Hospital Engineering

The Journal of the Institute of Hospital Engineering

Vol. 24 July 1970

Incorporating 'The Hospital Engineer'

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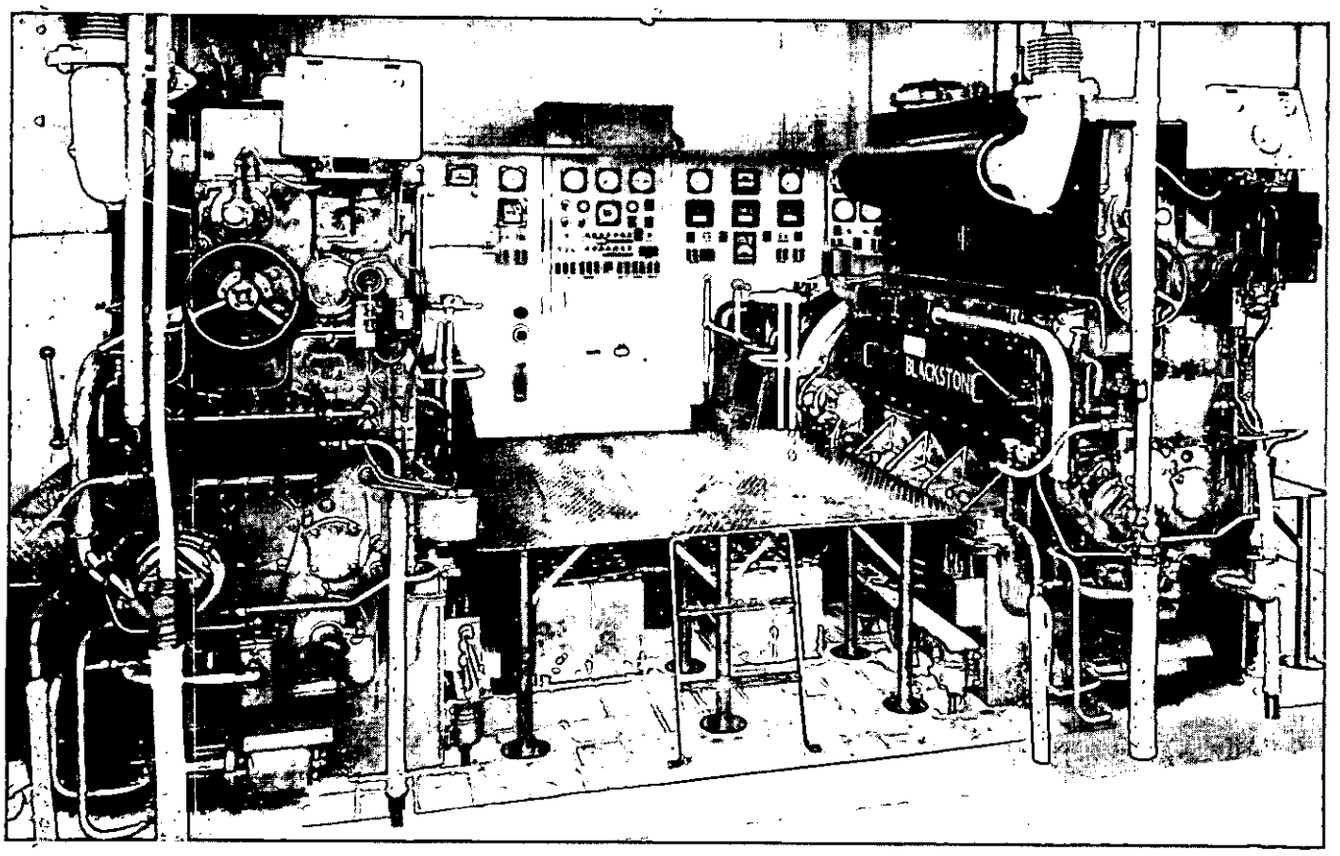

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Hospital Engineering

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Satisfaction—or concern?

The Department of Health & Social Security's Hospital Technical Memorandum 16—'Fire precautions'—published in May 1969, was a revised document awaited by hospital-service staff with more than a little interest. Further advice and guidance was provided by the Department in HM(69) 62, and this too can only be helpful.

Hospital authorities throughout England and Wales were called upon to make an immediate review of their fire-safety precautions, and to report back after three months on the progress made. They were also asked to ensure that their responsibilities with regard to fire precautions are adequately discharged by performing checks as they think necessary.

It cannot be stressed too strongly that the varied activities in hospitals, with laboratories, stores, kitchens, laundries, electrical equipment and gas supplies, render them especially vulnerable to fire, the cost of repairing fire damage in our hospitals amounted to £600000 in the year 1968-69. Constant co-operation between local fire brigades and hospital authorities must be allowed to continue, so that all staff, voluntary workers and contract wokers should know what to do if a fire occurs. All fire dangers should be brought home to everyone, efficient fire-fighting equipment should be available and regularly inspected and restrictions on smoking in certain areas should be enforced.

One assumes that, in the Department's view, the overall responsibility for ensuring adequate fire precautions should rest with a group officer, and that every hospital should have a senior officer with defined responsibility for carrying out group fire-prevention policy. It is also assumed that, in a number of hospitals, fire prevention, inspection of appliances, maintenance of necessary logs, regular inspection of premises, and certain aspects of training should be undertaken by fire-safety officers, an auxiliary grade, whose rates of pay are governed by the Ancillary Staff's Whitley Council.

It is now a year since the Department's valuable advice to authorities on the subject of fire prevention, and it has been a period of considerable problems regarding limited finance, staffing and recruitment throughout the service. Can officers with hospital-site responsibility, and it is here after all where the patients are to be found, guarantee that the Department's advice, well intentioned as it is, has been efficiently implemented, or should the Department or regional hospital boards not have authority of inspection as a matter of routine?

We must then surely see whether this field of activity is at present one for *'satisfaction or concern.'*

R G Smith
Group Engineer

WHAT PRICE FIRE SAFETY IN BRITAIN'S HOSPITALS?

by A. Leese, Q.F.S.M., M.I.Fire E

The Governing Council of the British Fire Services Association has for some time been actively pursuing a campaign with the Department of Health & Social Security designed to call the attention of the Department to what it considers to be a disturbing state of unpreparedness in hospital fire safety. This article is representative of the Association's views, and outlines the action taken to date on this important subject.

When the hospital service was nationalised in 1948, which doubtless had to be carried out if the country's health and medical services were to stand a chance of coping with future commitments, it would probably be fair comment to say that local pride of ownership and 'belonging to hospitals' was suddenly ended. Whereas up to this time there had been direct links under local-authority control between fire brigades in urban areas and their local hospitals, this was never quite the same after 1948, and from this point there would appear to have been a steady decline in the accent on fire precautions, probably brought about by three factors:

first, the removal of the hospital service from local control, with the interruption of the direct links as I have mentioned.

secondly, the low standing fire-defence arrangements appear to have received, compared to their importance and financial priority.

thirdly, the change in attitude of hospital secretariat from a position where there was personal involvement, to a position where the imposition of rules and orders from the Ministry gave rise to the expectation that everything would come from above.

To the last-named must be added the resentment, and in some cases almost open opposition, to the nationalisation of the service, followed by an introvert attitude wherein the Secretary became a law unto himself, an authority upon everything, including a presumption of sufficient technical knowledge apropos fire protection and engineering to suppress expenditure and action to an absolute minimum. Indeed, in many cases, nothing whatsoever was carried out.

These are the reasons for the backlog of work on fire defence which could and should have been preplanned and carried out on a continuous yearly programmed basis beginning 20 years ago.

The centralised system works efficiently only when all orders and instructions come down. Unfortunately when these are not forthcoming there is an inclination to wait, in the knowledge that if anything goes wrong in the meantime blame cannot be laid in the absence of directions. The system appears to have provided loopholes for lack of action and initiative, and it has not provided the requisite authority to ensure the maintenance of efficient standards of fire precautions. Consequently other priorities gave rise to complacency, and to the attitude 'it couldn't happen here'. Probably because they have seen it happen so often, firemen know that when fire strikes it always does so at times of unpreparedness, and almost always quite unexpectedly.

The Ministry has, of course, from time to time issued memoranda on the questions of hospital fire precautions; the first was issued in April 1956, eight years after the nationalisation of the service. During those first eight years the rot set in. Following this document there have been issues of others, probably the two most important being Hospital Design Note 2, issued in 1965, and Hospital Technical Memorandum 16, which was issued in 1966 and revised in 1969. Since then we have also had Leaflet HM (69) 62.

All of these are excellent, well written documents, but it should be pointed out that they are essentially technical in content, and doubtless written by fire engineers. In any efficient organisation when new policy is to be promulgated the thing to do is to ensure that there are technical staff available on the ground to

Mr. Leese is the Chief Fire Officer, Coventry Fire Brigade, and Past Chairman, Vice-President and Member of the Government Council, British Fire Services Association.

implement the specialised aspects of the instructions issued. In the case of these technical documents there were no such trained and qualified personnel, except in the odd case or two, to implement the directions, and it will be appreciated that by this time much of the local contact had been lost. It is conceivable, therefore, that the effective implementation by fire-service standards, of the directions within the memoranda never really had a chance from the very issue of the documents.

Thus the picture is not a rosy one, and yet if one considers the vast numbers of premises throughout the country and their age, the hundreds and thousands of patients every year who inhabit hospital premises, the nonambulant and other serious conditions of many of the patients, and the staffing difficulties, then the relatively small number of fires in hospital premises, and the very little loss of life and injury to patients, is really a record which the service has no cause to be ashamed of. At the same time, no one should be deluded into thinking that this apparent wellbeing can continue *ad infinitum*. Experience tells us that situations which on the surface appear to be stabilised or steady are certain signs of deterioration in standards, and that impending trouble is only round the corner.

All the complex problems associated with the development and expansion of the hospital service with limited availability of finance means that not enough new buildings can be started, existing premises get older and the attendant problems of maintenance become more acute. Yet the number of patients receiving treatment is increasing all the time, and in addition technological medical equipment increases in complexity and quantity. All these factors, and many others as well, add up to an increase in the inherent fire risk. It should never be forgotten that the fire-safety curve, which usually remains reasonably steady, can, as the Shelton incident showed, take on a dangerous downward trend.

There are now providentially healthy signs that boards and hospital management committees are realising that, just as specialists are a vital necessity in the medical fields of their operations, they are just as necessary if these authorities are to carry out their fire-defence responsibilities fully and adequately, and positive steps appear to be under way to appoint, one hopes, staff with the requisite technological, organisational and professional qualifications and skills.

The era of the diehards in the hospital administration service is also rapidly, and perhaps not before time, drawing to a close. The introverts and knowalls are giving way to a more modern concept of management where there is a wholesome request for, followed by the acceptance of, specialised advice, all of which augers for increased levels of efficiency and safety in hospitals.

No doubt many read the report of the investigating committee which was set up by the Minister of Health to enquire into the circumstances of the Shelton fire occurrence. It was a good report and set out fairly and squarely a series of facts which I happen to know from experience are not at all easy to establish after the event. After reading the report one finds oneself posing a number of questions:

(*a*) How many similar situations are in existence in hospital premises up and down the country at the present time?

