you can expect about 20 false alarms for each real fire call. When the fire alarm sounds, there is only about a 5% probability that there will be a fire. Some hospitals in rural areas are getting 30 or more false alarms a month during the summer season. Such systems obviously have a very low credibility in the eyes of staff.

That then gives some idea of the scale of the problem. What are we doing about it? I will restrict my remarks to our various research projects but other work is of course going on, the development of better equipment standards and so on. What is quite clear is that we haven't got a realistic method of measuring the performance of a fire alarm system.

How do we account for the many and varied factors that affect system performance. Things like detector type and sensitivity, building occupancy, system size, on line time and so on. We want sensitive systems in hospitals, the lives of staff and patients may depend on early detection, yet the more sensitive the system the more likely it is to give false alarms.

We are at the initial stages of a project which will look closely at these questions. The aim is to develop a truely objective measure of the performance of a fire alarm system.

Any such measure must be credible in the eyes of the fire alarm industry, fire brigades, and users. Only if it can be accepted by all concerned will it be of real value to health authorities in helping to identify rogue systems, in negotiation with

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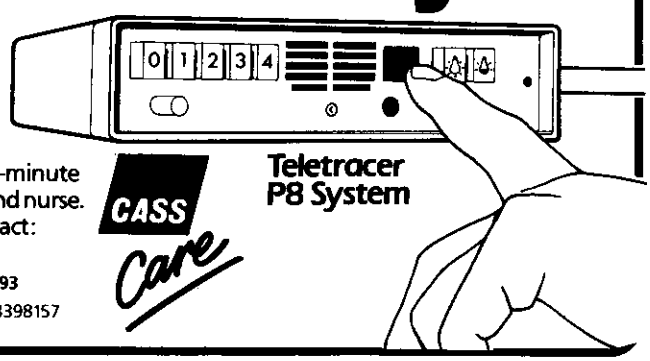

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fire alarm contractors, and in discussions with brigades over the validity of levying false alarm call out penalties. Designers who have specified systems recently or who have had dealings with manufacturers will know that there is a revolution currently going on in the fire alarm industry.

At the recent Fire and Safety Exhibition at Olympia some 15 manufacturers altogether were offering so called new generation systems. Some available now, others in the pipeline. The 'in words' are addressibility, whereby a microchip in the base of each detector enables it to be recognised uniquely at the control panel, analogue, and intelligent.

In a conventional system, a smoke detector is simply an on/off device. Whilst it sees a continously changing environment the only information it passes back to the control panle is either 'fire' or 'no fire'. In an analogue system each detector sends back to the control panel a signal proportional to the conditions it senses. It is the control panel that makes the decision as to whether there is a fire. Through suitable algorithms it may become possible in the future for systems to discriminate more accurately between real and 'look alike' fires.

First indicators are that the new generation systems now available do have the potential to reduce false alarms while maintaining, or even improving, the sensitivity of the system to real fires. The term intelligent although quite often used is to my mind not really applicable. Even the most advanced new generation systems are a long way from being able to discriminate in a way that person can between a fire and a non-fire stimulus. Much of the original work in researching the technology and demonstrating the possibilities of analogue detection was done by the Fire Research Station through the so called BRESENS (Building Research Establishment Sensing System) iniative.

The DHSS has supported BRESENS from its inception and a BRESENS system was nearly installed in a hospital. However a catch 22 type situation developed in that because BRESENS was unproven, it was not considered acceptable.

A hospital containing departments ranging from industrial through commercial to residential is probably almost the ideal providing ground for new systems. However the only way of testing BRESENS in a hospital would have been to install it in parallel with a conventional system.

Fire research station thinking, and some of the lessons from the BRESENS research, were taken up by the trade and as I have already indicated a few analogue type systems are now available commercially. One such system has been installed in a hospital and although much of the analogue information is not used, analogue signals from individual detectors are being transmitted to the central processor.

It seemed to me that here we had in essence a BRESENS system in a hospital. All it required was for the data transmission on the system to be interrogated by an external computer to give us the research information that we would have got from the BRESENS prototype on how detectors respond to stimuli in real environments. A project on these lines has been started. It is still in it early stages but we hope it will provide considerable information to support the development of new generation systems and appropriate fire algorithms.

Of the new generation systems that are available commercially, they all work in a slightly different ways and each offers different facilities. The choice open to the specifier is becoming quite bewildering ranging from conventional through multiplexed to addressable and analogue.

Another research project which I would like to start soon is an in depth look at the systems which are available, and to try and match them to the real needs and problems of health buildings. This should result in guidance to the health service in order that sensible choices can be made as to the best type of system for a particular need.

One final project I would like to mention in dealing with fire alarm systems is an investigation we are doing of alternative maintenance options. At the moment many fire alarm systems are maintained in house by health authorities. Where there are false alarm problems poor maintenance is often blamed. The Department has developed what we term the 'turnkey' maintenance contract for fire alarm systems. This is where one contractor takes responsibility for the design, installation and subsequent maintenance of a system. The health authority does not touch the system other than to carry out the routine checks called for in British Standards. False alarms, including Brigade penalties where there are incurred, will be the contractor's responsibility — excepting of course those caused by misuse or abuse of the system by the health authority.

A trial has been set up involving three hospitals very similar to each other in terms of building type, type of patient, and so on. In one a turnkey maintenance agreement is in operation, in another a normal contract maintenance agreement is being used, and in the third maintenance is being carried out in-house.

The objective of the project is to assess the benefits of the varoius maintenance options. It will be interesting to see whether a contractor in maintaining his own system without interference can indeed achieve significantly better results than the more usual type of arrangements.

