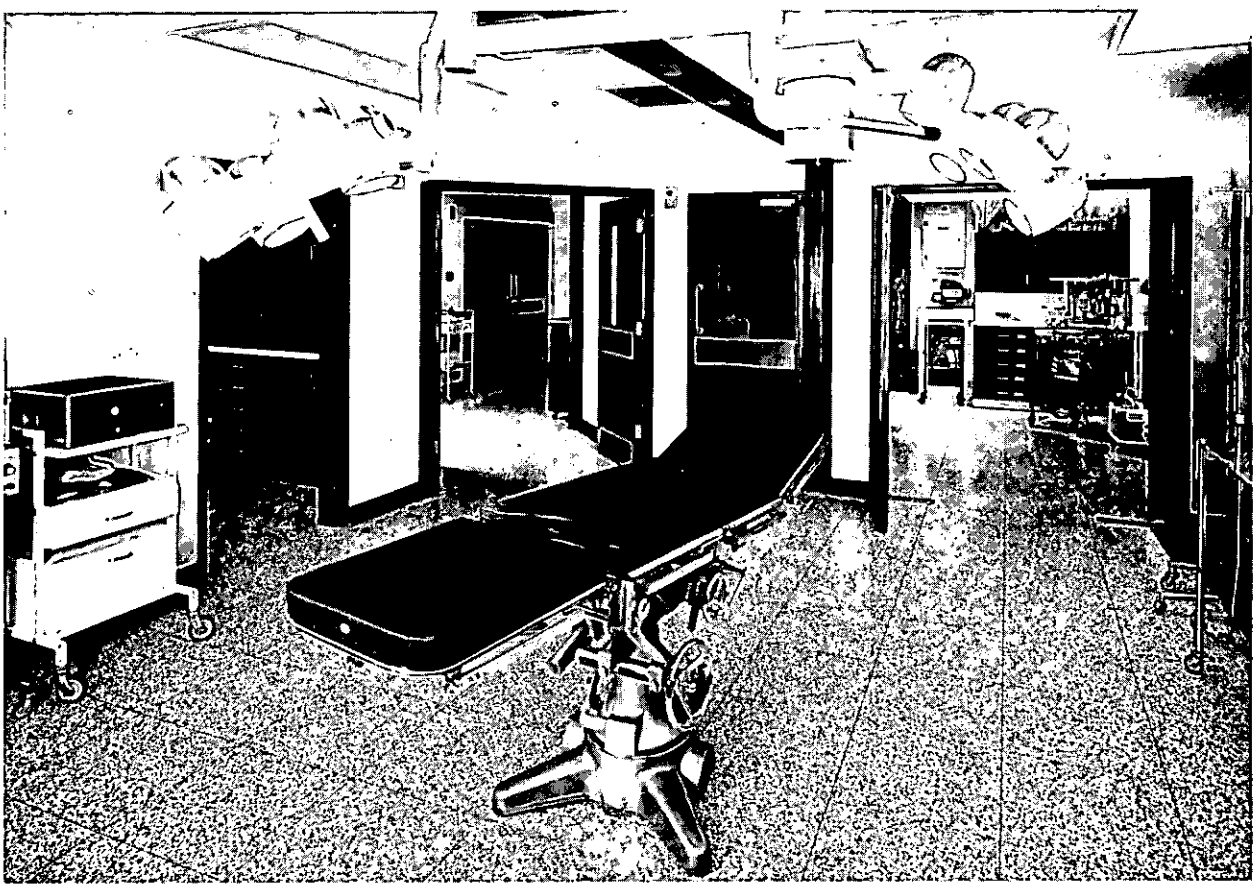
The Journal of The Institute of Hospital Engineering March 1985

HOSPITAL ENGINEERING

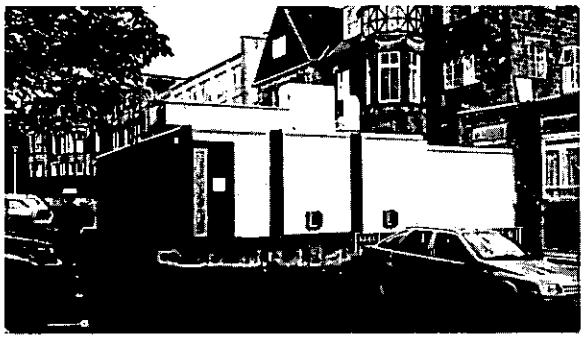
International Federation Issue

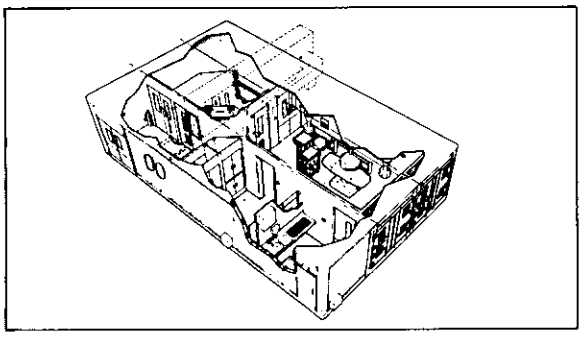
- The disposal of hospital waste
- Middle East construction — the management challenge
- Fluidized bed boiler

LESS ROOM FOR THE VOLVO



BUT FIRST CLASS SERVICE IS MAINTAINED





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HOSPITAL ENGINEERING

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I.F.H.E.

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Front cover picture: by courtesy of Middle East Construction

Institute News

The Engineering Council

ELECTIONS

Elections to The Engineering Council Assembly are taking place towards the end of March. Ballot forms will be sent direct to all Engineering Council registrants. As members will know, The Institute of Hospital Engineering is a member of Group 2 of the Engineering Council. It is therefore hoped that Group 2 will be well-represented at the Assembly.

NEW CHAIRMAN

Sir Francis Tombs, BSc, LLD, FEng, FIEE, FIMechE, Chairman of Turner & Newall plc, an engineering process company, is to be its Chairman from May 1, 1985, for a three-year period. Sir Francis succeeds Sir Kenneth Corfield, FEng, who became the first Chairman of The Engineering Council when it was set up three years ago.

The Watt Committee

The Watt Committee on Energy has made an agreement with the Manpower Services Commission by which the Watt Committee will provide advice and assistance to the MSC Open Tech Unit and to the energy projects of the Open Tech Programme. When the Manpower Services Commission in 1982 launched the Open Tech Programme for employers and individuals to have easier and more flexible access to technical education and training, with a focus on supervisory and technician levels of skill, making use of new technologies to remove the barriers to learning, the Watt Committee saw that in relation to Energy its own objects were complementary to those of the MSC. Discussions were initiated with the Director of the Open Tech Unit of the MSC to explore the contribution that the Watt Committee might make to the effective use of open and distance learning techniques for energy education as part of the Open Tech Programme.

Further details from: The Secretary, Watt Committee on Energy Ltd, 18 Adam Street, London WC2N 6AH. Tel: 01-930 7637.

Health & Safety Executive

NEW APPOINTMENT

Dr Archie Johnston, director of the Health and Safety Executive's Research and Laboratory Services Division, has been appointed to fill a place on the three-man Executive. Dr Johnston's appointment is for a period of three years and takes effect from 1 January 1985. He will serve the Executive in conjunction with his present post.

PROPOSALS ACCEPTED

The Health and Safety Commission's proposals to introduce a new and comprehensive system for the control of substances hazardous to health (COSHH) have already won a wide measure of acceptance from industry. Dr John Cullen, Chairman of the Commission reported 'There is now no serious questioning of the philosophy or the principles underlying the proposals and the measures are widely regarded as a significant advance in the protection of health at work.'

Further information from HSE Press Office: 01-262 3277 ext 256.

Technical conference

The Society of Hospital Linen Service and Laundry Managers are holding a Technical Conference on 16th-19th April at the Prince of Wales Hotel, Lord Street, Stockport.