(*b*) To what extent has this revealing document had the impact it ought, or was it a nine-day wonder finally to collect dust in already overloaded filing systems?

(*c*) Will the Ministry provide, in addition to the technical memoranda of recommendations, the appropriate financial assistance to appoint trained staff and carry out necessary work to ensure that hospital fire precautions will not end up being stillborn?

If one studies past history, the memoranda from the Ministry are sound, but, as I have said, they are concerned with complex fire-engineering problems, and the experts were not ready with the qualifications and experience to implement the recommendations; therefore the wonder to me is that there have not been many more serious hospital incidents.

The report highlights circumstances which unfortunately are only too well known to experienced fire-brigade officers, and the conclusions fall into two broad categories:

(i) those which have regard for structural protection, fire-defence facilities, equipment and appliances

(ii) those which register the need for staff training, procedures etc.

The former sometimes cost a lot of money to implement, but the latter usually cost little or nothing at all, and yet probably the most important aspect of fire prevention is without doubt the training of staff. All the built-in structural protection, the fire alarms and the fire-fighting equipment available are valueless if the occupants of a building have never been instructed in the correct use of such equipment, or had the reasons for the compartmentation of premises explained to them.

In almost every instance of fires where lives have been lost, there is evidence of apathy towards fire prevention on the part of management, and ignorance of correct procedure on the part of the employees. The Shelton Hospital fire was no exception to the rule. The national press at the time made play of the fact that there were locked doors in the ward where the fire broke out; the suggestion being that this factor played a major part in the tragic loss of life. But anyone who has read the report carefully will have realised that nothing could be further from the truth. In fact, the locking of doors was paradoxically instrumental in saving lives in that particular instance: the locked doors prevented four of the patients from entering the lethal smoke-filled corridor.

The painful but inescapable truth was that the members of the staff who had to deal with the situation in the first few vital minutes were unable to cope with an emergency which was alien to their normal working routine. Valuable time was wasted

simply because they didn't know what to do. How could they be expected to know — they had received no instruction. Yet the Ministry published Hospital Technical Memorandum 16 — Fire Precautions — in 1966, in which it was quite clearly stated that 'the Minister expects hospital authorities to have a carefully prepared programme defining fire prevention, fire fighting and the movement or evacuation of patients in an emergency at all premises under their control.' One might have hoped that this document would have jolted all hospital management committees out of their state of complacency, but it took three years of wasted time and the death of 24 patients before a good many people began to take a serious interest in the technical memorandum published by their own Minister.

Shelton Hospital was equipped with an efficient break-glass-actuated electrical fire-alarm system with operating points in every ward. Efficient in that it raised the alarm in the porter's lodge, but, from that stage onward, it became the instrument of antediluvian thinking. The importance of transmitting an urgent call direct to the local fire brigade became secondary to the task of informing one of the hospital fire officers and asking for instructions. In that particular instance, the officer had the common sense to instruct the porter to call the brigade immediately. But what would have happened if the officer had not been available or the porter had been engaged temporarily elsewhere? This practice of passing fire calls to some senior or higher authority is surprisingly mostly the rule and not the exception as one may imagine, and there has always been a widespread reticence on the part of hospital staff, arising from outmoded concepts laid down years ago, to call the fire brigade.

All the long standing and accumulative conditions which subsequently brought about the circumstances leading to the incident are epitomised in the report. While it is always easy to be wise after the event, it is crystal clear that, no matter how sound the Ministry's instructions were technically, and no matter how well intentioned, they were virtually doomed from the start.

The following few recommendations would, if implemented, make a substantial contribution in the general raising of fire-defence standards in hospitals throughout the UK.

Fire officers

Public fire brigades have resources of trained personnel with the requisite technical qualifications and fire experience to advise hospital authorities. The legislative fire-prevention responsibilities and duties being placed on fire brigades is, however, increasing all the time, and their fire-prevention officers will inevitably find themselves in the position where they can only spare the time to become involved in the principles of fire-prevention.

The responsibilities for the practical and physical aspects of fire-prevention arrangements and systems will therefore have to be increasingly assumed and carried out by the Ministry, regional boards and hospital management committees. These responsibilities have already been recognised and taken on by other government departments so there is ample precedence.

In the light of this there is a need to appoint qualified and experienced personnel to ensure the efficient execution of the technical recommendations on fire precautions, and to ensure that reasonable standards of fire-defence facilities are installed wherever needed as soon as possible.

Staff training

The key to the success of any fire-defence arrangements and organisation in hospitals is the human-element factor. Bearing in mind the considerable amount of knowledge which nurses have to acquire to administer their professional duties efficiently, it would be unwise to expect them to cheerfully assimilate a wide knowledge of fire-prevention or fire-fighting techniques. Instruction should be kept simple, and the most important aspects, such as sounding the alarm, closing fire-stop doors, evacuation of patients and operation of first-aid fire-fighting equipment, should be the primary concern of visiting lecturers to hospitals.

Communications

In a high life-risk area such as a hospital, all alarms of fire must be immediately transmitted direct to the public fire brigade without the intervention of officials whatever their status. The most efficient method is to ensure that a direct connection is installed from the alarm terminal equipment at the hospital to the fire-brigade control. The call is then transmitted automatically, thus eliminating the human element. Members of the staff of any hospital have the right to expect that, having operated the alarm system, the hospital fire procedure is automatically brought into operation, and that the call is instantly and automatically transmitted to the public fire brigade. Such a simple operation would then enable staff to concentrate all further effort to the protection, care and safety of the patients.

Inspections

Regional boards should be given authority of inspection of the fire-defence arrangements in all hospitals, and, where these are suspect, the powers to require dilatory management committees to take appropriate and urgent action to put matters right.

Fire-prevention reports

There will have to be a serious attempt to ensure that fire-prevention officers' reports aim at a measure of standardisation of the recommendations with a priority of emphasis on the most essential and important items within the report. Recommendations will also have to have relevance to the financial implications of carrying them out. Hospitals, like many other buildings, could be made into almost fire-free situations, but at what cost! In hospitals this would be achieved only at the expense of reductions in the standards of treating and nursing the patients in the hospitals. As long as there are overall priorities in expenditure, there must

be priorities in the implementation and paying for fire precautions.

The British Fire Services Association has long taken an active interest in hospital fire safety through its membership, many of whom carry out fire duties in hospitals throughout the UK. It was already known that there was disquiet with the Ministry's attitudes and policies to fire-defence arrangements generally, and this eventually came into the open at the British Fire Service Association's (South Midland District) fire-prevention conference at Watford on the 12th August 1969, where the following resolution was approved :

'That this conference registers its grave concern to the Department of Health & Social Security as to the apathetic and dangerous attitude of the Health Service towards standards of fire-defence in hospitals in general, and the status and authority of hospital fire officers in particular; and that the British Fire Services Association makes the strongest representations to the Minister and all other appropriate quarters accordingly'.

Subsequent to the resolution, the General Secretary of the Association has been in continual correspondence with the Ministry, and copies of the correspondence follow.

Letter from the Association to the Minister of Health & Social Security dated 22nd August 1969:

'In submitting the foregoing resolution, my Association is not unmindful of the action you have already taken with the view to improving the general fire-defence arrangements in hospitals. We also realise that this problem is but one of many which impinge upon other major policy questions of priority, not least of all the cost effectiveness of the provision of structural fire precaution and built-in fire precautions.

It seems to this Association that the vast economic problem inherent in the provision of the foregoing built-in protection is such that it may well prove difficult if not impossible to meet the scale of expenditure which could conceivably be called for when the overall picture throughout the country is known.

The alternative would be to phase large sums of finance from other priority expenditure in the Service, which, in the light of other considerations, would seem not to be a viable proposition especially in the background of the country's present economic difficulties.

This therefore raises the question of how the Department can most effectively, quickly and economically bring about a general raising of the levels of fire defence in hospitals, not only in the short term but in the future as well.

After so many years of apathy towards, and ignorance of, simple fire procedures on the part of hospital staff in general, there is a desperate need for fire-protection education at all levels in the Health Service. The training of staff, in the opinion of this Association, is of the highest priority, and continuous education of all staff will, in our view, afford the speediest and greatest impetus to the improvement of the fire-safety factors in hospitals.

Such a state of affairs can only be successfully achieved by the appointment of suitably qualified staff, and thereafter giving them the proper status and authority to enable them to efficiently and effectively carry out their important work.

This Association also believes that of all the possibilities open to the Department, the one of concentrating on the education of staff will also be the most economically viable when compared with all the financial factors of alternative considerations and policies.

My Association would be pleased to discuss any technical or other aspect of the foregoing constructive recommendations should the Department desire'.

Reply from the Department of Health & Social Security dated 29th September 1969:

'I am replying to your letter of 22nd August addressed to the Secretary of State for Social Services.

The Department strongly refutes the allegation of an apathetic and dangerous attitude towards standards of fire defence in hospitals in general. The need to bring home to hospital authorities the dangers of fire and the necessity for adequate fire precautions are fully appreciated. Advice on the subject was issued in 1956 and the most recent guidance is contained in HM (69) 62, a copy of which is attached. Information on good practice in hospital fire precautions is given in Hospital Technical Memorandum 16—'Fire Precautions', issued to all hospital authorities. The latest version of this memorandum is on sale at Her Majesty's Stationery Office, price 7s. 0d. (net).

The Department's view is that the overall responsibility for ensuring adequate fire precautions rests with a group officer and that every hospital should have a senior officer with defined responsibility for carrying out group fire-prevention policy. In a number of hospitals, fire-prevention duties broadly covering the inspection of appliances, maintenance of necessary logs, regular inspection of premises together with some aspects of training are undertaken by fire-safety officers; an ancillary grade, whose rates of pay have been agreed by the Ancillary Staffs Whitley Council. It is considered that the scope of the fire-safety officer's duties should remain as at present defined, but the Ancillary Staffs Whitley Council is carrying out a job evaluation exercise which will ascertain whether the present grading in relation to other ancillary staff adequately reflects these duties.

The proper training of staff in fire-precaution procedures is recognised as a first priority and part 9 of Hospital Technical Memorandum 16 and paragraphs 7 and 11 of HM (69) 62 emphasise the need for staff training. The Department is examining how hospital authorities can be assisted further with the education and training of staff in fire precautions'.

Letter from the Association to the Department of Health & Social Security dated 15th October 1969:

'Your letter of the 29th September which refers to the above is acknowledged.

My Association is already cognisant of the action taken by the Department by the issuing from time to

time of advice and memoranda to bring home to hospital authorities the necessity for adequate fire precautions. The Department will, however, surely be aware that the issuing of documents is by no means indicative that the advice will be efficiently acted upon in a manner to produce the results which appear to be intended by the Ministry. Indeed, the issuing of the documents are not even a guarantee to ensure that any action at all will be taken.

It is therefore in respect of the implementation of the advice, as distinct from the advice itself, which causes the members of this Association the concern previously expressed.