Sprinklers

We talk of fire detection systems as Active Fire Precautions, as opposed to Passive Precautions such as structural measures. However, such systems are hardly active, they detect fire and raise the alarm, but they do nothing to deal with the fire itself. A Sprinkler system that will both detect *and* control the outbreak of fire in patient areas is an attractive proposition.

In 1981 the Department set up a committee having representatives from Fire Research Station, British Automatic Sprinklers Association (BASA), Home Office and NHS, to develop a sprinkler system for life safety in hospitals. Work is continuing and a preliminary specification is available. Health Authorities are now starting to make use of these systems and I would like to say just a few words about them because some people have misunderstood the concepts.

The first point is that the system we are talking about is not an 'FOC' system; a special specification has been prepared. BASA has been involved in preparing the specification and their member companies will be aware of the specialised nature of the system. Briefly, the system will usually be fed from a small static water tank with a sprinkler head over each bed space. In the event of a bed fire only the one sprinkler over the bed should open to control the fire while patients are moved.

To operate early enough during the initial stages of the fire to be effective, a sprinkler head having a fast response will be necessary. FRS are doing fundamental research into the question of sprinkler thermal performance. The system is low cost, but not low quality. In particular the head itself must be reliable, and the hydraulics must be right to ensure the correct droplet size and water distribution.

Development is still going on. A vital next step will be to define the limitations of the system and assess the interaction of sprinklers with other aspects of fire precautions in hospitals. At the moment if you install a sprinkler system in patient areas it should be in addition to all the other recommended fire precautions. But at about £30 per head for a truly active system it is a good investment.

Summary

This paper describes in broad terms, the fire testing programme we carried out on whole bed assemblies in 1984. It should be clear that the tests were carried out in a thoroughly rigorous scientific manner. As always there is more to be done. The immediate task of finding the so called 'safe' bed assembly is proceeding with the search this year for safer pillows. Softer barrier foams are now being produced and it may be that the NHS could use full depth foam mattresses rather than a barrier foam wrap.

On the engineering side I have explained the false alarm problem, and I have reveiwed some of the research we are doing to see that new technology is used to give us better systems in future.

Life safety sprinkler systems give the possibility of truly active fire protection in patient areas. They will enhance fire safety but at the moment no trade-offs can be offered in other areas of fire protection — either active or passive.

My final point is that although I have considered the Department's fire research by looking separately at specific projects, the fire safety of a hospital must always be considered as a total package. To be effective, individual components of fire safety must not be considered in isolation but as part of the overall fire safety system.

This paper was first given at the Institute's symposium on Fire Prevention. The author is District Fire Officer for the Preston Health Authority.

Problems at District level

R L F COX

It is widely acknowledged that the National Health Service is the envy of Europe, it treats more patients, more efficiently and at a lower cost than that of its neighbours. This is due to the devotion of its workforce.

Training

This means that the staff themselves are our first and major problem, such devotion to their work makes them inward looking, towards their working environment and precludes additional work on time consuming matters outside their immediate duties. Fire training and fire precautions generally, fall into this category and when staff say they are 'too busy' to attend fire lectures, they mean that the job they are doing is too much of an immediate problem and they do not feel able to leave it to go to a fire lecture.

This is a training problem and although many fire lectures are both interesting and informative there are still a few hospital fire officers who expect staff to turn up to a two hour training session. Showing films is a good method of communication but what do they achieve? One film, in particular, staff ask if they can see again, and many believe that they are learning something from it because it has some horrifying scenes but if you question staff about the film a week later you will find that they remember the tragic scenes but nothing else.

Most people will agree that if someone sees a demonstration of a particular job function and then carries out that function under guidance they have a far better chance of remembering how to do the job.

It is not easy to demonstrate a fire but the handling of fire fighting equipment by all staff is essential as familiarity with the equipment will give staff the confidence they need in the use of fire extinguishers and hose reels. If we look at a geriatric hospital outside the main part of the town where the local fire brigade has an attendance time of ten minutes, you will probably have six wards, each ward with twenty patients and you could be down to nine members of staff. As a fire officer what advice do I give to a nurse if a patient sets fire to the bed? I am afraid there are still fire officers who will say — Your first action is to call the Fire Brigade, your second action is to evacuate the patients and you only fight the fire if it is safe to do so.

Fire precautions

The Works Department could be of great help in the use of old buildings. There must be many places which could be turned into fire training areas where fires could be started and the staff trained in the use of fire fighting equipment. There must also be places where, although it would be unwise to light a fire in a building, they could be used for smoke simulation. The supply of fire extinguishers to the fire officer on a regular basis so that they are used in rotation will mean that the Planned Preventive Maintenance system is carried out at the same time as training.

Training will go a long way towards patient safety but it will come to nothing if the building in which the fire starts does not have an adequate fire alarm system with a direct link to the fire station or a commercial receiving station. It is no use relying on switchboard staff who have to deal with fire alarms, drug alarms, oxygen pressure alarms, blood bank alarms and in some cases even boiler lock out alarms while they still have to cope with cardiac arrest procedures, anaesthetists on call, social workers and community nurses on call and in some hospitals they are expected to provide a reception service at the front door and answer enquiries by relatives about patients.

Telephone exchanges should always be installed somewhere away from the front door so that it is used by people who need to communicate by wire and not person to person.

Some fire alarms cause more problems than enough and although HTM 82 does not say you should have fire bells it is left to the designer of the system as to what you use as an alarm signal. As I once counted fourteen different types of alerting alarms in a hospital all using a bell, I suggest that it is time that only one recognisable alarm signal should be used throughout the National Health Service to denote a fire on the premises.