Further details from: Conference Secretary, Mr J. Webb, Saxby, 20 Westminster Road, Ellesmere Park, Eccles, Lancs. 061-789 2180.

Forthcoming Branch Meetings

North East Branch: *Hon Sec: G. Baxter TN Darlington (0325) 460100. 25 Augusta Close, Darlington, Co Durham DL1 3HT*
March 12th Telecommunications Lecture, Hexham

East Anglian Branch: *Hon Sec: J. A. Parker TN Norwich (0603) 611 233. The Jays, The Street, Ashwellthorpe, Norwich, Norfolk NR16 1EZ*
March 9th Annual General Meeting, St. Andrews Hospital, Norwich

Southern Branch: *Hon Sec. R. P. Boyce TN Chichester (0243) 781 411. 24 The Avenue, Chichester, West Sussex*
March 9th Annual General Meeting preceded by 'World Energy Supplied and Alternative Sources' by Technical Representative of C.E.&B. St. Leonards Hospital, Nr Ringwood

North West Branch: *Hon Sec. E. A. Hateley TN Manchester (061) 236 9456 ext 266. 3 Sibson Court, Sibson Road, Chorlton, Manchester M21 1NH*
March 19th Annual General Meeting followed by talk on the NW Water Authority.
April 16th Visit to new laundry at Oldham District General Hospital

West of Scoland Branch: *Hon Sec. R. W. Gardner TN Glasgow (041) 204 2755 ext 2710. 21 Middlehouse Court, Carluke, Lanarkshire*
March 22nd Annual Dinner Dance
March 28th Annual General Meeting, Glasgow Royal Maternity Hospital

East Midlands Branch: *Hon Sec. E. A. Hall TN Nottingham (0602) 475783. Messrs. E. G. Phillips Son and Partners, 26 Annesley Grove, Nottingham NG1 4GW*
April 24th Visit to Watnall Weather Centre, Nottingham

London Branch: *Hon Sec: P. C. Vedast TN 01-807 7340. 59 Oakfield Gardens, Edmonton, London N18 1NY*
March 26th Annual General Meeting and Implementation of Griffiths by Mr B. J. Harrison, District General Manager, Islington Health Authority, National Hospital, Queen Square.

Welsh Branch: *Hon Sec: M. J. Back Cardiff (0222) 755 944 10 Nant-y-Felin, Efail Isay, Nr Pontypridd, Mid Glam DF38 1YY*
March 14th Boiler House Control and Water Treatment, presented jointly by Messrs Gestra and Houseman Burnham. Location as above.
April 24th AGM and social evening. 7pm, Red Lion Hotel, Pendoylen.

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

Oxford Spring Lectures

The Oxford Spring Lectures (6 Branch meeting) will be held on 5th June at John Radcliffe Hospital, Oxford. Tickets £3 each.

ATTENDANCE AT BRANCH MEETINGS

The 'Rolling Diary' of Branch Meetings which appears regularly in the Journal was introduced to enable considerable savings to be effected so that branches were not obliged to circularise members prior to each and every 'technical meeting'. (Total savings resulting can be to the order of £2,000 per annum).

As a refinement and added aid to Branches, in future, a 'return slip' will be printed at the foot of the page of the Journal on which the 'rolling diary' appears. Members who intend attending any particular branch meetings are urged to complete this return slip and send it in to the relevant Branch Honorary Secretary so that anticipated numbers for each meeting are known in advance.

To: The Hon. Secretary,_____Branch

I would like to attend the meeting on _____

Name: _____

Tel. No:_____

Recent BRE publication

IP 14/84 A new method for predicting energy saving from on/off photoelectric controls by P. J. Playfair. This paper describes a new method, based on recent daylight measurements at BRE to enable energy savings to be predicted more accurately.

Cross reference

CIBS
A report on a cross-industry brainstorming session, at which the future of the building services industry was the subject for analysis. January 1985, page 45.

Letter to the editor

ELECTRICAL SAFETY

I was very surprised, and concerned, that your magazine published the article "Electrical Safety in Operating Rooms — an Australian Approach" in September '84. The approach of equipotentially grounding (EPG) patient care areas is antiquated. EPG is not required in the United States, and is specifically discouraged because of the potential shock risk to patients and staff that it creates (NFPA 99, chapter 9, Electrical Safety in Patient Care Areas).

The article did accurately reflect the hypothesis concerning shock and EPG as they were postulated in the late 60s and incorporated into many American Standards. Since that time EPG has been disregarded, and taken out of the patient care environment primarily because a properly installed non-equipotential system is already 'equipotential'. Deliberately grounding surfaces that don't need to be grounded in the first place only increases the likelihood someone would get a more severe shock should they contact a live source. Equipotential grounding creates what we call the "bathtub effect".

The following scenario might help illustrate this concern:

- In an equipotential grounded environment everything in the patient's area is grounded, including door frames, window frames, shelfs and redundantly grounding equipment.
- Assume an equipment fault occurs, line to ground,
- Assume also that the ground on the equipment is broken (an unlikely occurence with all the testing hospitals do)

For a shock to occur, the current has to have a direct path to ground. In an EPG room, the patient/staff is effectively in a 'bath tub', because they are surrounded by grounded surfaces. If a fault does occur, the patient/staff is very likely to find a grounded surface and get a more intense shock than otherwise.

So, EPG not only serves no useful purpose from a safety standpoint but actually increases the severity of shock. Present requirements in the National Electrical Code and National Fire Protection Association (NFPA) 99, (Health Care Facilities) only require equipment and surfaces, that are likely to become energised, to be grounded. The requirements also specify that equipment, including the integrity of grounding, should be tested at least twice a year.

Mary Ann Kelly
Staff Specialist/Clinical Engineer
Office of Hospital Management Programs
American Hospital Association
Illinois

The author has been a Member of Council since '63, Chairman of Finance & General Purposes Committee since '73, Member of Education Committee '67-71, Chairman of Membership Committee '67, Chairman of Publications Committee '68-73, Member of International Affairs Committee '75-85, late Regional Engineer of South West Thames Regional Health Authority.

Talking Point

KEN EATWELL OBE CEng FIMechE FCIBS CIHospE

Since Tyler...

'Talking Point' — obviously an opportunity to say what is on one's mind, as distinct from enlarging on a given set subject. On this basis and being now 'retired', (also knowing that very shortly I would no longer be a member of council after a stint of over 20 years) I sat down quietly to let my thoughts wander, then centre themselves, so to speak, on the topic that occupied the predominant place. It was an unusual experience because I was now 'on the outside looking in', as distinct from the previous situation when I was on the 'inside looking out'.

My mind focussed on the events leading to the setting up of the 'Tyler Committee' in 1964, and the report which it prepared. At that time engineers and engineering had in the main very little influence in the 'Health Care Industry', but fortunately some of them realised that the matter needed investigation, assessment and observation. There were, however, oases where the engineer and his profession flourished. It was noticeable that in these places the engineers were people who had been able to establish their credibility on the basis of personality and management acumen. It was not surprising, therefore, that a 'thin red line' running through the 'Tyler Report' emphasised the need for engineers to be educated and trained for their profession with particular attention to the management skills.

The response of our Institute to Tyler was immediate and positive and resulted in the setting up of the 'Keele Courses' at Falfield. What a challenge, but what help we received from the Ministry and training officers of the regions — indeed, from all disciplines working in the health service. The co-operation was amazing. It was as though a catalyst had been discovered that broke down the thrombosis in the communication system.

The history of this management skills campaign is well known, but the effect of it on the engineer and engineering cannot be overestimated. And so over the years the status of the 'works organisation' (for now we realise the importance of total building co-operation) has risen. We still love to look at boiler houses but are aware that management of the total concept and system is our prime objective.