The Department well knows or should do that, as things stand at the present time, the Minister's advice is not obligatory, and that this may on the one hand be acted upon in a manner conducive to producing the requisite standards of fire defence. On the other hand, however, a hospital management committee may conversely do as little as possible, or even worse still, nothing at all. In the case of those groups which carry out the minimum, or nothing at all, the hospital management committee can, as things stand, remain in their ivory towers safe from any inspecting or enforcing authority; this is, of course, without or until a fire or disaster occurs, at which point in time it is a little bit late in the day to start protecting the lives of the patients in the hospitals.

As long as the foregoing continues, we repeat the Department has no guarantee that its advice, well intentioned though this may be, is efficiently implemented, and in the opinion of this Association, the Ministry or perhaps the regional boards should have authority of inspection of the fire-defence arrangements as a matter of routine, and especially where these are known to be suspect. The Authority should also include the requisite powers to require a dilatory management committee to take such action as may be appropriate in the circumstances.

The organisation for adequately implementing the advice only exists to the tune of the interest or otherwise of the hospital management committees. This is not very surprising when one considers the non-existence of adequately qualified and experienced fire officers to advise and thus enable the groups and the boards to bring the Department's technical recommendations into proper perspective.

In our previous correspondence this Association made no reference to the questions of the rates of pay of fire-safety officers. Since you have now mentioned this matter, and the fact that the Whitley Ancillary Staffs Council is carrying out a job evaluation, the experience is that these officers are almost always generally grossly underpaid having regard to the responsibilities and duties which are, or should be, commensurate with the appointments. This Association also hopes that in evaluating the jobs, the opportunity will be taken to seriously review the entire concept of these appointments, the specifications of responsibility as may befit the various grades of officer required together with the technical qualifications, background, and experience of applicants to ensure they are adequately equipped to enable them to efficiently discharge the duties of the appointments. In the event, the Department, the boards and the groups will obtain precisely what each is prepared to pay for, and inevitably the quality of the officers appointed will, of course, have a profound effect upon the ultimate standards of efficiency which can be achieved.

You will by now have appreciated that your reply leaves many questions unanswered, and no matter how strongly the Conference resolution may be refuted, the Department must be naive indeed if it really believes, as things stand at the present time, that it has adequately discharged its responsibilities to the general public.

This matter will be considered by the Governing Council of my Association at the next meeting, and I assure you the members will look forward with interest to learning what positive action the Department will invoke to ensure that hospital authorities will efficiently discharge their fire-defence responsibilities in the future'.

Reply from the Department of Health & Social Security dated 28th November 1969:

'I am replying to your letter of 15th October concerning fire precautions in hospitals. Much of the earlier part of your letter appears to disregard the contents of paragraph 19 of HM (69) 62, a copy of which was enclosed with the letter of 29th September 1969.

The reports called for will enable the Department to assess the fire precautions position generally, including training of staff mentioned in your letter of 22nd August and also to take steps to remedy any deficiencies which may be revealed.

You are no doubt aware that the services of local fire brigades are utilised by hospital authorities both for assistance in staff training and for assessment of fire-prevention work; every opportunity is taken of encouraging such co-operation between the brigades and hospital authorities. Having regard to this assistance, it is not considered that there is any need generally to employ specialised fire officers in the hospital service, who would only tend to duplicate services already available from local fire brigades.

With regard to fire-safety officers, the job-evaluation exercise mentioned in the letter of 29th September was purely a grading review and was carried out on the basis of the duties at present assigned to the grade. This review did not indicate a need for any major change in the grading of fire-safety officers in relation to other ancillary staff'.

Reply from the Association dated 15th December 1969:

Your letter of the 28th November 1969 which refers to the above is acknowledged.

I refute your suggestion that my Association has disregarded paragraph 19 of the July memorandum, and must reiterate that the Department's calling for reports will not make one iota of difference to the general raising of fire-prevention standards in hospitals, and again stress that it is upon the positive action the

Department takes by which it will finally be judged, and this is awaited with much interest.

We were, of course, aware of the utilisation of the services of the public fire brigades, but you should also be mindful of the extent to which they can provide the requisite measure of technical assistance, because this is directly commensurate with the demands of their already heavy and expanding operational, legislative and fire-prevention commitments. Indeed, it has come to our knowledge of cases where the public fire brigades just cannot meet the work loads requested by certain hospital authorities, particularly in the spheres of training, lectures and instruction to hospital staff, and we believe this situation for the reasons outlined will progressively worsen. If the amount of assistance forthcoming from fire brigades reduces or is incapable of filling an adequate need, then clearly there must inevitably be dangerous gaps in the systems, and your suggestion therefore of duplication of services seems to have little relevance.

The Department's expressions on the question of the appointment of fire officers are quite obviously not shared by various boards and groups up and down the country, as the enclosed photocopies of seven advertisements from two fire-service technical journals indicate. You will readily appreciate that the remarks in paragraph 7 of my letter of the 15th October 1969 are particularly applicable to the advertisements relating to fire-safety officers for hospitals (as opposed to regional or area appointments) which are in the £15–£16 per week range.

It should be appreciated by your Department that the duties these officers should rightly be called on to perform involve individual thought, organisation and administrative responsibilities in their hospitals, while the salaries being offered fall far short of the rates applicable to the existing local-authority fireman grade under which a first year provincial fireman receives £910 basic pay rising to £1070 with relatively higher rates for the London area, and it would seem appropriate to reiterate that the Department, boards and groups can expect to obtain precisely what each is prepared to pay for.

The last sentence in paragraph 19 of HM(69)62 of July which requests regional boards to "see that the responsibilities of hospital management committees in regard to fire precautions are adequately discharged, making such checks on the state of fire precautions as they consider appropriate" is really the acme of irresponsibility. The Department well knows that the regional boards have neither the qualified and experienced officers or the organisation to discharge these duties and responsibilities. Are we to experience yet another charade of theoretical paper fire prevention by clerks operating a system of report forms? The Department is once again abrogating responsibilities on to regional boards who, if anything goes wrong, will as usual be expected to carry the responsibilities without having had the opportunity of effectively discharging them.

This Association has no doubt whatsoever that the appointment of technically qualified and experienced fire officers is an absolute necessity; indeed, we would regard such appointments as a prerequisite to the establishment of efficient fire-defence arrangements, and we must therefore reject your statement that such appointments are not considered necessary. If, as now seems clear, some boards and groups, if not all, are realising the appointment of specialist officers is necessary, and with respect they are closest to the actualities of the requirements, then the Department, instead of writing pious statements that such officers are not necessary, should face up to and accept the facts of the situation, and set about providing the requisite level of technical and financial assistance to boards and groups to ensure they appoint personnel capable of adequately discharging the responsibilities and duties called for.

Your premise that the existing services already available from the public fire brigades are adequate is hardly in keeping with the policies of other government departments and ministries, some of whom have been employing specialist officers for many years and others more recently. Surely, by the Department's reasoning, the public fire brigades ought to be just as capable of fulfilling the technical needs of these departments, but hence the appointments. We would further add that none of the other government departments and ministries referred to have anything approaching the life risks inherently carried by the Department of Health & Social Security in its hospitals throughout the country, therefore it becomes even more difficult to reconcile its present policy.

You refer to the recent grading review apropos fire-safety officers; it seems to us this review was in respect of those specialist officers for whom you considered there is no need. Therefore, if this is the case, do not these officers already duplicate the services of fire brigades?

We detect an element of illogicality in the last two paragraphs of your letter. As it appears to us, the job evaluation was hardly likely to indicate a need for any major change, as the study only seems to have been concerned with salaries as compared with those of other staff within the grade, and we are left wondering if the evaluation team had the assistance of a technically qualified fire officer to enable the appointments to be put into proper perspective. Your reply appears to indicate that the job evaluation was inadequate in both extent and scope; it is to us therefore not surprising that the conclusions were as you have outlined.

My Governing Council at its last meeting was of the opinion that the Department's attitude to the whole question concerning the provision of efficient fire-defence arrangements in hospitals leaves much to be desired, and the impressions are that the content of your replies can only be calculated to confirm this Association's serious concern.

In the light of the information gleaned from your correspondence, my Association will be left with little alternative than to reaffirm its opinion that the measures the Department has taken thus far are not calculated to provide the requisite guidance to boards and groups which will produce the results called for by the

circumstances. We sincerely hope we do not have to be proved correct in our views by awaiting the outcome of the next tragedy. Perhaps you might be interested to persue the article on page four from the enclosed *National Fire Prevention Gazette*.

The question was raised at the last meeting of my Governing Council of making public the correspondence between the Association and your Department; perhaps you will kindly intimate your agreement to such a course of action.'

Reply from the Department dated 16th April 1970:

'I am sorry for the delay in replying to your letter of 15th December 1969.

The Home Office Fire Department has informed us that while some fire authorities may be hard pressed, they nevertheless have a specific duty under Section 1 of the Fire Services Act 1947 to secure efficient arrangements to give fire-prevention advice in their areas when requested. We consider it fair to say that no fire authority is so badly overworked that it cannot survey hospitals and provide advice and guidance on ordinary matters of fire precautions. All fire authorities can give advice on the training of hospital staff, but, in some instances, they may not always have sufficient manpower to give regular instruction to staff at all hospitals in their areas.

It has already been accepted that some form of assistance may be required to hospitals in some areas. For this purpose the Department has agreed to the request by two regional hospital boards to employ officers specialising in fire-precaution matters on an area basis — you mention the advertisements in your letter. These officers will assist with general fire-precautions and training over a number of hospital management committees and will supplement the advice and assistance available from local fire brigades. It is proposed to allow regional hospital boards to employ officers on a similar basis, where assistance is considered necessary for the proper implementation of fire-precaution procedures. The organisation of fire-precaution matters rests with hospital groups, and we must leave it to the judgment or regional hospital boards to decide whether assistance is required on an area basis.

One of the objects of HM(69)62 was to ensure that, where not already in existence, hospital authorities should set up a proper administrative structure for the supervision of fire-precaution matters. The replies received to the memorandum indicate that this objective is being achieved. Where deficiencies of any nature are revealed, action is being taken to ensure they are remedied. The organisation outlined in this HM with the area officers now proposed and the aid available from local fire brigades should be adequate without increasing the overall responsibilities of fire-safety officers to meet fire-precaution requirements.

The Department has no objection to the publication of the correspondence with your Association, but, in this event, in order to present a balanced view of the situation you will no doubt consider making public also the relevant documents referred to in the correspondence.'*

Reply from the Association dated 30th April 1970:

'Thank you for your letter of the 27th April 1970.

My Association is fully conversant with the responsibilities of fire authorities under the Fire Services Act 1947. With regard to your comment about the extent to which you believe fire authorities are overworked, we believe you are hardly in a position to pass informed authenticated comment.

With respect, I would suggest that only chief fire officers of local-authority fire brigades would be in the position to make authentic observations on the extent to which their fire-prevention departments were overworked or otherwise.

Upon the questions of carrying out surveys and the giving of advice, we draw attention to the observations made in paragraphs 5, 6, 7 and 8 of our letter of the 15th October 1969, which comments we again reiterate. We know from experience that, if the above comments are to stand a reasonable chance of success, then, because of the vastly increasing legislative work loads of fire authorities, hospital management committees are going to have to stand more on their own feet, and the sooner this fact is faced up to the better.