In most cases the Health Service does not carry any form of insurance. If the health service were to go to an insurance company for a quotation for insurance premiums against fire in all its two hundred Districts it would cost £50m a year and many of the costly fire precautions would have to be carried out before the insurance company would accept the liability any way.

I have, therefore, no conscience when looking at my list of fire precaution recommendations and seeing a figure of around £250,000 as to me it is only one year's premium and not only would this save the building but protect the patient at the same time.

It has often been said that money spent on fire precautions would be better spent on much needed medical equipment or patient facilities but what if we use what little money we have to buy haemodialysis machines which would save life in reality as against spending the money on fire precautions because fire is hypothetical

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Teletracer 2600

anyway. The argument is a good one until a fire occurs and destroys not only the haemodialysis machines but the unit which houses the machines as well.

How often have I heard the phrase 'We agree that fire precautions are important and urgently needed but where is the money coming from?' If each District in this country was given an extra £2m tomorrow they would not consolidate the buildings they have by ensuring that the fire precautions were up to the highest standard but would take a chance and spend the money on matters which, at the time, are topical. It is indeed most unfortunate for some poor souls that we will have to have another fire with considerable loss of life before District Management Teams will look to their fire precautions.

There is, however, an answer to the problem of fire precaution spending. Some Regional Authorities had the answer way back in the 70's when special allocations were set aside for laundry equipment, lift replacement and fire precautions. Each Hospital Management Committee would put forward what it considered a worth while case which was assessed by the Board and in this way at least some progress was made in each Hospital Management Committee.

Sadly this practice has, in some Regions, been discontinued and the money allocated to Districts as part of its overall annual budget. Progress on the back log of fire precaution work immediately slowed down. This is a national problem not a District one and fire officers have to listen to others saying we have no money available for fire precautions as the allocation is already earmarked for other items considered to be more important by those who have never seen a fire or its consequences. I must ask, therefore, when do fire precautions become important? After the fire has started?

Guidance

We have enjoyed, of late, a whole series of documents from the Department of Health and Social Security and a few from the Home Office giving guidance on fire precautions but what happens at District level. After all there are over 300 different religions based on the Bible so with 200 Health Districts there could be 200 different interpretations of the guidance. I know that one District says 'The DHSS has produced this and, therefore, it must be followed to the letter', whereas another District takes the view 'This is only guidance, what do they know anyway, they should get down to District and try doing my job for a few days!'

There are also those who come somewhere in between; those who quote H.T.M.'s when it suits their political view and when it does not forget their copy and leave it in the filing cabinet. There are also some who believe that H.T.M.'s are law for fools and guidance for wise men but consider themselves among the latter.

If we are to make inroads into fire prevention the Senior people must attend courses of guidance. I do not consider it sufficient just to invite, as a polite invitation can be declined on the grounds of pressure of work. I think it should be more in terms of, 'you are required to attend'.

These are all problems which can be solved, not at District level, but Region, Department of Health or Government. Every organisation has to be run according to a set of rules and the bigger and more complex the organisation, the bigger and more complex the rules. So, policies have to be formulated simply to produce guidelines on how the organisation is to be run. HC(78)4 was produced by the DHSS and asks for policies to be produced and implemented at all health service levels. A policy is a document which can only be applied if all parties are in agreement with it and if those who agree to it are willing to back that policy; only then can it be implemented. Districts are quite willing to produce policies but do not always back them by financial arrangements or by management. The answer may be in the appointment of General Managers but only time will tell if their appointment has been effective or not.

New buildings

Now, let us look at a new building and incorporate all the guidance given to us by the Department of Health and the Home Office. Is the Architect aware of the guidance? Not always. I have just had a building handed over which had keys in glass fronted boxes all over the place, when the Local Authority Fire Brigade were asking for their removal in 1971. If the Architect is aware of the guidance there may not be a problem but many contractors and sub-contractors consider the health service a soft touch and take short cuts which can lead to costly remedial work at an early stage and the fire protection given to the building being put to the test only in a real fire situation when we shall have disastrous results.

Hand over meetings are all very well but is the compartmentation inspected above every false ceiling. We could have a hospital costing £50m to £60m just completed but still needing £1m worth of fire escape stairs, suspect compartmentation and a fire alarm system which gives a continuous ring throughout the site if a Psychiatric patient decides to break the glass of the fire alarm unit and wake everyone up at 2 a.m. You may consider this to be a problem of lack of supervision by either the Architect or Clerk of Works but even at District and Unit level Building Officers will write out a specification which includes cleaning up and making good but how often does the work of the contractor get checked? How often are contractors in breech of their contract by not taking note of fire precautions? How often is action taken against them? How often are they brought back to infill holes they have missed or clear up the mess they have made. It is not unusual for a contractor to knock out a complete concrete block in order to put a one inch pipe through a fire resisting wall and if a false ceiling is used the inspecting officer has no way of knowing if the fire wall has been breached unless he starts taking down the ceiling tiles. There are, of course, breaches of the fire wall which neither the Fire Officer or Building Officer may be aware. Who orders an extension telephone. Is the company who installs the telephone interested in fire precautions or just installing a telephone.

Another area is the repair to P.V.C. floor coverings. The contractor turns up without reference to anyone and everything is fine until the edges have to be welded. The fumes set off smoke detectors and to everyone's amazement five fire engines in charge of an irate fire officer arrive at the front door.