We have witnessed a massive investment of capital monies in new building and refurbishing of the old, together with a changing pattern of patient care and advancement in diagnostic and therauputic techniques. In all these fields of activity the engineer has been fully involved: prosthetics and medical engineering have meant a co-operation between the medical and engineering professions almost unthinkable a few decades ago.

Unfortunately the morale of works personnel and indeed others in the N.H.S. is at a low ebb, for reasons that are understandable. Few of us like change, especially if we feel our security is threatened; nevertheless, we must accept it and use it to the benefit of the profession and vocation in which we operate. However, experience indicates that health service engineers and engineering have increased in stature and importance in a most remarkable way since the setting up of the N.H.S. in 1948, because of an ability to accept new challenges and provide new solutions.

The future is bright because credibility is based on the trust which our colleagues and associates realise they can place in us.

IFHE News

Obituary

Delegates to the 8th Melbourne Congress, and all those who read reports of the Congress, are aware that the retiring President, Cor Sonius, was absent on account of his wife's illness. Sadly Mrs Tiny Sonius died some days later. She will be much missed, and every sympathy is extended to Mr Sonius.

Papers for Barcelona

The first announcement of the Barcelona Congress has now gone out giving details of the scientific programme, and making a call for papers. Anyone who has not got the leaflet and need further information should contact the Spanish organisers at Congress Secretariat, AEDIAH — Diagonal, 647-08028 Barcelona, Spain.

3rd Copenhagen Conference

The first announcement of the 3rd Copenhagen International Hospital Conference 16th-19th September 1985, has gone out. The theme will be 'Transitions in health care' concentrating on how health-care services can meet the many challenges of a rapidly changing society. For further information write to: Conference Secretariat, Copenhagen Congress Centre, Bella Centre A/s, Cenre Boulevard, DK-2300 Copenhagen S, Denmark.

Portuguese Association

1985 PROGRAMME

a) **22 March** — Visit to new Coimbra University Hospital, followed by debate (10.00 a.m.)

b) **4 June** — Workshop on "MAINTENANCE TRAINING FOR HOSPITAL ENGINEERS" (at 10.00 a.m., at INSA, in Lisbon)

c) **14 and 15 November** — 3rd Symposium on "Hospital Safety" at Hospital Magalhaes de Lemos, in Oporto (from 9.30 a.m. to 17.30 p.m.)

Entry is free for all members of Hospital Engineering Associations affiliated to I.F.H.E.

Spain

An intensive course, 'Energy saving in hospital installations', was held on 18th-20th December '84 in Barcelona. It was organised by AEDIAH — Catalonia, and patronised by the Government of Catalonia.

7th Annual meeting

The 6th Annual Meeting of AEDIAH will be held at Zarag0za on 9th-11th May '85. The theme is a double one — nurse unit care and hemodialisis units. Visits to several hospitals will take place on 11th May. The general lecture will be given by Prof. Eduardo Caetano. Ex-President of IFHE.

The author was prevented from presenting this paper at the 8th Congress of IFHE. It was originally given at The Institute's 39th Annual Conference in 1983. Mr Kensett is Chief Engineer for the Welsh Health Technical Services Organisation in Cardiff.

The disposal of hospital waste

R G KENSETT BA CEng MIMechE MCIBS MInstE MBIM FIHospE

For many years the disposal of hospital waste has been a neglected service. Where incinerators have been installed these have also been subject to limited maintenance with very little concern shown as to their performance. Again the disposal of waste was looked upon as an unpleasant and menial task which, in consequence, was left to either the newest or the dimmest of the hospital porters to complete. In many cases engineers did their best to make sure waste disposal was an administrative function in which they had the least possible involvement.

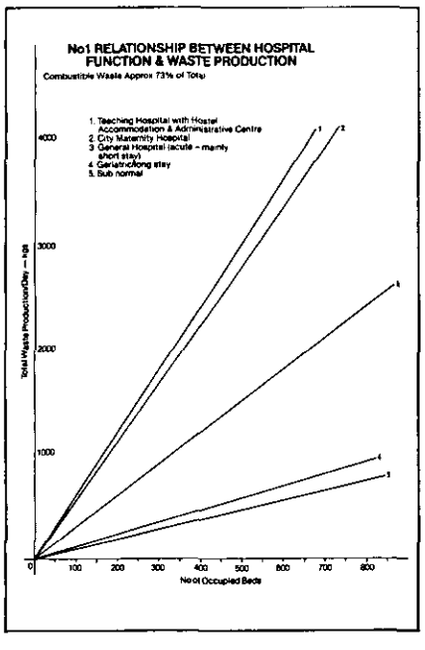
During recent years there have been changes of policy in this function, brought about by changes in the waste materials themselves, by diminishing availability of alternative means of disposal such as land fill sites, tips, etc. and most certainly in the UK, by the impact of legislation such as the Health & Safety At Work Act 1974. A further factor has been the increasing attention being given to our environment and insistence upon is protection.

In consequence, authorities look to the hospital engineering profession to ensure the function of waste disposal is completed as efficiently as possible.

Waste generated

If one is to dispose of the waste properly, the first thing must be to establish accurately both the quantity and the type of material to be handled.

Over the past 2-3 years I have made a detailed investigation of the subject and Fig.1 shows the weight of refuse produced per bed for various types of hospital. Fig.2 gives an analysis of the typical samples of hospital waste. This is an



No 2 Average constituents and calorific valves of hopital waste

Constituent	% Present	% Corrected for non combustibles	Established CV for Material Btu/lb		CV of const. present adjusted for weight present Btu/lb		CV equiv. Mj/Kg		Comments
			Median	High	Median	High	Mean	High	
Paper-clean	9.55	13.2	74.00	—	976	976	2.27	2.27	All paper assumed to have the same C.V.
Paper-dirty	6.51	9.0	74.00	—	668	668	1.55	1.55	
Kitchen waste incl. veg parings and plate scrapings	22.60	31.3	30.00	75.00	940	2350	2.19	5.47	Kitchen waste is variable dependant upon water quantity. Where large amounts of veg waste is present C.V. is low
Plastics incl. plasticised warapping and syringe bodies	14.62	20.4	85.00	11200	1740	2250	4.05	5.33	Data on plastics indicates a variation between 4500-11000 Btu/lb dependant upon type and manufacture
Ward and path waste includ. tissue	19.75	26.1	05.00	9450	1700	2200	3.85	5.12	Ward waste is again variable animal tissue is low but dressings cotton wool etc will increase totals considerably.
Non combustible waste-tins, glass etc	27.97	—	—	—					
Totals	100.00	100.00			6024 8484	Mean High	13.91 19.74	Mean High	

average analysis of all hospitals and it will be appreciated that the actual constituents will vary with the type of hospital. For example, it is unlikely that human tissue will be present in the waste from a long stay sub-normal hospital.

Because of the increasing legislation many UK hospitals now offer waste disposal facilities to Health Centres, Clinics, Doctors' Surgeries and Public Health Laboratories in their particular District. Thus, when assessing the quantity of waste it is necessary to be aware of such additions.

There are, of course, difficult wastes peculiar to the hospital services which must be considered. These are

1. Pathological waste in liquid and solid form
2. Contaminated waste from isolation wards
3. Human tissue
4. Animal carcases from research laboratories, possibly highly contaminated
5. Home and hospital renal dialysis waste
6. Radiological waste which may be in the form of contaminated dressings, injection pellets and isotopes.

Analysis of waste

Considering Fig.2, the typical analysis of hospital waste, possibly one of the items which draws attention is the comparatively high percentage of non combustibles — some 27%.

When the initial analysis was completed this was one item to be questioned and it did in fact lead to two further checks which confirmed the findings.

Much of the material was found to be tins of various types but principally from the kitchens. There was quite a high proportion of other metals present and of course these days, there is a tendency to discard and replace rather than repair many items.

The paper has been segregated into clean and dirty and the percentage quoted includes paper based products. The paper classified as dirty includes wipes, disposable towels, etc. from wards, all of which may be contaminated and drug wrappings have been included as comprising dirty paper in the widest sense.