My Association will be pleased to learn that the Department has agreed to the request of certain regional boards to employ specialist officers, and that other boards will be permitted to follow suit should they consider such assistance is thought necessary. We believe the Department should be directing and guiding and not waiting for regional boards and hospital management committees to make decisions on such important principles of safety to the public. As we have stated before, there has been for years ample precedent in other government departments for such action.

The Department should also rationalise the specification of responsibilities, appointments and salaries structure. The appointments should in our view preferably be made on a uniformed basis with appropriate ranks and markings and a national command structure set up accordingly, otherwise the rank structure will be piecemeal and full of inconsistencies. My Association would be pleased to assist you in arriving at appropriate rank markings or any other points you might wish.

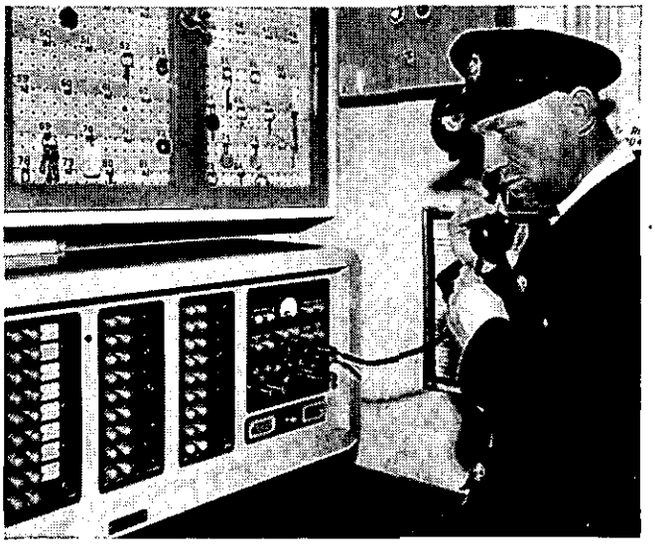
The efficiency reports which were called for by HM(69)62, will, we suggest, be directly commensurate with the qualifications and experience of those who complete and assess the information. Short of seeing the reports it would be inappropriate to make informed comment, and while there does appear a greater awareness abroad of the importance of fire safety and hence some action to put matters right, we should require far more evidence than is currently available at this point in time before we would be prepared to take the optimistic view expressed in the fourth paragraph of your letter; time will tell.

Your agreement to the publication of the correspondence is appreciated.'

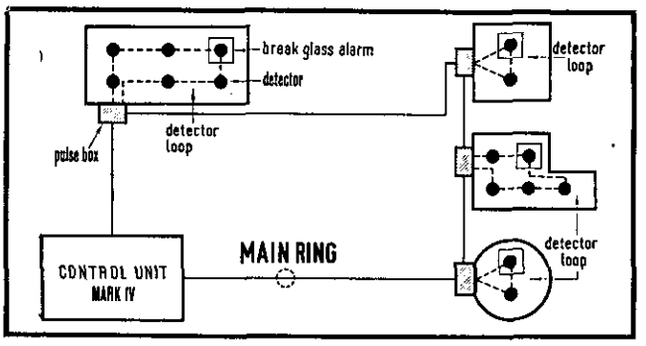
*The only document referred to which has had a restricted circulation is HM(69)62. This will be reprinted in the August issue of *Hospital Engineering*

Thoughts on automatic fire protection

by Sir Frederick Delve



Central control point



Schematic of Auto-Thermatic system

Regular readers of this journal will recall that I contributed an article following the Shelton Hospital fire (1968, volume 22, number 9). At that period an inquiry into the fire had been ordered and I prophesied it would be found that there had been a delay in calling the fire brigade and that deficiencies in the fire instructions and procedure would be revealed. It required no special knowledge on my part to make such prophecies as experience has shown time and time again that this is invariably the case when fire strikes and lives are lost. As is now known these prophecies were subsequently confirmed.

My article dealt primarily with the importance of automatic fire-detection systems in hospitals, and I described in detail Sound Diffusion's 'Auto-Thermatic' fire-detection system and the special features that it possesses. As explained then, it is most important that any automatic fire-detection system must be reliable beyond question and should be constantly monitored wherever practicable, so that an instant warning is given visually and audibly of any fault arising, whether caused maliciously or by accident.

In May 1969 the Department of Health & Social Security issued Hospital Technical Memorandum 16 — Fire Precautions. This is an excellent publication which is well prepared and deals comprehensively with all aspects of fire prevention, protection and precautions.

Since the issue of this memorandum, I have had several opportunities of discussing the subject of automatic fire detection with a number of hospital engineers. In the course of these discussions three main points emerged; namely finance, the relative merits of thermal and smoke detectors and the problems that can arise when a hospital comprises a number of separate buildings, some of which are situated at considerable distances from each other. Rather than repeat or amplify any matter dealt with in the memorandum, I propose to confine my observations to these matters.

The impression I gained with regard to finance was that the funds allocated for fire precautions are insufficient to carry out all the works advised in the memorandum, therefore, not unnaturally, hospital engineers are anxious to do as much as they can with the money available to them. This is not an unusual situation in a national service, and one's attitude must be reasonable and realistic. A strong case can be made out for more hospitals, better equipment and many other items that may allay suffering and preserve life, and therefore expenditure on fire precautions must take its place in order of priority. This requires that hospital engineers must determine their own priorities within the limits allocated for fire precautions. No doubt this has already been done, and a programme has probably been drawn up possibly extending over one or more years, according to the amount of the work to be done. It is not a simple matter to determine priorities, as all matters relating to fire safety are relative in importance. However, in my opinion, prior consideration should be given to the instant detection of fire wherever and whenever it occurs, the simultaneous sounding of an alarm, the automatic transmission of a call to the fire brigade and the availability

Sir Frederick Delve is a director of Sound Diffusion Ltd., Hove

of portable fire extinguishers of the appropriate type to enable the fire to be dealt with while in its initial stage at its point of origin. It is probable that portable fire extinguishers already exist, in which case the fitting of smoke-check doors in selected positions could be substituted in the priority order. In my opinion, these are the most important matters, as they provide for an outbreak of fire being detected immediately it occurs and for an early warning being given to staff and the local authority fire brigade. Action taken on these matters without delay will go a long way towards safeguarding life and property.

Regarding the relative merits of thermal (heat) and smoke detectors, both have certain advantages and disadvantages. As is probably known, there are two types of smoke detector; one utilising the effect of smoke particles in an open ionisation chamber and the other relying on the clouding effect of smoke in a photoelectric device. Both types are more sensitive than thermal detectors.

The natural reaction to a demonstration of the speed of response to fire by smoke and thermal detectors is to be 'sold' on smoke detection. However, careful thought should be given to the economical and operational considerations when designing an automatic fire-detection system:

(*a*) A smoke detection system is generally more costly to install than a thermal system.

(*b*) Under conditions of high ambient levels of aerosols and smoke, particles may cause false alarms in smoke detectors unless their sensitivity is reduced; careful setting must be borne in mind.

(*c*) Heat detectors require considerably less servicing, and, in consequence, the annual cost of maintenance is reduced.

(*d*) Provided that where practicable the lowest actuating temperature settings are used, the difference in response time of heat detectors and smoke detectors can be reduced. However, high ambient heat conditions will necessitate a higher temperature actuating setting which adversely affects the sensitivity of heat detectors.

The type of fire to be expected (whether the fire is likely to produce considerable smoke before heat or vice versa), the degree of life risk and contents value, must also be taken into consideration when determining the sensitivity and installation costs of the system.

Either system would fulfil all requirements, but perhaps the ideal system incorporates both heat and smoke detectors, utilising each where it is likely to provide the standard of detection required. It can, however, be unwise to consider using the greater sensitivity of smoke detectors to economise on the number of detectors necessary to provide efficient protection; for example, placing a sensitive smoke detector in a corridor to protect the rooms off the corridor must inevitably result in a much slower detection of a fire in one of the rooms than would have been the case if heat detectors had been installed in each room.

Problems arise where a hospital establishment includes a number of buildings situated at distances one from another. Sound Diffusion's 'Auto-Thermatic Mark IV' system was designed specially to meet difficulties of this kind, and not only does it fulfil all technical requirements but also, because it utilises a single loop (ring) cable, an economy in cost results.

A few remarks about this system might prove useful. It was designed for use at hospitals or widespread industrial sites, and operates on an advanced signalling system which eliminates the need to run separate cables from each building or section of a building to the central control equipment. The normal multiple cable feeds are replaced by a 3-core 'main' ring cable which is looped to small relay units. These relay units are termed 'pulse boxes', one of which is positioned at each building or section of a building. The ring cable starts and finishes at the control panel and enables up to 46 separate buildings or sections of buildings to be indicated on the control panel. The detector circuits are wired in the normal manner and are each connected into separate pulse boxes.

Under normal conditions the detector loops are constantly monitored by power taken from the main ring, the relays in the pulse boxes being held energised.

Immediately a detector is operated, the monitoring current in the local loop circuit is interrupted, causing the relays in the associated pulse box to release. This, in turn, causes a signal to be sent back to the control equipment via the main ring. The central control equipment automatically locates the pulse box on which an alarm condition exists by means of a sequential polarity-reversing technique. The use of this method completely avoids the drawbacks and degree of unreliability that would be experienced by employing from the mains supply, provides a standby supply in identifying transmitters in the pulse boxes.

A 40 V nickel-alkaline battery bank, trickle charged from the mains supply, provides a standby supply in the event of a mains failure. A charger unit incorporates a saturated reactor designed to ensure that the battery bank is always fully charged. If the battery is partially discharged due, for example, to a brief mains failure, the saturated reactor will, on the resumption of supply, alter its impedance characteristics and increase the charging rate to a value of several amperes. As the battery charges, the reactor impedance progressively increases until, when the battery is fully charged, the current has been reduced to a few milliamperes. Relay supervising circuits are fitted which indicate any abnormality in the operating characteristics of the battery or its charger.

Altogether there are now 27 hospitals in which Auto-Thermatic units of varying kinds are installed. These systems are giving full satisfaction, and, in the few instances where fires have occurred, they were quickly detected and dealt with; no lives were lost or injuries sustained, and only minor damage resulted.

Part 5

Electrical-installation testing

by A. Egley

3 Test results and data

3.1 Insulation-resistance test

The IEE Regulations state that with all fuses and links in place, switches closed, and all poles of the wiring connected together, the insulation resistance to earth shall not be less than 1 M Ω. Large installations may be divided into groups of not less than 50 outlets.

With all lamps removed and appliances disconnected, the insulation resistance between all conductors connected to one pole and all conductors connected to the other pole shall not be less than 1 M Ω.

All m.i.c.c. cables, except those terminated in glass–resin seals, must read infinity on test.

The number of outlets includes all switches, sockets, lighting points, clock points etc., except that each socket and lighting fitting incorporating a switch will be classed as one outlet.

3.2 Earth-continuity tests

The conduit, trunking and cable armouring is part of the earth loop from the point of view of earth-loop impedance. Therefore, the conduit (etc.) resistance should not be more than half what the earth-loop impedance is expected to be. This will necessarily be a matter of design and figures cannot be quoted which will cover all circumstances. Remember that values in excess of 0·5 Ω are suspect, and a thorough check should be made before proceeding further.