Some problems occur which often almost go unnoticed except perhaps by the fire officer. Courtyards are built to give light and ventilation, but if on a single storey building space is needed the courtyard gets built upon. It may be fire resisting and be in line with the standards required for fire protection but if a fire does occur what happens to the smoke produced, there is nowhere for it to be vented so we get a smoke logged building which threatens the patients much further away than would have been possible if the building had remained with its courtyard.

Districts often carry out these schemes themselves but if the Regional Health Authority has handed over a building complete with a courtyard the District Health Authority should really be going back to ask before they commence work. There are so many modifications carried out in hospitals that I have to ask — will compartmentation work? I would suggest that it is yet another myth and I can foresee a breakdown if they are ever put to the test.

When HC(78)4 was produced it had one big failing. The specialist fire officer would be responsible to the District Administrator or a member of his staff and it is these last six words which make nonsense of the whole business. If in the future that Fire Officer will be responsible to the General Manager direct then some progress may be made. On the other hand the General Manager may see the District Works Officer as Chairman of the District Planning Team, in which case it could be appropriate for the fire officers to be transferred from administration grades and placed within the Works organisation on Works grades. This will ensure that the Works Department receives the best advice at an early stage. This is of course assuming that the Hospital Fire Officer has served at least five years in the National Health Service. Most Health Service Fire Officers agree that the difference between the job with the local fire brigade and the health service is considerable. So much so that we must consider training fire officers within the HNS and providing sufficient incentives for them to remain in the employ of the Districts with a wealth of hospital fire experience behind them. In the future he will be called a Specialist Fire Prevention Officer with justification because he will be a Specialist.

This paper was presented at the Institute's Fire Prevention symposium. The author is Assistant General Manager (Estates Services) for the North Western RHA.

Planning for fire precautions at Regional level

G W AYRES ARICS ACIArb

I shall deal with my subject — Planning for Fire Precautions at Regional Level — as generally as possible, but inevitably a certain parochialism comes in when giving illustrations and statistical information. Firstly, the functions of an RHA in the broadest terms. These are Strategic Planning, Resource Allocation, provision of major capital works and monitoring the progress of District Health Authorities.

More specifically, the role of an RHA in fire precautions is to be found principally in its responsibilities for capital works and monitoring Districts. RHAs also, of course, have responsibility for implementing fire precautions measures in premises managed directly by them. HC(78)4 is the source document in this respect.

The principal topics to be considered are:-

- ☐ Our objectives as an RHA.
- ☐ Formal requirements.
- ☐ The status of Local Authority Fire Brigades.
- ☐ The effectiveness of our procedures.
- ☐ The cost effectiveness of our procedures.
- ☐ The need for common standards.
- ☐ The application of standards.
- ☐ Management arrangements at RHA level.
- ☐ Thoughts for the future.

1. Objectives

(i) All our effort is directed, principally, towards the welfare of the patients and staff who occupy health buildings.

(ii) People must not be put at greater risk from fire than they face either at home or work. Sometimes not too taxing a criterion.

(iii) Primarily, we must reduce deaths and injury in the case of fire.

(iv) We must also protect property and particularly those of major significance, i.e. those containing bed-bound or confused patients or strategically important departments such as regional specialties or district laundries.

2. Formal requirements

Again HC(78)4, mentioned earlier, is important here. Under the Fire Precautions Act 1971 hospitals, as a whole, have not been designated as premises which must comply, but the possibility is there. However, those parts of hospitals which can be defined as factories, offices or shops have been the subject of a Designation Order and so must comply with the Act.

For the remainder of premises, as an alternative to designation, a Health Authority must:-

(i) Have a clearly defined fire precautions policy.

(ii) Install and maintain physical fire precautions to:-
  a) prevent fires
  b) ensure detection, and
  c) stop fire spreading.

(iii) Have plans for each unit for:-
  a) raising the alarm
  b) fire fighting
  c) evacuation of patients, and
  d) staff training.

(iv) Must seek advice from Local Authority Fire Brigades.

(v) Must comply with DHSS standards.

At first sight much of what I have said would appear to be a District or hospital level problem, but obviously, an RHA is vitally involved both in its designing and its monitoring role.

There is other important guidance material. From DHSS we have Health Technical Memoranda, Health Circulars and Nucleus Fire Policy. From the Home Office there is a draft Guide to Fire Precautions in Hospitals. The DHSS publication "Fire Document for Health Buildings, March 1985", lists 30 Acts of Parliament for non-designated premises, 40 HNs, DSs, HTMs, 18 Dangerous Substances Regulations, all excluding residential accommodation.

3. The position of local authority Fire Brigades

a) A very important factor is that the Chief Fire Officer is legally bound to respond to requests for *advice* on fire precautions matters. (Fire Services Act, 1974)

b) An equally important factor is that the Chief Fire Officer does *NOT* have any legal duty or responsibility for fire safety standards in Crown Properties beyond giving advice if requested.

c) Any Crown Property designated under the Fire Precautions Act 1971, (e.g. factories, offices, shops) will be dealt with by H.M.Fire Inspectorate, although the Chief Fire Officers may be involved as an administrative convenience, not a legal requirement.

d) Legally then the Chief Fire Officer cannot visit, inspect etc., unless asked to do so and cannot impose standards. He offers valuable goodwill advice which is generally regarded in the NHS as being standards which should be observed.

e) He could be an expert witness in any enquiry into a fire incident involving death or injury.