Kitchen waste is something with which we are all familiar but the point to be emphasised is its very high moisture content.

Clinical waste includes the waste from wards, theatres and laboratories and as a general policy it is recommended that such waste should be considered as polluted and potentially dangerous.

The special wastes which can be difficult to dispose of and which are hazardous to personnel should be considered separately and methods of handling and disposal are considered further in this paper.

Methods of disposal

Local Authorities in the UK are naturally reluctant to accept hospital refuse. It is considered as potentially dangerous and and since the introduction of Health & Safety At Work legislation, there is positive concern regarding hazards to staff.

The staff themselves are also reluctant to handle hospital waste because of the offensive nature of much of the clinical waste. Many Authorities are also worried over adequate controls being enforced during the transport of wastes. Some Authorities will, we have found, accept general waste in an emergency but never clinical waste. In such situations they insist on dedicated containers for the hospital waste and require to be advised of any proposals to transport hospital waste using the public highway.

Tipping is a method which can be used in some cases. It is essential that the waste be segregated and only non clinical waste be tipped. In the UK some tips are designated as authorised sites and waste should only be disposed of in such locations. These tips are controlled and a proper policy for covering waste is in being. There is a danger, unless segregation can be guaranteed, of children playing on the tip and uncovering such items as syringes, needles, disposable instruments, etc. and the high risk of injury from such material will be understood. We are only all too familiar with the public outcry that results from accidental tipping of human limbs and tissue which was not segregated. One could question whether or not disused mine shafts could be considered for tipping of some wastes.

Maceration and discharge into the sea or a tidal river has been considered and was in fact tried in the Mersey area of the UK. It does give rise to a major pollution and environmental problem. One Public Health Officer was insistent that the rodent population multiplied at a rate equivalent to the square of the nutritional value of the effluent but it is suggested this must be open to question.

There are specialised collection firms who are authorised to handle all categories of waste. Experience indicates that the majority of these use registered tipping sites and none have as yet access to private incineration facilities. None the less such firms may be a useful adjunct in an emergency, but it is suggested that careful segregation is essential. One such firm when interviewed, stated that they would require indemnity against a failure by the Health Authority to have enforced a segregation policy.

Compacting has been considered as a possible means of disposal using the blocks of refuse as landfill. Again this is a method which legislation would render unsuitable for clinical waste. Costs are also high. The current UK price of a machine to reduce the bulk to 1/15th in size and to handle 250Kg of waste per hour, would cost approximately £22,000. Machine power is also high being, for the machine quoted, 20 H.P. with an electrical load of 22-25 Kw in total.

Pulverisation has also been investigated and costs and power are comparable with compacting and of course, there is always the problem of final disposal. Thus one realises that the only really acceptable method and the most economic must be incineration.

A recent report commissioned by the Greater London Council 'Working Party on the Disposal of Clinical Waste in th London Area', came out very strongly in favour of incineration at hospital level. If found that without question this method was the most efficient, safest, easiest and most environmentally acceptable. It also found that in the majority of cases it of-

SOMMAIRE FRANCAIS

Evacuation des déchets provenant de hôpitaux

Cette étude a pour objet les problèmes posés par la production de déchets par l'ensemble des locaux du Ministère de la Santé Publique, les divers types de déchets produits et leur analyse. A partir de ces données, elle engage la discussion sur les déchets les plus délicats à traiter et plus particulièrement afférents aux services de Santé Publique, tels que les déchets pathologues, liquides et solides, les contaminats provenant des services des contagieux, les tissus animaux et humains, les dèchets de dialyses rénales pratiquées dans les locaux mêmes ou au domicile du patient ou encore les déchets radiologiques. Elle examine les différentes méthodes d'évacuation de ces déchets de même que les précautions qu'il est indispensable de prendre pour leur manutention en toute sécuirité par le personnel hospitalier.

Ensuite, ce rapport étudie les différents systmes généraux d'évacuation qui peuvent être adoptés, parmi lesquels:

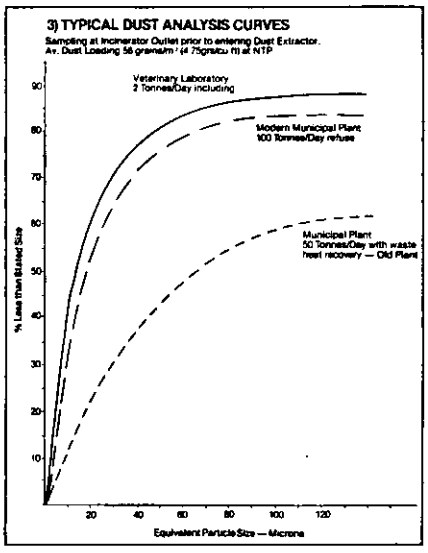
— L'évacuation prise en charge par les autorités locales, avec commentaires portant sur l'aspect légal,
— Le recours aux services d'experts oui de sociétés spécialisées dans l'élimination de déchets,
— La compression,
— La pulvérisation et la macération,
— L'incinération.

Il y est particulièrement question de la mise en oeuvre d'une politique clairement définie en matière d'élimination de déchets, y compris en ce qui concerne le traitment des déchets délicats ou spécifiques. Une ligne de conduite envisageable mise au point part l'auteur est ensuite examinée et discutée. Des diagrammes et des relevés préparés pour permettre aux hôpitaux d'adopter cette politique figurent également dans ce rapport.

L'auteur conclut son étude en présentant l'incinération comme la meilleure méthode d'élimination de déchets. Il analyse les données sur l'incinération telle qu'elle est pratiquée actuellement, ce qui l'amène á comparer les dépenses qu'elle entraîne par rapport à d'autres méthodes d'évacuation et à discuter de projets éventuels d'installations destinées à l'incinération ainsi que des structurations possibles qui leur seraient le mieux adaptées.

fered the cheapest solution.

Incineration does of course require to comply with increasing legislation covering health and safety, control of pollution, Clean Air Acts, etc. and as the result of such legislation the type and quantity of emission must be considered. Fig.3 shows an analysis of emission rates from various types of incinerators operating in the UK. Unfortunately there has been no opportunity to carry out similar tests on hospital installations, but it is considered that these should approximate to the emission rates shown for a large veterinary laboratory.



Waste disposal policy

It is suggested that to ensure efficient and effective waste disposal it is essential to institute and to maintain a policy for waste collection and disposal.

The policy I have instituted within my Region is given on the attached Appendix No.1. Attached is a suggested form of waste disposal survey which is applied when arrangements are reviewed and incineration replacement or upgrading is under consideration. The figures quoted to establish the calorific value of the waste (a necessary procedure if a properly designed and proven heat recovery system is to be included) result from a series of surveys and chemical analysis of the material.

The main item to ensure a satisfactory performance must always start with an enforced segregation policy. This may well give rise to complaints from medical and nursing staff but it soon becomes accepted practice and has been shown to be well worthwhile.

Depending on the size and type of hospital you are considering, it may be necessary to carry out twice daily collections. Where there are heavy operating lists or extensive laboratories on the site (such as the Public Health Laboratory) then a twice daily collection from these areas is essential.

Something which is often overlooked when planning disposal facilities in the provision of adequate storage facilities for waste awaiting final disposal. The average bag of refuse which will contain in the order of 12-15Kgs., depending on contents of course, will be sized approximately 500mm diameter x 750mm long with a density of about 65Kg/m^3. Another point is to encourage staff not to over fill these bags. There is always the danger of bags splitting and the question of some forms of clinical waste being spilt into public routes is of course unacceptable. If it occurs outside there is always the additional problem of pollution from waste blowing about the site.