Table 1 Earth-loop impedance test results (assuming 240 V supply)

Loop impedance	Maximum earth-fault current	Maximum rewireable fuse	Maximum h.r.c. fuse	Loop impedance	Maximum earth fault-current	Maximum rewireable fuse	Maximum h.r.c. fuse
Ω	A	A	A	Ω	A	A	A
0·2	1250	400	800	3·5	71	20	40
0·4	625	200	400	4·0	62	20	40
0·6	415	140	300	4·5	55	15	30
0·8	312	100	200	5·0	50	15	30
1·0	250	80	160	6·0	42	10	25
1·2	208	70	125	7·0	35	10	25
1·4	178	60	100	8·0	31	10	20
1·6	156	50	100	9·0	28	5	15
1·8	140	45	80	10·0	25	5	15
2·0	125	40	80	12·0	21	5	10
2·2	114	35	60	14·0	18	5	10
2·4	104	30	60	16·0	15	5	10
2·6	96	30	60	18.0	14	2	6
2·8	89	30	60	20·0	12·5	2	6
3·0	84	25	50	25·0	10·0	2	6

3.3 Earth-loop impedance test

The test results to be expected in practice are determined by the size and type of fuse protecting the circuit or section. Table 1 gives a guide to the figures required.

3.4 Earth testing

Two possible results are obtainable from the test equipment:

(*a*) soil (ground) resistivity in ohms per metre cube.

(*b*) resistance of an actual earthing rod.

If (*a*) is available we can determine the earth resistance of an earth rod from the equation

$$R = \frac{P}{0{\cdot}83L} \log \frac{48L}{d} \qquad (1)$$

where R (Ω) is the resistance, P (Ω/cm³) the soil resistivity, d (in) the earth-rod diameter and L (ft) is the earth-rod length.

One rod is unlikely to be sufficient at a substation. It is pointless to drive in more rods side by side because the resistance areas overlap. Generally, rods should be spaced at distances at least equal to their lengths. Tables are also available for given lengths and spacing of rods, or a graph can be used.

If (*b*) is available we do not require eqn. 1 and we use the graphs or tables directly.

Nothing is simple or sure in these calculations. Readings taken in different seasons give different results, and in short, it is a specialist item and the information given above is largely for interest. A full treatment is impossible within the length of this article.

The soil resistivity for various areas of the UK is shown in Table 2.

3.5 Antistatic floor testing

(*a*) *Dry test*

New floors

Average readings should not exceed 2 M Ω with no individual reading exceeding 5 M Ω.

Existing floors

Ideally these should have readings within the above range. If a floor has an average below 2 M Ω and no individual reading above 50 M Ω it is acceptable.

(*b*) *Wet test*

New and existing floors

Average readings should be not less than 50 000 Ω with no individual reading less than 10 000 Ω.

Table 2 Soil resistivity

Material	Specific resistance
	Ω/cm³
ashes	350
coke	20–800
peat	4500–20 000
garden earth—50% moisture	1400
garden earth—20% moisture	4800
clay soil—40% moisture	770
clay soil—20% moisture	3300
London clay	400–2 000
very dry clay	5000–15 000
sand ; 90% moisture	13 000
sand ; normal moisture	300 000–800 000
chalk	5000–15 000
consolidated sedimentary rocks	1000–50 000

ACTION IN THE EVENT OF FIRE

by A. J. Owrid

Introduction

The Department of Health & Social Security, in circular HM(69) 62, 'Fire precautions in hospitals', indicates an increase in fires in hospitals in England and Wales amounting to a fire-loss figure of about £600 000 in 1968.

In Hospital Technical Memorandum 16, 'Fire precautions' (revised May 1969), the major causes of fire are listed as being attributable to :

careless disposal of smoking materials	23%
fish fryers	14%
electric wiring	6%
electrical apparatus (other than heaters)	4%

The most serious aspect of fire in hospitals is the ever-present danger of patient accommodation becoming involved, where many helpless people are unable to save themselves and must be assisted or carried to safety. For this, the staff and firemen may have to make several journeys, and in consequence the time needed to evacuate a ward or ward block is much longer than that taken by able-bodied people to proceed to safety.

Mr. Owrid is the Fire-Prevention Officer, The United Manchester Hospitals

Raising the alarm

The alarm should be promptly raised by anyone detecting or suspecting fire. Fires which increase to serious proportions, sometimes resulting in loss of life, can often be traced to incorrect action in the initial stage, particularly a delay in raising the alarm. This function will not be promptly discharged unless all staff are aware of the correct method of raising the alarm and the location and method of operation of manual fire-alarm contacts, or, in the absence of a fire-alarm system, fire telephones.

Clear and precise fire-instruction notices should be permanently displayed in suitable positions throughout the hospital. It is of particular importance that telephone operators and relief operators are in no doubt about their responsibility to call the fire brigade without delay; messages should include relevant information such as the nature and location of the fire and points of access. The hospital secretary, matron and engineer should be immediately notified of all fires. In every hospital there should be a senior officer with defined responsibility for fire-prevention policy to co-ordinate and direct the action of staff in a fire emergency.

Care of patients

After raising the alarm, any patients in immediate danger from the effect of fire and, particularly, smoke, must be removed to a place of safety, kept under surveillance and reassured. There may not be sufficient nurses and other staff immediately available to do this efficiently, particularly during the night. It is therefore vital that mobilisation of additional staff is prompt and adequate; wherever possible, resident off-duty staff should be alerted. A fire involving a person must be immediately extinguished, preferably by placing the person in a horizontal position and smothering the fire with a blanket or other suitable material.

The DHSS has drawn attention to the flammability of certain synthetic-fibre garments, and the resultant danger to patients when these garments are involved in fires. Garments made from the less flammable fibres are recommended for elderly and disturbed patients, and for those felt to be careless in using lighted matches or smoking materials.

Restricting the fire

One of the most dangerous results of a fire is the obvious one — the production of heat and smoke. This should be restricted by closing all doors and windows in the vicinity of the fire. Self-closing smoke-stop doors are sometimes secured in the open position; this is bad practice, and in case of fire these doors must be closed immediately. All smoke-stop doors should be labelled, for example, 'Smoke door — keep shut'.

Medical gases are supporters of combustion, and, in addition to the normal precautions (which should

include no naked lights in the area of discharge), these must be controlled in the event of fire.

Attacking the fire

Most fires comprise a chemical reaction which uses fuel and oxygen and generates heat. These are normally divided into three classes. Class A consists of carbonaceous materials, including wood, paper and textiles; this type of fire can be extinguished by cooling with water from a hose reel, water extinguisher or even a bucket. Dry rising mains for fire brigade use are required in certain buildings over 50 ft in height, and all buildings over 80 ft in height, with outlets on each floor. In addition, sprinkler installations, which automatically detect and attack a fire, are sometimes installed in high-fire-risk areas.

Class B is the flammable liquids; e.g. ether, methylated spirit, petrol, oils, cooking fats and paints. These are usually extinguished by smothering with asbestos blankets, or by extinguishers emitting foam, carbon dioxide or dry powder. Although suitable for oil and similar fires, methyl bromide, CTC and CBM are not recommended because of the toxic nature of the chemicals used.

Class C comprises electrical equipment involving the danger of electric shock. The first requirement is to isolate the supply of electric current, and then to extinguish the fire with a nonconductive agent such as carbon dioxide or dry powder. Many fires in electrical equipment can be avoided by ensuring that the supply is isolated after use, particularly in equipment that is not required to be continuously in operation; such equipment includes domestic appliances, including television sets.

Means of escape in case of fire

There should be at least two safe avenues of escape from all wards and departments. These should lead to the safety of a separate fire-resistant compartment on the same floor, across a fire-escape bridge to another building, down an internal protected staircase terminating at ground level and providing direct access to open air, or down an external fire escape to ground level.

Fire-exit doors leading to means of escape should be clearly marked, unobstructed and easily opened without a key. In cases where escape doors are locked, keys must be permanently available, usually in glass-fronted boxes fitted to the doors.

Lifts must *not* be used for evacuation purposes.

Evacuation of patients

Methods of evacuation depend on both the hospital design and the condition of the patients. Ambulant patients should be moved first; guiding rather than help may suffice. Semiambulant patients may have to be assisted or carried, using an appropriate hand seat. Nonambulant patients may be moved in their beds on the same floor level, providing that communicating doors are of adequate width. Where nonambulant patients have to be evacuated and the lateral movement of beds is impracticable, it may be necessary to place patients in blankets on the floor and pull them to safety. Blanket removal should only be used where no other method can be adopted, and where speed is essential because of the spread of fire or smoke. Stairs or steps cannot be negotiated by this means.

As an alternative to being carried on stretchers, which may not be available in the early stages of a fire, patients may be secured on mattresses with mattress lines and pulled to safety via staircases. In all cases where patients have to be taken to safety using hand seats or on mattresses, two nurses or other members of staff are required to assist each patient.

Before the fire brigade arrives

Fire in hospitals require immediate action by the person discovering or suspecting fire, and support by staff in the vicinity. Thus all staff are obliged to be potential fire fighters. No help will be forthcoming until the alarm is raised, so this is the first priority. Other members of staff who are required to report at predetermined assembly areas on the alarm being given should be directed by the senior person in charge. Nursing staff on duty in wards and clinics should be directed by the senior nurse in charge, and should remain with the patients.

When the fire brigade arrives

On receipt of a fire call the fire brigade will respond speedily, with a predetermined attendance designed to be adequate for the immediate attack on a fire in a high-life-risk building. The fire brigade should be given clear instructions relating to access, and, where possible, a member of the hospital staff should act as a guide. Hospital access roads should be kept free of obstruction; motor vehicles should be garaged or parked away from the main hospital buildings.

The senior fire-brigade officer will assume overall responsibility, and senior members of hospital staff should place the resources of the hospital at his disposal. The hospital engineer, on being informed, should arrange for suitable members of staff to report to the officer in charge at the fire. They should be prepared to take required action for which their technical and specialised knowledge make them very suitable. These duties may include the controlling of services, for example electricity, gas, water, medical gases, plant room, boiler house, laundry etc. To enable such action to be efficiently discharged, service controls should be clearly and permanently indicated, together with an indication of the area controlled.

Conclusion

In this presentation, action in the event of fire has been referred to under a series of headings, designed to follow a safe sequence of events. It should, however, be recognised that each fire is different, and circumstances will dictate the immediate action to be taken. The priorities must be dealt with quickly if the action is to be effective until the fire brigade arrive and assume control.