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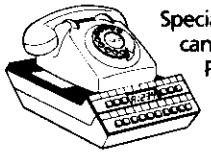

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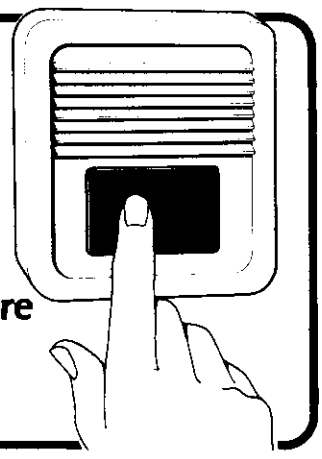

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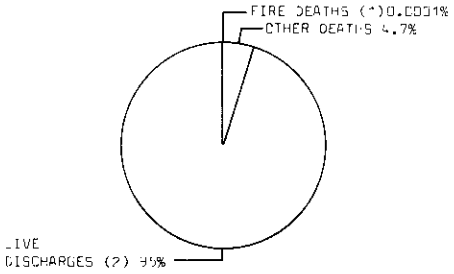
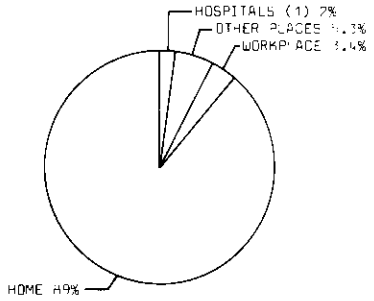
PERSENTAGE ANALYSIS OF HOSPITAL STAYS

DIAGRAM 1



ANALYSIS BY LOCATION OF FIRE DEATHS
ENGLAND AND WALES 1976

DIAGRAM 2



NOTES: (*) = AVERAGE 1971-80
(2) = AVERAGE 1981-84

DIAGRAM 3 ANNUAL CAPITAL EXPENDITURE

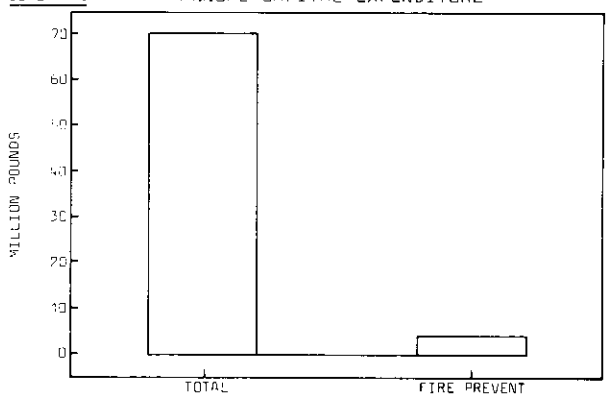
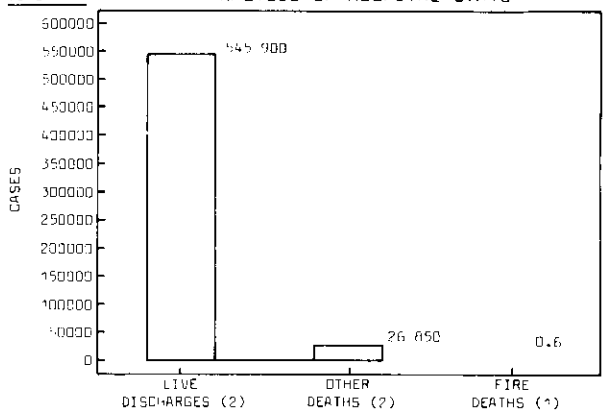


DIAGRAM 4 ANALYSIS OF HOSPITAL STAYS



4. The effectiveness of procedures

Any death or injury is simply a tragedy and I am sure you will not misconstrue my reasons for quoting some statistics.

UK 1971-1980

143 deaths due to fire

30 deaths in single fire in 1972

91% of deaths were single deaths with most fires started by the victims.

80% of deaths were among psychiatric or geriatric patients.

NWRHA over the same period

6 fatal fires & 6 deaths

i.e. all single deaths

All were psychiatric or geriatric patients.

All were due to smoking cigarettes.

In the period 1981-1983 there have been no deaths in our Region but 15 non-fatal casualties.

To put our tragedies in a Region-wide context, we have:-

132 hospitals

260 smaller premises

Floor area 2½ million square metres.

35,000 beds

3,500,000 out-patients

600,000 in-patients

It has been said before that you are a lot safer in hospital than at home, providing you keep away from the surgeons. Diagrams 1 to 4 illustrate the point. Not, of course, that surgeons are not safe, but the point was that hospital accommodation is very safe from the point of view of fire risk.

Diagram 1 graphically illustrates the fact that 95% of those who enter hospital in NWRHA leave alive. About 4.7% of patients die in hospital, obviously this includes long-stay patients, other than from fire and about 0.0001% die from fire.

Diagram 2 analyses deaths by location in England and Wales and, as I said before, you are safest in hospital and at greatest risk at home. 89% fire deaths are at home, 3% are at workplace, 5% are elsewhere and 2% are in hospitals.

Diagram 3 illustrates total annual capital expenditure in NWRHA, about £70m, and annual expenditure on fire precautions about £4m.

Diagram 4 again analyses hospital stays. In NWRHA it shows almost 600,000 live discharges per annum, almost 27,000 deaths per annum, and 0.6 fire deaths per annum. The question is would any increase above the £4m fire precautions expenditure be better spent at increasing caseloads.

5. The cost effectiveness of our procedures

The NHS has very limited resources, capital provision has been relatively well protected in real terms in recent years but in our Region at least our stock is ageing in spite of a substantial capital programme. So every cash consuming decision at policy level must be cost effective and fire precautions are *NO* exception. It can be stated, I suggest, that whilst eternal vigilance is vital, it is probably impossible in practical terms to improve the safety record of the NHS whatever the level of investment.