It is suggested that the Key Elements of a waste segregation policy are:-

1. A minimum number of decision points, i.e. occasions where staff (generally nursing staff) have to select a disposal route.
2. An easily understood and properly instituted segregation code.
3. Readily visible, clear and concise instructions to act as reminders to staff, which should be displayed at collection points.
4. Adequate staff training (it is recommended that this be included in the curriculum of Nurse Training Schools and Induction Courses).
5. A system of regular monitoring to ensure the policy is effective in practice.

Storage of waste awaiting disposal

Whatever policy of final disposal is agreed it is essential to provide adequate covered storage for the collected waste. It is a too familiar sight to see torn open bags with the contents blowing about, particularly waste paper. There is a little point in enforcing a segregation policy if this is the end result. A discrete area away from the public access should be selected and waste must be stored under cover. The required area is discussed further in regard to incinerator houses.

Policies for difficult wastes

It is essential to ensure staff protection by instituting a policy for the disposal of difficult wastes peculiar to hospitals. If there is not a policy the Health Authority is liable under Health & Safety legislation. Provided you can show that there is in being a properly instituted policy which has been drawn to the attention of staff, then the responsibility will rest with the individual.

Renal Dialysis

Possibly one of the highest risk areas is in the disposal of waste products and used equipment from renal dialysis, whether from the hospital itself or collected from home users. The first point is that as soon as the equipment is ready for disposal, it should be placed in a distinctively coloured bag (yellow is satisfactory) and sealed at its point of use, a heat sealing tong is recommended. The type of equipment to be disposed of can include plastic blood lines, membranes and coil dialysers complete with attachments.

Where collection is to be made from a patient's home, then the sealing should be carried out in the home and before collection. The sealing must be carried out in such a manner that accidental spillage or tampering cannot occur. A double fold with separate heat sealing of each fold is recommended.

Staff handling the waste or responsible for its transport must be made aware of the dangers and the necessary precautions. The only satisfactory method of disposal is incineration and the plant operator should be instructed to dispose of the bags as soon as these are received.

Disposable gloves must be worn by any staff handling the waste.

Radio Active Substances

Sealed sources are easily contained. The safest policy is to clearly label these and store them in a safe place until decay has reduced the activity level such that the material can be disposed of with normal waste. The important point is to make a decision that the item is a potential hazard and take precautions accordingly.

Radio active excretia from patients treated with radionuclides can be a problem. The waste should not be stored because of the potential hazard. Unless there are particular problems, disposal to the sewerage system is generally acceptable. This offers sufficient dilution to be acceptable. Most cities discharge into the sea or a river not used to supply drinking water. It is recommended that certain WCs should be reserved for such patients and the level of radiation monitored regularly. Such drains should be regarded the same as drains from Radiological Laboratories and work on them should only be carried out under the direction of the Radiological Safety Officer. It is of course essential to measure radiation levels when these drains are opened for inspection.

Liquid waste from solutions is normally of sufficiently low level to be disposed of via the sewers using plenty of water to ensure dilution.

Solid waste such as paper tissues, glassware, etc. is normally of a low level of activity but it is advisable to check this. Provided the level is below the permitted level, such waste may be disposed of in the normal manner. Occasionally more active waste arises such as bed linen from incontinent patients, broken applicators, etc. This should be stored, if possible, until the decay reduces the level of activity or disposed of via special disposal services. The Government Research Establishments, well experienced in handling atomic waste, are usually very helpful. Care must be taken if you are considering incineration because the process concentrates the radio activity into the ash and high activity ash in an uncontrollable state may be the result. Again, advice should be sought from the specialist establishments. The final advice must always be never take risks, make enquiries from the specialists.

Plastics

As we all know the plastic content of waste is increasing and there are special items to be disposed of such as petri dishes from laboratories. These incidentally, should always be sterilized before being sent for disposal.

Some manufacturers claim to be able to incinerate virtually 100% loads of plastic — a claim which is unlikely to be met in practice. As part of the waste disposal policy this material must always be mixed with standard waste in the recommended proportion of 25% plastic to 75% standard waste. Incinerators seem to cope adequately with this proportion and there are no problems of excessive black smoke.

Incineration

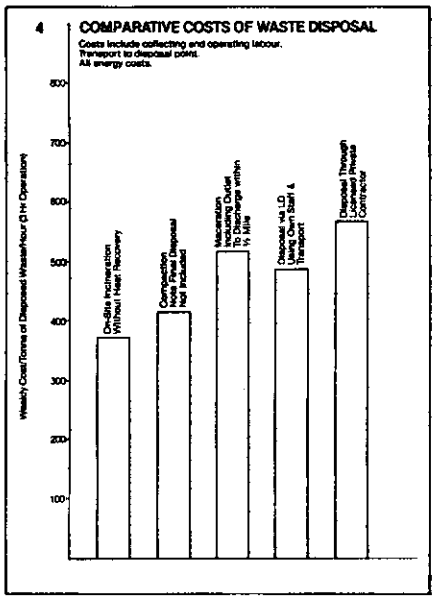
The preferred method of disposal must always be incineration. Fig.4 shows the costs of operating a typical hospital incinerator (based on UK costings) and Fig.5 shows the comparison costs of the methods outlined. It will be seen that overall on site incineration is the most economic as well as the most satisfactory. The costs of incineration are based on operating the plant for a maximum of 30hrs per week. This is essential to allow adequate time for de-ashing, cleaning, etc.

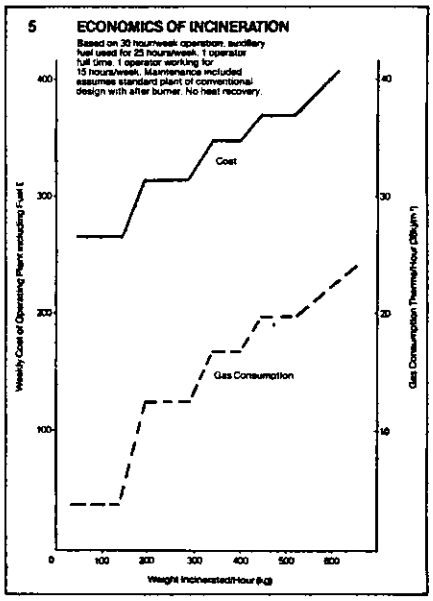
The need for properly designed and correctly specified incinerator plant is now universally recognised and the British Standards Institution has recently revised BS3316 "Large Hospital Incinerators".

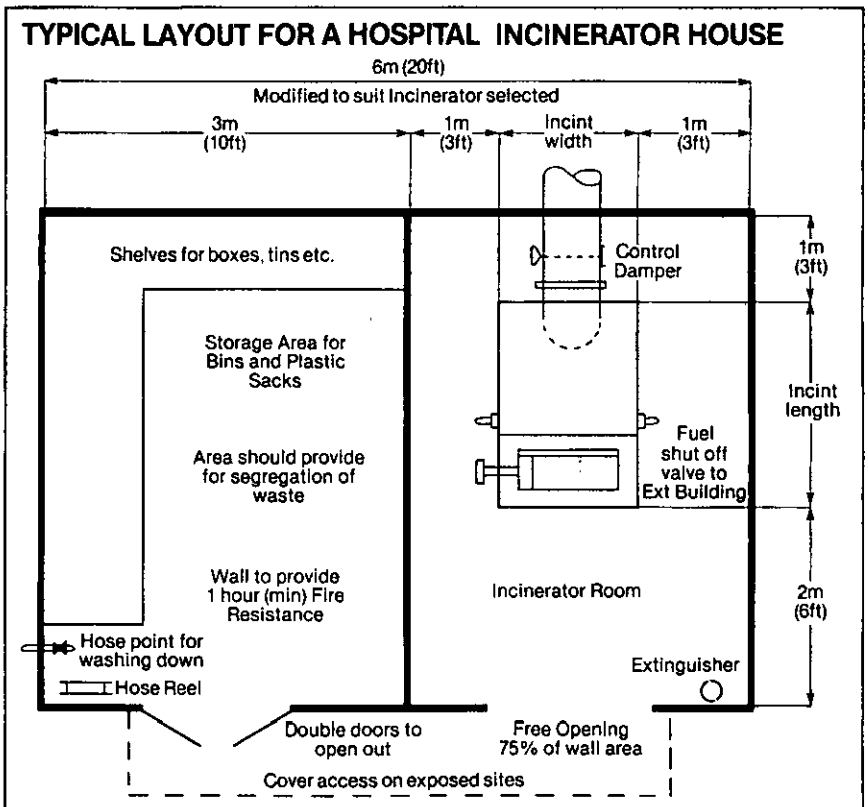
There is a definite need for greater consideration to be given to the design of incinerator houses. These must provide adequate space to enable the operator to de-ash the plant and to safely load the waste. The house should provide adequate covered space to store at least 2 days average collected waste under cover and under safe conditions. With increasing attention being given to staff health and safety, the house should include adequate toilet and washing facilities with showers included on the larger plants. Changing space for the staff and some messroom/rest room facilities are recommended.