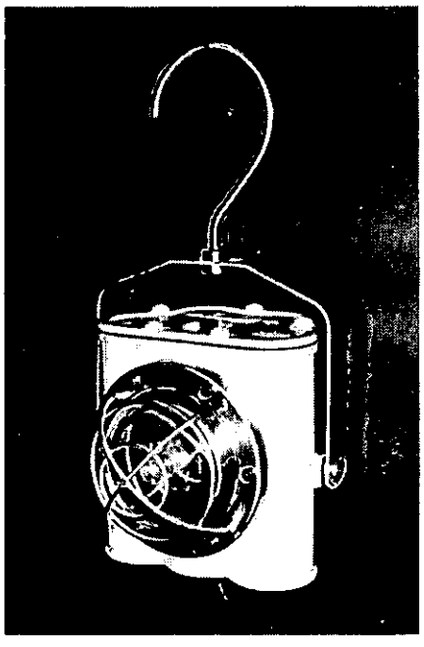
* Market News *

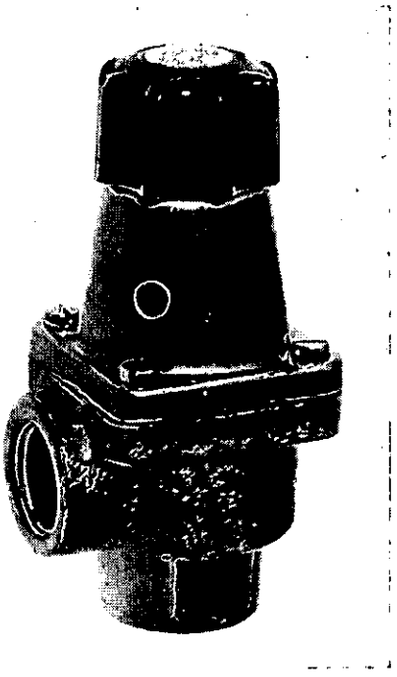
For further details, simply encircle the relevant number on the reply-paid postcard

Rechargeable handlamp

A new handlamp incorporating a rechargeable nickel-cadmium battery has been introduced by Cadmium Nickel Batteries Ltd. It will give full illumination continuously for 10 h (whereas a dry-battery lamp will give a diminishing amount of light). The sealed sintered-plate battery will in normal service last for many years, requiring no maintenance other than recharging. The 6 W xenon bulb gives a high output, and the reflector is designed to give a wide angle of light distribution. The Saftilamp has a heavy-duty nylon body and a polycarbonate bulb cover. It may be suspended at any angle; it weighs 6 lb. It can also be safely used immersed in 3 ft of water. **HE87**

Cadmium Nickel Batteries Ltd., Station Rd., Hampton, Mddx.





Safety valve

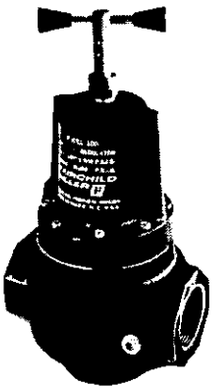
Perrymatic Hydronics Ltd. is now marketing a range of diaphragm safety valves particularly suitable for closed commercial heating systems. The valves, which fully meet the DIN Standard, are designated series SYR, and are available in 0·5 in, 0·75 in and 1 in sizes. Each valve comprises an aluminium die-cast top section connected by four fixing screws to a cast-iron pressing which is threaded for flow and relief connections. The hand wheel is of red plastic and a diaphragm of resiliant material on a steel seating ensures positive action. To avoid tampering the stainless-steel spring is factory loaded and totally enclosed within the valve. The valves are designed to give instant release at 37 lbf/in², and are not subject to 'dribbling', release being instantaneous when the pressure reaches the preset level. **HE88**

Perrymatic Hydronics Ltd., Chester Rd., Northwich, Ches.

Gas-pressure control valve

Capable of high accuracy under varying flow conditions, the new Fairchild Hiller Model 100 pressure regulator enables single-stage pressure cuts from 500 lbf/in² to inches w.g. to be achieved, with the added safety of an integral relief valve.

A pintle, opposing the downstream pressure with an applied spring load, minimises extraneous forces and cuts response time. Effect of supply-pressure instability is therefore negligible, and the mechanism is sensitive to downstream pressure changes as small as 0·5 in w.g. Adjustment of pintle position to maintain constant pressure with change of flow is achieved by a venturi tube in the outlet port; the depression created is fed back into the control chamber. Excess down-



stream pressure operates the relief valve, allowing 'backing off', and maintaining dynamic rather than static equilibrium under steady-state conditions. **HE90**

EFCO Ltd., Deltech Division, Woking, Surrey

Smoke detector

A new smoke detector (Type P1D-B) has been designed to detect smoke and/or combustion gases within a few seconds of a fire starting. The unit consists of an inner and outer chamber, the insides of which are ionised by a radioactive material. The inner chamber is sealed from atmosphere, and when smoke or combustion gases enter the outer chamber the voltage ratio between the two chambers is changed. This voltage difference is amplified and the signal transmitted to the control unit. It operates on a 24 V d.c. supply, and normal current consumption is 4 μA per unit. Stable operation is provided irrespective of voltage variations and over an ambient temperature range from —10°C to 60°C. Each unit will normally protect up to 10 000 ft³ of enclosed area. **HE89**

Photain Controls Ltd., Randalls Road, Leatherhead, Surrey

Cooling tower

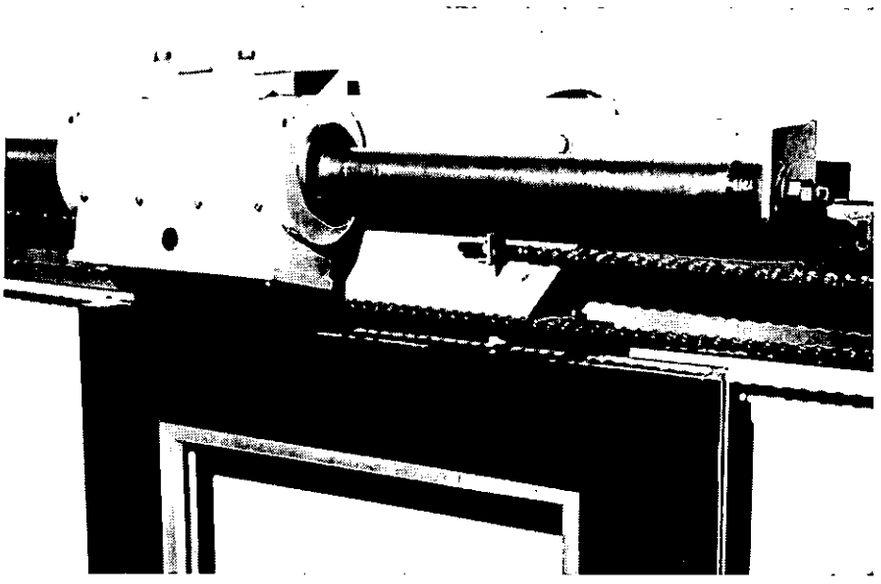
A new packaged water cooling tower, the NC double-flow packaged cooling tower, is now available from Redman Heenan Froude Ltd. It is an extension of the Heenan Marley 4400 series of induced-draught crossflow-pattern cooling towers. Available with refrigeration capacities from 100—500 ton (flow 80—2000gal/min), the design permits multiunit installation to cater for larger capacity requirements. Maximum cooling effect is obtained by the new, high-performance p.v.c. fill, specially patterned to prolong air–water contact while providing low resistance to the air flow. **HE91**

Redman Heenan Froude Ltd., Shrub Hill Rd., Worcester

Linear motor

A new d.c. linear motor for the operation of sliding doors will fit within the thickness of a 4·5 in brick wall, requires only 6 in headroom, and even where headroom is unavailable can be mounted unobtrusively behind the door. The motor has only one moving part. Maintenance is limited to occasional inspection of bearing clearances and the carbon-brush contacts which normally give years of service and which can, in any case, be changed within a few minutes. Originally designed for the operation of lift doors, the motor is equally suitable for other types of sliding door—single, double-leaf or centre-closing. **HE92**

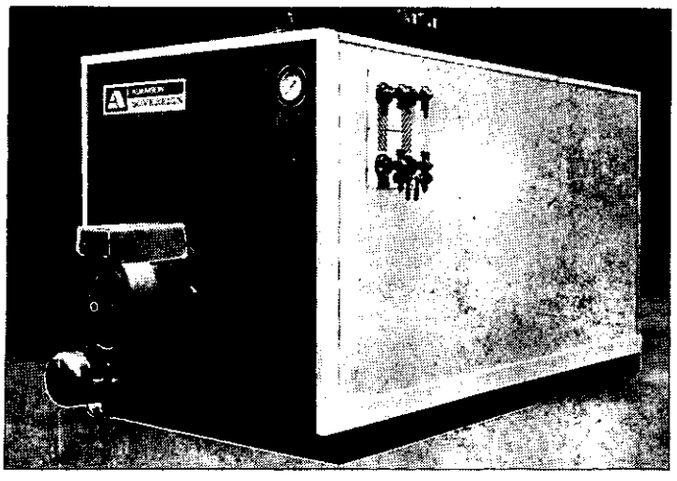
Cobar Precision Co., Leeds



Range of package boilers

The Sovereign range, a new design of 3-pass wet-back steam boiler, runs from 1500 to 35 000 lb/h with working pressures up to 250 lbf/in². High thermal efficiencies of 82 to 85% are maintained over full turndown. The boilers are designed for oil, gas or dual-fuel firing, and there is a selection of burners. The outer casing is double-skin mild-steel sheet with 2 in of mineral wool filling the cavity, and these act as excellent thermal insulators and acoustic baffles. Panels of the casing can be removed in minutes to give direct access to the boiler shell for inspection. **HE93**

Joseph Adamson & Co. Ltd., Hyde, Ches.



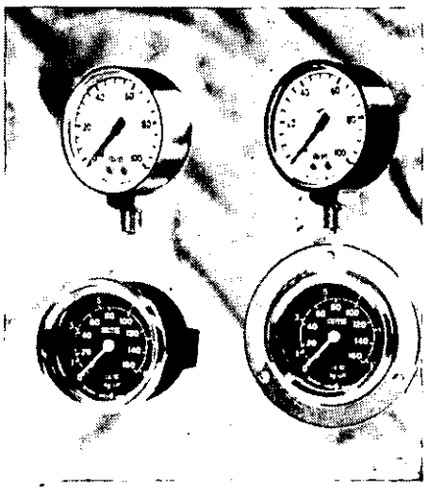
50 mm Bourdon gauges

Smiths Industries have redesigned their 50 mm pressure gauges as the first step in introducing a standardised range of gauges. The new Venture gauges, enabling Smiths to give their customers off-the-shelf service, is of the 1% Bourdon-tube type, with three basic mountings: direct back connection, direct bottom connection, and flush panel (either strap or 3-hole fixing) with adaptor flange. The casing can be of a.b.s. with plastic window, or metal with glass or plastic window.

The specified accuracy applies over the range 0–60°C, and the instruments will withstand shock loads of 100 g.

The upper working limit is 3000 lbf/in² and at the lower end gauges are available to cover the range 0 to —1 bar (0 to 30 in vacuum). **HE95**

Smiths Industries Ltd., Kelvin House, Wembley Park Drive, Wembley, Middx.