We need to compare the cost and benefits of fire precautions with costs and benefits of other facilities for saving life and for improving the quality of life, which are the fundamental objectives of the NHS.

What cost would an actuary place upon an extra life saved in this context? This is a fair question if the statistics are fair. It is not possible to give precise figures for expenditure on fire precautions because many such precautions are integral to the structure of buildings. However, it seems likely that built-in structural and engineering fire precautions could amount to 5% of total building costs.

If this is about right, NWRHA is spending about £4m each year on fire precautions and this could be expressed as about £5 per in-patient. Purely for purposes of comparison, an ESMI Unit or a 50 bed acute ward would cost about £2m, or we could employ 200 nurses who would not only be nursing patients but would also be the most effective type of fire alarm system. As I said, these were pure comparisons and this money must, of course, be spent, but such figures become important when one considers any marginal benefit that may accrue from increasing the current level of investment.

At the macro level the current replacement value of NWRHA stock is about £2,100,000,000. Assuming the 5% figure stated earlier to be right, we shall spend about £100,000,000 on fire precautions alone in replacing our buildings. Decisions that increased the 5% to say 6% can be

seen in their real significance. Again, what would the actuary have to say.

Of course cost is not the only factor, but it has to be stated that value for money *IS* the only factor when seen across the NHS as a whole. The major decisions that affect fire safety requirements for the NHS must take into account these matters of marginal benefit and value for money.

So if we consider cost effectiveness in fire safety measures we must study carefully the factors which most influence such safety. Major examples are:-

(i) restricted smoking (since 70% of oil fires are caused by smokers).

(ii) less flammable materials (mattresses, covers, curtains)

(iii) staffing levels (nurses are excellent fire wardens)

(iv) restrictions upon fire precautions which also restrict observation of, and access to patients.

(v) progressive horizontal evacuation procedures.

Then, and only the, because of the great expense, we must consider increased expenditure on integrated building and engineering fire precautions.

6. The need for common standards

We are, of course, dealing with serious matters that affect the safety of the public at large. So it is essential to have standards of practice agreed at the highest level. I mentioned before the large number of guidance notes, Acts of Parliament etc. that have to be taken into account. Many of them quite properly deal with matters of detail, e.g. hose reels, fire alarms, but in general terms, too much detail tends to obscure principles and make interpretations more difficult.

Here I would like to mention draft HTM 81. "Fire Safety in Health Care Premises — Planning and Design of New Buildings". A great deal of time has already been spent on preparation of and consultation on this still evolving very important document and it has been criticised by some RHAs. It seems to have two basic faults — 1) it goes into too much detail rather than dealing with principles, and 2) it seems to lack a sense of the real costs and benefits of what it requires.

If I may return to ground previously covered, can we justify more expensive fire precautions when the majority of fire deaths are single deaths, the majority of fires are extinguished locally before the fire brigade arrives and the number of fatalities is very small. Can we justify impeding observation to an unacceptable degree (by prohibiting glazing in sub-compartmental walls and in Mental Illness or Geriatric wards) when we know the value of observation of patients. Can we justify restrictions on numbers of beds per ward or nursing unit when we know this increases costs, impedes observation and increases risks of general accidents. Can we justify fire precautions that are far more expensive than Building Regulation requirements.

7. The application of standards

Standards of whatever origin have to be interpreted for application to specific projects, including particularly standard designs. The RHA's position in the middle of the NHS structure inevitably leads to its being required to interpret national standards not only in order to apply them but also to give guidance to Districts. Varying interpretations are inevitable because of the wide variations in the designs and the large number of individuals involved in design in a Region. An example of the differences that can occur is that in a number of ESMI Units designed in my Region by different design teams the quantity of fire dampers in ventilation ducts ranged from 75 to 150 with costs ranging from £15,000 to £30,000. Interestingly, this was applying identical guidance material to one of our standard layouts.

In my view it is the duty of project teams, design teams and commissioning teams to collaborate in the production of Fire Precaution Plans for all new buildings, illustrating the protection and evacuation policy that has been incorporated. My RHA is introducing a procedure in the near future to cover this important aspect.

An important side issue, whilst mentioning Fire Precaution Plans, is their great value in determining the effect of post-completion minor alterations on fire integrity, e.g. computer or telephone cabling being inserted. Who has not come across the incident where a specialist firm is employed, say by the Administrator or Treasurer, to carry out a specialist installation without reference to The District Works Department. Certainly the District Works Department must co-ordinate all such works so as to protect the fire precautions provisions that have been designed into the building.

Returning to varying interpretations we certainly experience such variations from different fire brigades. But look at their problems. Again quoting my Region, Lancashire Fire Brigade has a third of the population living in two thirds of the geographical area. Greater Manchester has two thirds of the population living in a third of the area; a population density ratio of 4:1. So their problems of accessibility of manpower, equipment and services are quite different and can demand different facilities, i.e. water storage for fire fighting.

Retrospective application of standards is a very difficult problem because of the long time scale involved in planning and construction of a major hospital project.

A major District General Hospital was completed in one of our districts in 1980. The design had begun in the late 1960s and design was completed in 1972. The construction period extended from 1974-1980.

A survey of the hospital was varried out by the Fire Brigade in 1981 using as a basis for evaluation the HTM Fire Safety in Health Buildings published in 1978 — six years after design work was completed. The resulting report was extensive, critical and costly to implement (£900,000) and illustrated graphically this problem of retrospective application of standards.