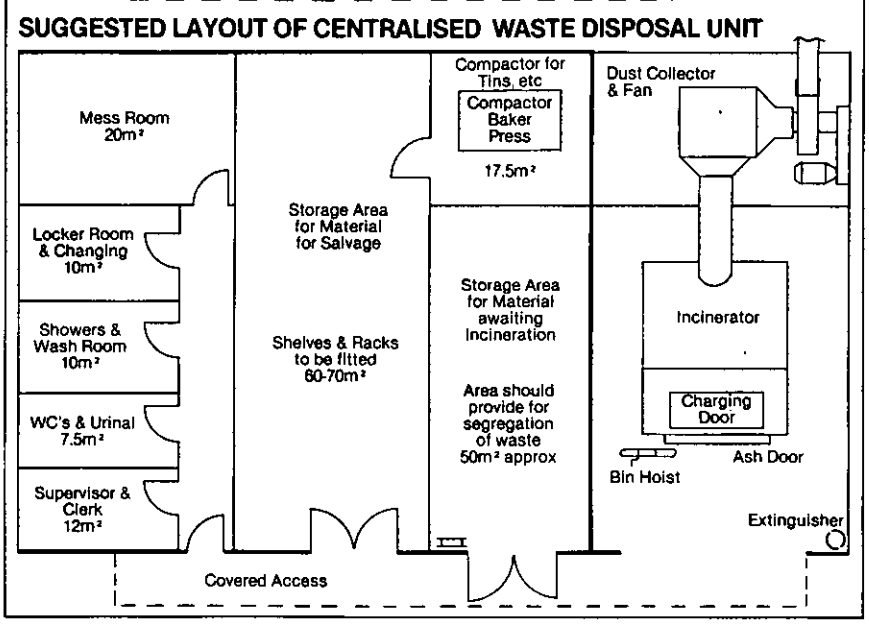
Whilst consideration is often given to these points, particularly on modern plants, there are few installations where adequate attention has been given to ash removal. Ash is usually some 7-10% of the charge by weight, so for an average hospital it is likely you will need to dispose of some 300Kg of ash per day at a bulk density of around 300Kg/m³. The problem occurs in transferring the material from the plant to the bin or container for its removal and it is generally this task that is responsible for the dirty state of many incinerator houses. The removal by vacuum transfer is rarely successful. There is no simple answer since any equipment purchased is only used for a short period each day and in consequence is uneconomic. The best contribution must come from the design layout and from providing a workable means of transferring the ash into a closed bin or road vehicle container.

To summarise, the first requirement, whatever disposal method is selected, must be to establish the quantity and type of waste to be handled and for this the method of conducting a survey, Appendix 1, is recommended. It is suggested that the subject is now of such importance within the hospital service that it warrants the appointment of a specialist officer to control









the process and to be available to advise staff as required. It should not be left to spare porters, it warrants the attention of the engineer.

As hospital engineers, establish your procedures, delineate your policy and ensure it is followed. This service which it is appreciated, is not one of the most glamorous activities, must be understood and given the backing it deserves to ensure it is completed effectively and efficiently. It is part of the service provided and there is a responsibility to staff and patients to perform it satisfactorily.

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Appendix

WASTE DISPOSAL POLICY

Where it is intended to review incineration requirements, it is essential that, as a first step, full details of quantities, categories and, if possible, calorific values of the material for disposal, be obtained.

This information can be found by completing a waste survey and to establish accurate figures it is recommended that the survey be carried out over a minimum period of 7 days which *must* include a weekend.

The following procedure should be used and is recommended as a future policy to ensure proper waste segregation.

(1) Each Ward or Department should have its accumulated waste cleared prior to the survey which should commence at 0900 hours on preferably a Monday morning.

(2) A fresh batch of distinctively coloured plastic bags should, at the same time, be issued to each Ward or Department. The following categories of bag are suggested:-

— Single layer black bag for generation waste — No.1 (Clean and dirty paper, wrapping paper and paper bags, floor sweepings and dead flowers.)
— Double layer red bag for pathological waste — No.2 (Used dressings, anatomical waste, any animal carcases from laboratories and human tissue.)
— Double layer blue bag for wet waste — No.3 (Disposable bed pans, incontinence pads, wet wipes, disposable towels, etc.)
— Lined paper bags (generally fawn/brown) — No.4 (All kitchen waste except for clean wrapping paper, cardboard boxes, straw, etc. which should be bagged separately.)
— In the case of the operating suite, a list should be maintained of the amount and type of human tissue disposed of — this should not be a problem as it is usual practice to weigh human organs removed during surgery.

(3) Collections should be made daily (say 1600 hours) from each Department. The collections should be made separately if it is not intended to weigh on collection, which is recommended. If bags are weighed and logged, a general collection is satisfactory.

(4) Each Department, other than the Theatre Suite, should be asked to place a random sample in a separate bag which will be used for analysis.

(5) After weighing and checking, the waste may be disposed of in the normal manner.

NOTE: Non-burnable waste, i.e. tins, bottles, etc., should be placed in a separate bag in each Department.

The author is a director of Haden International Ltd. This paper was first given at the 40th Annual Conference at Bristol last May and was presented jointly with a paper by J. Dalziel, which will be published in the June International issue.

Middle East construction — the management challenge

F H BAILEY FCIBS MBIM

The title of my paper of course is the management challenge of work in the Middle East. Since this carries the implication that life is usually difficult for me I have no alternative but to face up to the circumstances and press on with it. I hope to give a balanced view of the difficulties that exist behind the apparant glamour of construction work in the Middle East, and to attempt to explain why we so masochistically persevere with it.

A fair starting point would seem to be to define what we mean by the Middle East and to identify the main features that make it so unique, and such a challenging construction market-place compared to other established overseas territories or the United Kingdom.

In geographical terms, the expression — Middle East — is generic and somewhat ambiguously cuts across continental, political, and ethnic boundaries to loosely define the block of land contained between Europe and the Soviets to the North, and Asia and Central Africa to the South and East. It would be pointless to name the countries — I am sure you are familiar with most of them anyway.

So much for basic geography. What other features then cause us in the construction industry to isolate the Middle East from the rest of the world?

The most obvious one that springs to mind immediately is that it is the home of the Arab and hence the Islamic religion. In ethnic terms therefore it is essentially one enormous area of common language and religion-based culture. Local variations occur of course and are obvious to the seasoned traveller. But essentially, this single common factor is the dominating feature. Experts in the audience will be quick to point out that Iranians are not Arabs and that Israel exists but I shall exercise my right to a degree of poetic licence and ignore them for the purposes of this address.

Equally easy to identify is the commonality of climate, the area being one of the harshest, most barren territories in the world outside the polar regions. In a word — raw desert, bringing with it the ultimate in solar exposure and extremes of temperature not to mention the virtual absence of fresh water.