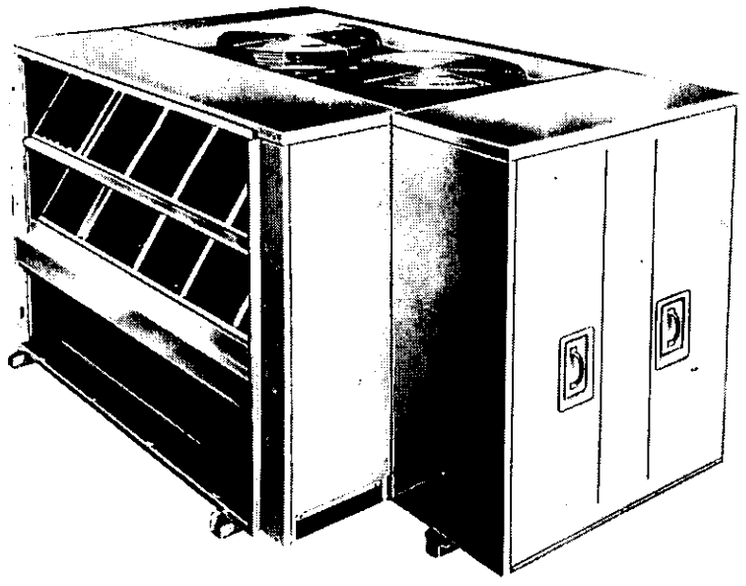
Underfloor duct system

Key Terrain Ltd., a member of the Reed Group, has introduced a new underfloor duct system in rigid p.v.c. for the distribution of power and telephone services.

This is available in standard lengths of 4 m and in two main sizes, 60 × 25 mm and 90 × 35 mm high. It can be installed in single, double or triple duct runs according to the types of service required, with a complementary range of boxes, power and telephone pedestals and ancillary fittings.

A feature of this new system is a direct outlet for the connection of power and telephone pedestals. This fitting can be easily solvent welded to the duct, either before screed is laid or at any time afterwards during the life of the building if subsequent connections to the duct are required. **HE94**

Key Terrain Ltd., Reed Group Site, Larkfield, Maidstone, Kent



Packaged air conditioners

A new range of self-contained packaged air-conditioning units is now available from Carlyle Ltd.

The 50DA range comprises 11 sizes with cooling capacities from 25000 to 286000 Btu/h. They can be used singly or in groups and can be installed on the roof or through the wall of a building. All models are factory wired and charged so that only ductwork and wiring are needed on site to complete the installation. The hermetic compressor has vibration isolators, crankcase heater, muffler, discharge manifold, automatically reversible oil pump, and a time-guard circuit which prevents short cycling. The direct-drive propeller fan is resiliently mounted, and the bearings are permanently lubricated.

HE96

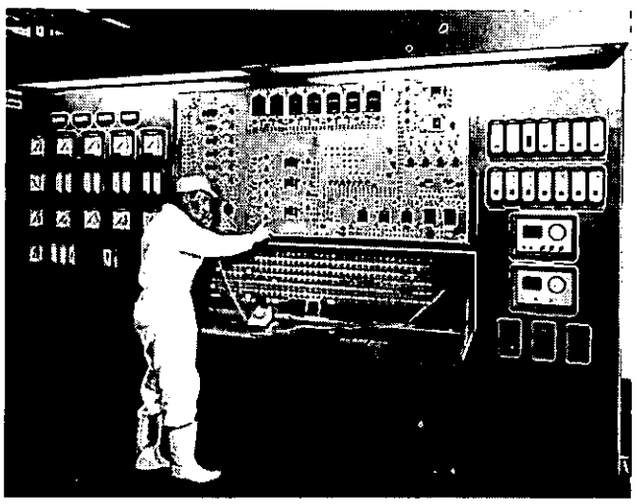
Carlyle Air Conditioning Co. Ltd., Bilton House, Uxbridge Road, Ealing, London W5

Clippings

The problem of metering the amount of heat supplied to the various units making up a group or district heating scheme has been made a far more realistic proposition by a new heat meter being evaluated by Ferranti Ltd. This could replace the present systems, which use either high-cost equipment or apportioning methods. The new meter, accurate to 3% and with further refinement possible, could cut the meter-installation cost considerably and enable the user to control his spending by keeping an eye on the meter reading. The heat meter measures two parameters: the temperature difference between water inflow and outflow, and the mass flow. The latter, extremely small at low flow rates, is measured by a servo-assisted, self-steering carriage, controlled by the actual sensor in the stream. Mass-flow and temperature-difference are combined, and the result is displayed on a simple counter calibrated directly in heat units.

200 Multitone RA60S receivers and 20 talkback transmitters are used in a 4-hospital pocket-paging link being set up in Oxford. The scheme, worth £10 000, allows for a call to go out from one hospital to receivers anywhere in the four hospitals involved, and for the call to be coded to indicate its point of origin. In addition, each hospital will be able to send out group-alert calls to its own cardiac-arrest team.

Softening water by ion-exchange is expensive, and by electrodialysis is inefficient. The average of the two evils is attained by a plant supplying 264 000 gal/day designed by William Boby & Co. Ltd. of Rickmansworth. The plant, being installed at an Italian oil refinery, comprises an electrodialysis unit, which reduces the dissolved solids from 1600 to 340 parts in 10^6, ins eries with an ion-exchange unit, which reduces the concentration to around 0·05 parts in 10^6. The savings arising from this scheme are due to the greatly reduced amounts of chemicals required, as the electrodialysis plant uses only electric power.



The new 'Callabrew' voice-operated drink-vending machine allows the customer to supervise the preparation of his drink at all stages from dehydrated powder to freshly made beverage. The machine (shown above being tested under sterile conditions) incorporates a central computer which responds to verbal instructions such as 'Cola, flat' or 'Windsor soup, with sugar', and displays subsequent operations on the mimic diagram, enabling the customer to adjust the flavour concentrations as required. A company spokesman said recently, 'This machine really is the last word. The only problem seems to be that it's not too good with dialects, but that will soon be beaten, I'm sure. Then all we have to do is rig up some sort of gadget to stop the cup-delivery mechanism jamming'

Polyplan Ltd., of 97 Princess Rd., Leicester, is holding two intensive short courses on plastics in building design and construction. The first is from the 21st to 24th September, and the second is a one-day course on the 25th September. A descriptive brochure and curriculum is available from the organisers.

Fire precautions in hospitals

By C. A. Powell

1 Introduction

Hospitals are unique in several important respects of fire precautions. A most important feature of hospitals is that they are constantly manned : as the old Windmill Theatre motto said 'we never close.'

At the Department of Health & Social Security we have kept records of all fires that have been reported since 1956. It is quite clear that many small fires have not been reported, but it is probable that all fires involving significant damage or injury have been recorded. A fact clearly revealed by the records is that, although there are a lot of fires in hospitals, most of them are soon detected and tackled and very few become serious despite the fact that most hospitals are old and many are very old. This, I feel, is entirely due to the fact that hospitals are continuously manned, and, even when fires occur in unoccupied parts, the fact that people are around at all hours means that they are likely to be discovered and tackled much sooner than if the premises were unmanned. The point I am making is that people are good fire detectors.

There is, however, no room for complacency : fire costs to the hospital service were about £600 000 in 1968 and there is little doubt that this figure could be considerably reduced if fire precautions were improved. An example of what can be achieved is shown by the reduction in fish-fryer fires that has followed the attention that has been drawn to this risk and the special precautions that are now recommended. Some fish-fryer fires are still being reported, but, in each instance, it has been reported that the fryers concerned

Mr. Powell is with the Department of Health & Social Security

had not been modified to comply with these recommendations.

2 Hospital fire risks

Fire-risk areas in hospitals fall into two categories; risk-to-life areas and what I call insurance areas where the aim is to reduce the financial loss and, of course, to reduce any inconvenience to the running of the hospital which may be caused by fire damage.

Life-risk areas can be further divided into two classes; namely patient areas, which are by far the most important because patients may be helpless or non-ambulant, and staff residential premises. The life risk in staff quarters is probably less than in ordinary domestic premises because staff are able bodied and should have had some training in fire precautions, whereas ordinary domestic accommodation may include aged and very young persons.

The special fire risks in hospitals are therefore largely confined to patient areas. Fortunately, with a few exceptions which I will discuss later, these areas are continuously manned, and fires in these areas should be quickly discovered and tackled provided the staff are properly trained and adequate first-aid fire appliances are available.

Reviews of fire-precautionary arrangements in the hospital service following the Shelton fire will result in many thousands of pounds being spent on improving fire precautions. While the expenditure on fire-protective work that will result from this exercise will, in most instances, be justified, it is important that we get priorities right. The real lesson to be learnt from the Shelton fire is that vital time was lost in raising the alarm, in calling the fire brigade and in tackling the fire because of inadequate staff training.

3 Fire-safety organisation

One of the criticisms levelled at the Hospital Technical Memorandum 16[2] is that it is easy for the Department to issue such a document, but it is virtually impossible for hospital authorities to comply with the recommendations because of limited financial resources. As the person mainly responsible for this document I welcome this opportunity of stating that I fully appreciate that it is much easier to tell people what they should do than to actually implement the recommendations. But limited financial resources should not prevent hospitals from having an efficient fire-safety organisation, which is by far the most important contribution to fire safety. Expensive fire-protection works are important in preventing extensive fire damage once a fire has become established, but the real priority with regards to the risk to life in manned premises is that everybody concerned should know exactly what to do in the event of fire and that adequate first-aid fire-extinguishing equipment is conveniently available. The second priority is to provide smoke and fire protection appropriate to the time necessary to move patients out of the risk area.

Firemen are important because they are trained and carry the appliances necessary to tackle established fires, but one does not have to be a fireman to tackle a small fire with a fire extinguisher or hose reel or to close fire-stop doors or to move patients during the early stages of a fire. A typical hospital having, say, 500 beds will have a staff of about 500. Just think how the fire risk would diminish if every one of those 500 knows where the fire appliances are and how to operate them, knows exactly how to raise the alarm and call the fire brigade, knows which are fire-stop doors and the best way to move patients and, what is probably even more important, if they are all fire-prevention conscious.

4 Staff training

I appreciate that staff training is a formidable task considering the staff turnover in most hospitals, but the importance of staff training cannot be overstressed. Full use should be made of films and slides to create interest and to make each member of the staff fire conscious, but there is no substitute for actually rehearsing the procedures in raising the alarm and operating fire extinguishers and hose reels. Rooms used for staff instruction should be equipped with a telephone and/or alarm points as necessary, a hose reel and each type of extinguisher (empty). Each member of the staff should go through the motions of raising the alarm and running out a hose reel, and the best methods of moving patients should be rehearsed.

Fire extinguishers due for recharging should be discharged by staff during staff training, and, while it will not be possible for each member of the staff to operate a charged extinguisher, they should all operate and handle a discharged extinguisher of each type so that they are familiar with the method of operation.

A film that I recommend should be seen by every person who works or indeed visits hospitals is entitled 'They called it fireproof' and is obtainable from the National Film Board of Canada.

5 Justified fire precautions

It is important to keep a sense of proportion in deciding what fire precautions can be justified. For example, a proposal was made that all wards should be equipped with sprinklers. Of course automatic sprinklers are an excellent fire precaution in premises that may be unoccupied and contain significant flammable storage, indeed there may be parts of hospitals that justify the provision of sprinklers where these conditions exist, but in constantly manned parts of a hospital, however, the most effective sprinkler is a hose or hose reel in the hands of an operator who can direct it into the seat of a fire and, to avoid unnecessary water damage, can turn it off when it is no longer required.