Authorities and Brigades alike are confronted with a dilemma when guidance changes dramatically during the building period. Currently we consider a design frozen during the design stage for budgetary purposes. A similar position is taken on Statutory Instruments such as the Building Regulations, which are not applied retrospectively to projects approved prior to the date of the enactment of revised regulations. If, however, serious shortfalls in current guidance are identified and remedied in revised national guidance, works built in the transition period present the owner with the dilemma of commissioning buildings fall short of current guidance. The cost of additional works

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may be considerable.

The carrying out of any work resulting from retrospective application of standards reinforces the need for a set of Fire Precaution Plans.

8. Management at RHA Level

Here I will describe NWRHA's way of approaching this task. We have had since 1975 a small section of building control officers who, in collaboration with their engineering colleagues, have special responsibility for fire precautions matters. The staff is one Principal Building Control Officer and one assistant, and their brief is to comment on all in-house schemes. All consultants and Districts have been informed of the Building Control Group and are invited to submit their schemes for comment. In practice nearly all major schemes are submitted. It is made clear, both for in-house and consultants, that the responsibility for compliance rests with the designers.

In recognition of the problem of different interpretations of regulations by different Authorities we set up, about 3 years ago a high level Joint Group on Fire Safety. It comprises RHA Architects, Engineers, Building Control Officer, Divisional Officers from both Greater Manchester and Lancashire Fire Brigade, and a representative from District Fire Prevention Officers. The Joint Group meets every 2 months to agree common standards and to promote common understanding.

In our Region we embraced enthusiastically the principle of Nucleus, but not in detail. In other words we have kept the cruciform shape but most departments have been altered to a greater or lesser extent to reflect local views and requirements. It is very important then that, at regional level, we clear the way as far as possible for the 25 or so schemes above £5m in our 10 year Capital Programme that depend upon our standard designs for their completion within time and cost limits.

The outcome of the discussions of the Joint Group on Fire Safety are the issue of joint NHS/FB Fire Policy Guidance Notes.

A final point on management arrangements at RHA Level is that we have at our region regular meetings between Chief Officers and District Fire Prevention Officers.

9. The future

What are some of the changing factors that will have to be taken into account when planning for the future? What is happening to the NHS building stock? It is ageing. It is becoming more intensively used including more and more high cost complex engineering technology. The greater use of five day beds will mean periods when accommodation previously occupied all week will sometimes be unoccupied. There will be a reduction in the number of patients in large mental hospitals — traditionally high fire risk hospitals. Presumably most of that high fire risk will follow patients to their new accommodation in the community or wherever. The issuing of HTM 88 is very important here. In the broadest sense the closure and disposal of large mental hospitals and the disposal of other surplus stock will reduce the overall problem of fire protection.

Our policy for the future at RHA level will be to work for the consolidation and simplification of National Guidance. We will continue co-operation between NHS, Home Office and Fire Brigades and we shall attempt to have the result of such co-operation reflected in national guidance. We would criticise past national guidance because it has tended to contain too much detail, which has resulted in ambiguities rather than addressing the principles.

We must work to persuade others to keep Fire Precautions in perspective. What I tried to do earlier was illustrate the very high standards of protection that have been achieved and I was seriously questioning the marginal benefit of greater expenditure. New regulations that require too many small protected areas by restricting the number of beds in a compartment to 8, the number of beds per geriatric nursing section to 20, or the amount of glazing between wards, could lead to more deaths and less safety for patients simply because staff cannot keep patients under proper observation. Proper research must go into determining the cost effectiveness of future guidance. Such cost effectiveness might better be achieved by concentrating less on the design and construction of buildings and more on policies for staffing levels, banning smoking and developing fire resistant furnishings.

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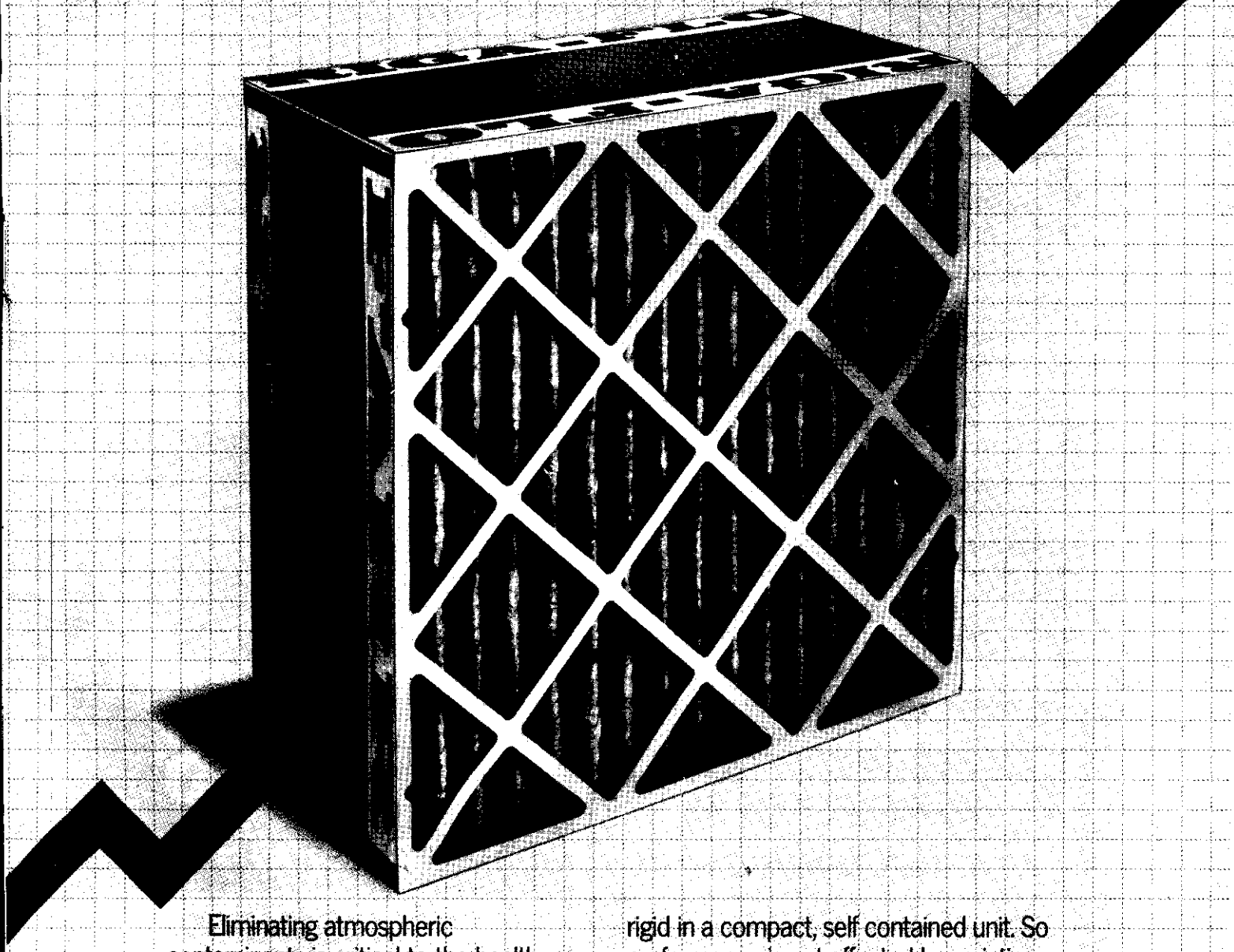