For thousands of years, the inhabitants of this barren desert region have either huddled together along the banks of the few rivers or oasis green spots, or have roamed as Bedouin, never able to expand, and almost devoid of any natural resource to put to any use beyond their own consumption.

Suddenly — there was oil. Millions, then billions, then tens of billions of pounds worth of it! Not evenly shared between the various countries of course but nevertheless creating a dramatic impact in everyone living within the Arabian Middle East. A construction industry sprung up virtually overnight. First came the oil fields themselves followed rapidly by plan after plan to spend the new found wealth on transforming the deserts and creating a totally integrated infrastructure on a scale never before witness in the history of the world.

The construction achievements of the ancient Egyptian Dynasties, fantastic as they were, pale into insignificance against many modern day building projects which have mobilised literally millions of workers, and have been constructed at record speeds.

Like bees to the honey pot, the so called developed nations of the world descended on the Middle East, Saudi and the Gulf States in particular. Like a modern day Klondike, the pickings were rich for the first on the scene, and also for some of the survivors, but many have found to their cost that they were in fact quite unprepared and ill equipped to cope with the challenge that the Middle East actually provides.

The somewhat naive, but certainly not unintelligent Arab, soon learned his way around and his natural trading instincts soon enabled him to detect and reject the rip-off when he saw one. By a process of rapid self-motivated education he has brought himself to the point where he can now very rigorously administer the most complext of projects, forcing the performers to give ultimate value for money at every step. White elephants are frequently built of course, but what quality!

The UK construction industry is tough and complex. It frequently places the task of project management almost beyond human comprehension. Can it really be worse in the Middle East? Surviving consultants and contractors unanimously say — YES. Non-survivors don't say a word because they don't know what hit them!

In addition therefore, to all the traditional problems of construction management, the overseas manager is faced with a whole spectrum of NEW hazards, each one seemingly destined to destroy the project before his very eyes. In case you are expecting a set of neat, tidy solutions, then you will be disappointed. All I can do is to identify some of the more onerous hazards that the overseas operator has to be aware of and to try to suggest why we bother at all.

There aren't really any magic secrets: George Bernard Shaw was once asked if he had any 'golden rules'. He replied — 'Yes, just one — The single Golden rule is never ever to have any golden rules!'

Design

In order to identify some of the day to day problems that confront us I think it appropriate to start with Design. On the technical front there are of course no "International standards" as such and the engineer has to learn to work to many national standards and codes of practice, British, American, German, and French are some of the more common ones. These are often adulterated by brand new attempts at local regulations, and I have seen specifications where all known standards have been called for simultaneously! A good formula for confusion to say the least!

On a single job each discipline could well be to a different National standard. British based mechanical services may well have to be suited to being run off American power supplies for example, or the reverse may be the case. In any event the wise contracts engineer will always study the disciplinary interface carefully.

In general, I think I could remain unchallenged to declare that the Middle East, always with some exceptions of course, isd not a design and build market. Consulting engineers are therefore prevalent, ranging from the mighty Bechtels and Ralph M Parsons empires through most of our well known major British practices to one man band cowboys from every corner of the globe. Quality of design therefore varies enormously.

Designers are not without their problems and the Chartered Institution of Building Services recently held its own conference dedicated to considering the problems of designing for the developing world with heavy emphasis on the Middle East.

I quote a few of the more profound findings of that conference: a biased engineers viewpoint, naturally!

- The Quantity Surveyor holds a greater whip-hand than on UK Projects.
- The design team offers constructive advice while the QS can only offer cheaper solutions.
- The Middle East malaise is the lack of designer job satisfaction.
- The architect often has to insist on lower standards of design than one would like to see.
- Co-ordination is invariably left to the main contractor.
- Most projects are run to very short programmes and design changes do not vary the original key dates. (and *that's* a consultant complaining!)
- Lack of site information *initially,* often produces early design based *entirely* on assumptions.
- Construction regulations are frequently ambiguously interpreted or watered down, to suit the influence of the customer.
- Terminology is frequently confusing.
- Design prepared offshore to the territory is rarely satisfactory, in that inappropriate solutions will be designed-in.

The Consultants' lot is not a happy one is it? What about the poor old Contractor then?

Buildability

What a wonderful new buzz word that is, now almost in constant use. The inexperienced designer, the unchecked drawing, the supplier who only makes it *his* way, the mismatch of American to British threads and power supplies etc etc of such tings is non-buildability made of. The Middle East is the biggest error magnifying glass there is.

With tight time schedules, long communication chains, and exhorbitant running costs the job simply *has* to be buildable from the onset if it is to stand a chance of being completed to the satisfaction of all the involved parties.

All too often the project will be the impossible dream of the client who frequently believes that *any* problem can be resolved by the issue of another cheque. (or at leat the promise of one!

Architectural competitions seem to give some architects an opportunity to create their own lifelong ambition, sometimes with the result that the very uniqueness of the structure makes it virtually impossible to build. The resultant lump sum fixed price contract, with performance bonds and penalties, can rapidly become a farce from the very beginning.

The developing world has an uncanny weakness for the very latest, very best that can be bought. This sometimes childlike obsession for the 'frontiers of sicence' type systems or procedures, all too often adds quite unnecessary and inappropriate complexity to both the structure and the engineering services.

An oversell by Western Salesmen? Maybe. Certainly slightly *irresponsible* selling, in my book.

- Consider the sophisticated fire detection system that operates wonderfully in New York and reads well in the brochure, but simply hates sand or sun.
- What of the very latest in plastic piping technology applied to perfection in Holland but which collapses in the heat even before installation.
- or the most dramatic luminaire used in the very latest London Office block which turns to rust in one week in Abu Dhabi.
- The fully automated, all singing all dancing, control system that requires an army of the manufacturer's engineers to supervise commissioning and maintenance, even if the Contractor can understand it enough to install it in the first place!
- and so on, and so on.

Consider Metrication — that can be quite fun too. The comprehension of the term 'metric' as perceived by an Italian, an American and a British Team working together can be quite an education. Acres of modular ceilings designed around a metric precision grid can hardly be the best place to mount a battery of American light fixtures and diffusers, built to unchangeable *imperial* dimensions.

Parts that have never seen each other before. The British motor to drive an American machine. The British gland plate that won't take American cable. The hydrant that won't hook up to the local Fire appliance — all buildability problems.

I cannot let buildability pass without a quick word about the intransigence of many manufacturers. Echoing the words of Henry Ford, they all seem to offer a complete range of features and total flexibility — until you place the order. Then

SOMMAIRE FRANCAIS

Construction au Moyen-Orient — problèmes de gestion

A partir de sa propre expèrience, l'auteur parle de facon génOerale 6et avec humour) des difficultés opérationnelles et des problèmes de gestion qui existen dans le secteur du bâtiment des pays du Moyen-Orient, difficultés qui son liées au climat, aux différences de culture et à la présence d'une main-d'oeuvre multinationale.

it's a case of have the type we make or forget it. Americans are bad but unfortuantely British manufacturers have a lot to learn about customer needs, particularly for export. The Japanese? Well that's another story.

Designers must forever be alert to the practical achievability of their design which may have to be built by a contractor from *any* nation.

Climate

Having produced a functional, buildable design we can then turn to some of the more local problems of which climate will feature immediately.

Desert climates really do have to be experienced to be believed. Day temperatures can exceed 50°C, that is over 120° Farenheit. Inland it can drop to freezing or even below. Not once or twice, but day after day after cloudless day. Humidity can be 100% in coastal areas, and down to minimal, highly dangerous levels elsewhere.

Sand storms can spring up without warning and may last for days in very severe cases. They often produce zero visibility and stop all outside work and movement. Unlike fog they are accompanied by strong winds which play havoc with unsecured equipment and they certainly leave their mark, since the sand will infiltrate everywhere. Low level gritty sand can compete with the best of wire brushes, and the airbourne sand, sometimes rising thousands of feet into the air, has the consistency of talcum powder.