Another proposal was made for a computer room to be fitted with sprinkler heads: I don't know which could do the most damage, a fire or water from the sprinklers. In general, in constantly manned premises where trained staff can be quickly on the scene once

the alarm has been raised, fire detectors are preferable to sprinklers. First because detectors operate much more quickly than sprinklers, and secondly because water damage is likely to be much less. For those interested in this subject I recommend an article by Dr. Taylor of the Fire Protection Association[1]. It is worth noting that this article reveals that damage in sprinklered buildings amounted to £140 000 and £115 000 in two instances where there was severe water damage.

6 Cost of hospital fires

Fire Research Station statistics indicate that fires in NHS hospitals, private hospitals and nursing homes now number about 600 a year. Most fires are soon discovered and result in minimal damage, but some are costly and it is of interest to consider how these occurred and why they developed into large fires despite the fact that the hospitals were manned. Table 1 lists the fires that have cost about £17 000 or more since 1956.

7 Roof voids

Fires in roof voids are liable to be expensive because they can become established before being discovered even when people are in the vicinity. They are difficult to tackle and there is likely to be considerable water damage in the premises below the fire. For this reason special attention should be given to fire precautions in roof voids, particularly in eliminating flammable construction, insulation etc. and in ensuring adequate fire protection where flues and engineering services pass through the voids.

8 Occupational/industrial therapy departments

The activities of these departments frequently involve considerable quantities of flammable materials, and strict supervision is necessary to ensure that the necessary fire precautions are complied with. The premises should be thoroughly inspected before being vacated after use, and it is also desirable that they are inspected half to one hour later. When these departments are located in a life-risk zone, automatic fire detection is highly desirable.

9 Laundries

The risk of spontaneous ignition occurring unless proper steps are taken to cool articles that have been tumbler dried is well known, but incidents due to this cause are still occurring in hospital laundries. It is important that the staff concerned are properly instructed in the correct procedure, are strictly supervised and that conspicuous notices are provided as a constant reminder of this risk.

10 Laboratories

Many laboratory fires result from the combination of highly flammable substances and gas burners. There should be strict supervision to ensure that only quantities of highly flammable substances required for immediate use are kept in a laboratory and that additional quantities are kept in a special store set aside for this purpose. The substitution of electric heaters for gas appliances can make an important contribution to fire safety.

Special precautions, particularly against the possibility of overheating, are necessary when equipment which constitutes a potential fire risk is left operating during the night when the laboratory is unmanned. Where laboratories are located within a risk-to-life zone, automatic fire detectors should be provided.

11 Smoking

Careless disposal of smoking materials is by far the most serious fire risk in hospitals, and our records show that there has been a significant increase in fires attributed to this cause in recent years. It seems likely that a contributory cause is a more liberal attitude in hospitals nowadays. However, when it comes to smoking, it can be very dangerous particularly where geriatric and psychiatric patients are concerned.

There is no simple solution to this problem. It is important that nonsmoking areas are clearly defined and no-smoking rules are strictly enforced. Adequate facilities for the safe disposal of smoking materials should be provided in smoking areas, and every opportunity should be taken to draw attention to this risk; e.g. during staff instruction, by posters etc.

Where unreliable patients are concerned, smoking should only be permitted where the patients can be properly supervised.

12 Arson

Arson constitutes a very significant risk in hospitals. It is important that all concerned are warned where patients are potential arsonists, and appropriate steps should be taken to prevent them obtaining matches or lighters.

13 Timber buildings

Increasing use is being made of timber buildings at hospitals as a ready means of providing additional accommodation. Timber buildings in themselves are not hazardous, but, because of their flammable construction, it is important that fire precautions in these buildings are of a high standard and that the buildings are not located in a risk-to-life zone. The linings of such buildings should be adequately fire resisting, and engineering services should have the highest standard of fire protection. Only enclosed low-temperature-type heating equipment should be used in these buildings.

14 Fire deaths

There has been a rather dramatic increase in fire deaths in hospitals during the last two years. During the previous 12 years no fire deaths were reported, whereas 36 fire deaths have been reported during the last two years. Three of these were individual instances where confused patients have caused their own death by careless disposal of smoking materials. The remaining

33 lives were lost in three separate fires which were not large. A significant feature of these fires is that the deaths were primarily due to asphyxia caused by smoke from burning cellular upholstery in two instances and a cellular rubber mattress in the other incident. A feature of burning cellular rubber and other cellular materials such as polyurethane is that they are liable to smoulder and give off considerable quantities of smoke before actually bursting into flames. This means that a considerable danger could exist before the source of the fire is detected.

I am not suggesting that cellular upholstery and mattresses should be banned from hospitals, but it is important that all concerned should know of this new hazard. With upholstered chairs, the risk can be considerably reduced by design and, in fact, open-sided chairs with sloping seats are available, and with these it is virtually impossible for cigarettes or matches to become trapped. The position with mattresses is more difficult because flammable bed clothing is likely to become involved first, and a flame retardant enclosure for the mattress would be only marginally effective in these circumstances. It may well be necessary to limit the choice of mattresses in wards housing patients that are liable to be confused or be unreliable in the handling of smoking materials. Regardless of the type of upholstery or bedding, there should be strict supervision of smoking with these categories of patients.

15 Wards unstaffed at night

Some wards are not constantly staffed at night (for example, those housing suitable categories of long-stay psychiatric patients), and this raises a problem concerning fire precautions during the nonstaffed periods. Manually operated fire-alarm facilities are only suitable for those parts of hospitals where persons are always on duty. It is not usual to consider using patients in deciding the fire-safety organisation, but in instances where the patients do not need to be supervised at night, there is the possibility that the most reliable long-stay patients could be trained to operate the fire alarms in the event of fire. Instances have been reported where patients have discovered fires and raised the alarm. If such an arrangement is not considered practicable, the only satisfactory alternative would be to install automatic fire detectors in these wards.

16 Contractors

A number of fires in hospitals have been attributed to the activities of employees of private contractors while carrying out work at the hospital. Firms employed by hospitals should be urged to impress on their employees the need for taking appropriate measures to minimise fire risks in carrying out their work. A suitable clause to this effect should be included in all preliminary bills for building or engineering contracts.

17 Fire alarms

There is a great reluctance of some people to regard telephones as a reliable means of raising the alarm in the event of fire. Our records show that in most instances where there is a fire at a hospital, telephones are used to raise the alarm, despite the fact that many of the hospitals had a manual call-point system. All sorts of reasons have been put forward for not relying on telephone systems, but the clear fact is that the use of telephones has proved to be very reliable based on experience over many years. Against this, although call-point alarm systems are less used for raising the alarm, there have been two instances recently where the systems have failed because the batteries were discharged. It does seem that in an emergency people instinctively use the method of communication with which they are familiar and usually make for a telephone. With telephones being increasingly used in hospitals, clearly the time has come when it must be acknowledged that expenditure on manual call-point alarm systems cannot be justified where a suitable comprehensive telephone system exists.

18 Conclusions

I have tried to show that an efficient fire-safety organisation, where the staff know exactly what to do in the event of fire with satisfactory first-aid extinguishing equipment readily at hand, is the most important contribution to fire safety in hospitals. Nearly all big fires start as small fires, and prompt proper action by those present during the early stages of a fire is of vital importance.

Where fire-protective work is necessary, patient areas should have the highest priority.

Fire protection in non-life-risk areas is a normal insurance matter, and it is a question of expenditure which can be justified as an insurance against a realistic assessment of the fire risk involved. It is important that all concerned should realise that capital resources are limited, and expenditure to secure unreasonable standards of fire protection can only be found at the expense of delaying the rebuilding of old hospitals where the fire-protection arrangements may be inherently substandard, and where expenditure must be restricted because the premises are scheduled to be renewed.

Finally, I would like to make a plea to all those who are concerned with building and equipping hospitals to eliminate flammable materials whenever satisfactory alternative materials are economically practical. Obviously it is impractical to eliminate all flammable materials, but every contribution in this connection, whether it be in construction, finishes, fittings, furniture or utility equipment, is a worthwhile contribution to fire safety.

The opinions I have expressed do not necessarily represent the views of the Department of Health & Social Security.

19 References

[1] TAYLOR, H. D.: 'How do the various systems of automatic fire protection compare in bringing about the extinction of a fire with the least damage, *Fire Prot. Ass. J.*, 1969, **81**.

[2] Hospital technical memorandum 16, May 1969 (HMSO)

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(iii) City & Guilds mechanical engineering technicians Full Technological Certificate (Part III) which must include plant maintenance and works service.

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Application forms may be obtained from the Secretary and Treasurer, 14 Ardross Street, Inverness. The closing date for applications is the 31st July 1970

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Further details are available from the Secretary to the Board, Brompton Hospital, London SW3, to whom applications should be sent, stating details of age, experience and qualifications, and giving the names and addresses of two referees, by the 27th July 1970

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(ii) City & Guilds mechanical engineering technicians Full Technological Certificate (Part III) which must include plant maintenance and works service.

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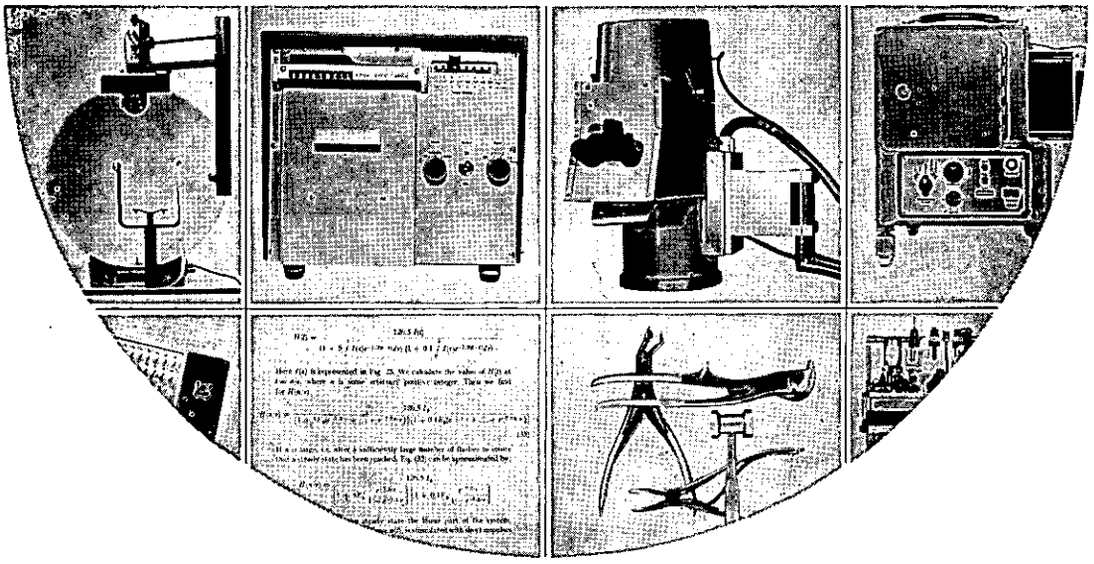

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