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The Regional Blood Transfusion Unit in Leeds is now protected by a Dale 270kVA generating set and the set will provide standby power for the unit at Seacroft Hospital. The generating set is from the Polar range and is pwoered by a Volvo Penta TID-121-FB engine with a Newage SC4340 alternator and the specifications by the Yorkshire Regional Health Authority were stringent.

Another Dale installation is at the new coal fired Energy Centre in Dewsbury which was officially opened recently by the Secretary of State for Energy, Peter Walker MP. (To be featured in the November issue of *Hospital Engineering).*

Further details from: Dale Electric of Gt. Britain Ltd, Electricity Buildings, Filey, Yorkshire YO14 9PJ. Tel: (0723) 514141.

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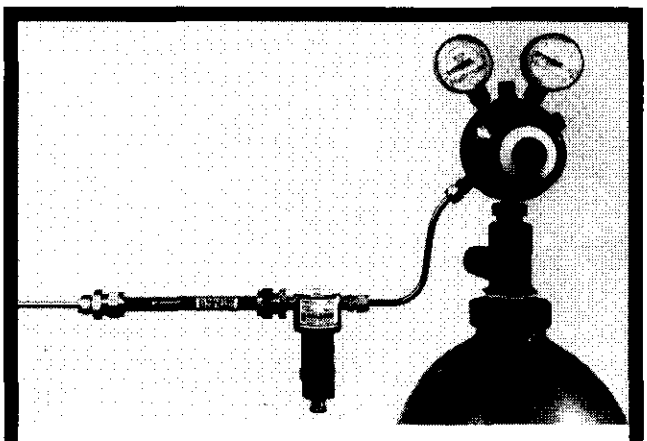

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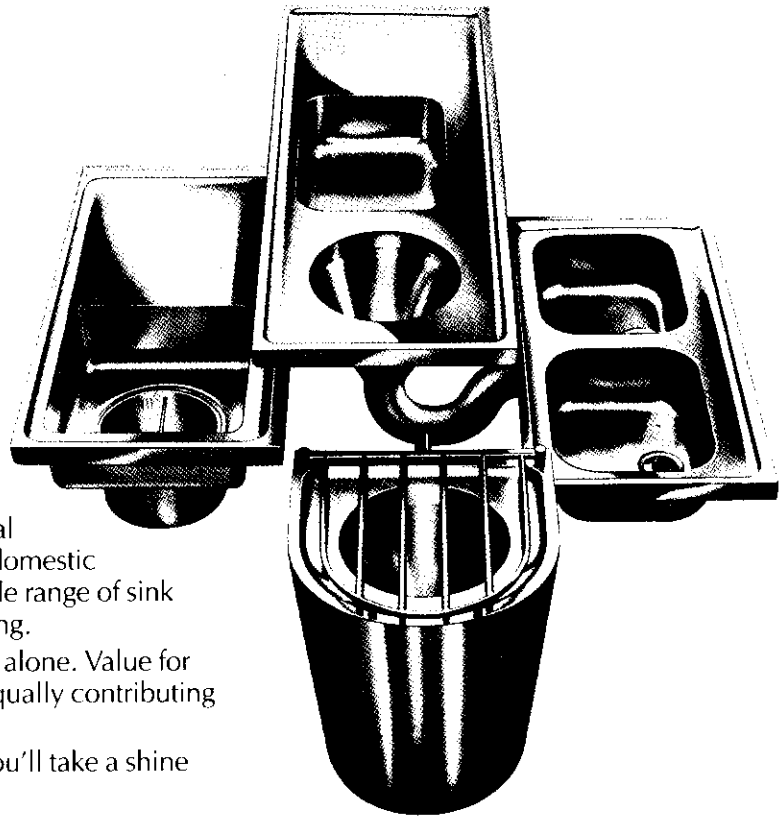

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