In coastal regions the high humidity turns the deposited aftermath of a sand storm into a highly corrosive mud pack coating everything in sight. Ferrous materials really love it!

A study of meteorological data for any of the desert regions will indicate very low rainfall figures, just as one would expect. What it doesn't tell you is that the odd few inches per annum frequently falls all at once, within an hour or two!

Believe it or not, Jeddah in Saudi is regularly subjected to a meter of floodwater from flash storms. (Only once a year of course!). A sodden desert instantly turns quite beautiful but what a mess the building site becomes.

Climate actually impacts in three ways — On people, on design, and on materials. European concepts of endurance and performance are no longer valid for expatriates exposed to cloudless days for months at a time in such high temperatures and relative humidities. We often use Pakistani labour and belying their colour, many of them live in the snows of the Hindu Kush and experience the same climate shock and productivity problems as Europeans.

Design of environmental services to suit climate is not a problem in terms of equipment duty for the ambient conditions, given the correct design data. But suitability of materials is often overlooked at this stage. They have to cope with the transportation hazards, the phenominal corrosiveness of coastal regions, the temperature ranges particularely of exposed surfaces, the violent sand storms and vermin such as the Jerbil which will eat virtually anything.

If the designer hasn't got it right, the Contractor is invariably expected to, all within the limited amount of time remaining. (Frequently referred to as the construction period!)

The installed equipment is naturally required to be as-new when it is fixed and it is the Contractors job to defeat all that nature can throw at him to achieve it. (All within his lump sum fixed price of course).

Communication

Communication is an art from which is frequently ignored, and at best totally abused.

Drawings must be almost childish to be effective in the hands of third world operatives. Well intentioned use of trunking instead of conduit, or fittings instead of pulled bends by the operatives when the opposite was the engineers intention can destroy the best material control system overnight, and result in profits for the airfreight carriers.

Graphic emphasis is to be preferred to excessive notes. Specifications too must be definitive and totally unambiguous if the designer, procurement engineer, and the operative are to be of one accord and get it right first time, and on time.

Correspondence is almost invariably over long distance and involves telex just as much as memo and letter writing. What a story I could tell here but I leave the details to your own imaginations.

Used as we are to our own ease of communication in the UK imagine the task on a remote site, tens or even hundreds of kilometers from the nearest telephone or telex. Even the post office box will be that distant too. Those of us involved don't have to imagine it!

Everyone these days seems to believe that management is purely the exercise of demanding a detailed report on everything.

— *Now* when it is going to be finished?

— Show me where all your materials intransit are?

— *Why* is the American supplier on strike?

— What is your Labour plan?

All good relevant stuff you might say, but how does one maintain an adequate information base 3,000 miles from home with at least a week to turn paper round?

All too often well intentioned support turns into conflict. The man on the spot runs out of critical material. He telexes home base for an immediate airfreight despatch. The ever helpful but ever diligent and responsible Engineer in London decides that he has *already* sent twice the amount of that material the job needs. What does he do? — he sends a memo in the next courier pack instead of the material on the next plane. With a copy to everyone else as well of course!

To cope with this sort of problem a very rigid authority code must be impressed on everyone involved in communicating. If Joe says do this nobody moves but if Fred says it then action must be instant.

What I've just said is about the in-house problems of communication. Externally, the difficulty of traditional contractual relationships is frequently enchanced by a mixture of nationalities all trying to function in English. We Brits don't help of course and we flog on with our elegant Contractual pose to the fury of the German or Korean consultant or contractor.

An additional communication problem between the Middle East and other, Western Countries is not just the time zone shift — (Saudi is 3 hours ahead of us and ahead of New York by 8 hours), but the working week. The Islamic rest day is Friday with many activities ceasing midday Thursday. Sites are therefore incommunicado with the UK from early Thursday morning round to Monday leaving only 3 full days of communication. A working week of over 50 hours compared to 35 or so in the UK makes it even worse.

Logistics

This is a military term which has come to have a relevant place in construction vocabulary.

The marshalling of men, materials, accommodation, tools and sometimes food for even the smallest job can only be effective if it is infact planned in a pseudo military fashion.

The eternal triangle formed by the three points of a remote desert location, a head office in the UK, and the Supplier, perhaps so far away as the West Coast of America or Hong Kong has beaten many a masive computer based company system set up to handle it.

Nearly two hundred years ago Napoleon learned to shorten his command lines yet we've all done it again and most contractors are only just learning to place their logistics control where the action is; on site.

Have you ever wondered why the Middle East routes are so lucrative for the airlines? It's not the passenger traffic — it's the airfreight of all the right things to replace all the wrong things sent by sea plus the things that couldn't wait to go by sea plus the thousands of courier packs full of memos!

Labour

With very few exceptions, such as Egypt or Iran, the local population is inadequate as a labour source. European or American expatriates are too expensive to employ as operatives and are almost exclusively restricted to supervisory tasks. Operative labour has to be imported from third world countries such as Pakistan, India, Thailand, or the Philippines.

Recruitment, transportation, housing and welfare, ethnic considerations, skill and aptitude all take their toll on the organising manager.

Retraining is often required. For example Pakistanis are taught British M & E skills. Bring them to Saudi for an American electrical system and you have to establish a school to retrain them.

Expatriates must learn snippets of the

work force language, Urdu in the case of Pakistanis. They must convey all instructions in simple comprehensible form using plain English interlaced with command words in the workers' language. The most peculiar case I can recall was a particular gang of Pakistani electricians who developed a strong Glaswegian account from their Supervisor and couldn't be understood by anyone else!

Semantics

An added burden for the hard pressed British Manager trying had to understand the contract procedures or a set of tender documents is semantics, particularly when Americans or American trained Arabs are concerned. Anyone who thinks Americans speak English should change from watching Dallas to doing a contract with them!

- Quite used to submitting tenders or quotations we find ourselves working on bids or cost proposals.
- Programmes become time schedules.
- Good old fashioned Building Services can become engineering utility systems, or simply utilities, or facilities.
- Contract engineers eagerly offer their information for approval by the consulting engineers only to find to their dismay that they are actually handling data, not information, and they should have sent it as a submittal. Not a transmittal, that's something else! A real case of back to the drawing board.

Working drawings are probably the classic; to the point where I don't believe anyone, regardless of nationality, can properly define what is meant. A misunderstanding here can cost as much as a major construction mistake.

For the engineer the term maintenance can be a nightmare. FIDIC contracts use the term to define defects liability but all too often the client thinks he has brough a year of full scale operation and maintenance! With a performance bond at stake, persuading him otherwise can be a delicate piece of negotiation.

Arab norms play their part too and one soon learns that no true blue Muslim will insult Allah by making a prediction come true, that's coming too close to becoming a prophet ones self. Any time in the future therefore becomes simply, tomorrow or Bukra and everything is with the will of Allah-Inshallah.

Legislation

This can really push a contractor to the brink. Everyone here knows something of the Islamic regulations on alcohol which actually vary enormously is different countries incidentally, but the mass of regulations that have to be observed is formidable. Not only do they severely affect the way in which expatriates and the labour force behave but they impinge on just about every aspect of the work. The real problem is finding out about them.

Most regulations are made by Royal Decree and are immediately in force. Publication is usually only in Arabic and circulation of written details are usually only available when they filter down to the government clerks months later. All rules and laws are subject to change without notice.

To assist with this aspect most Expatriate companies employ a Government relations advisor, or use their sponsoring agent for this task. Employing an indigenous Arab is the only possible way of keeping up to date and getting out of trouble if you do happen to put a foot wrong.

Materials

Materials control can be the downfall of many a contractor. I've already identified the logistics task in organising their purchase and transportation. Containers have revolutionised shipping but have introduced new problems of marshalling, filling them economically and stuffing them professionally.

A 20 tonne container is a fine way to *despatch* goods but *receipt* might not be so clever. A few years ago, worried by arms and alcohol smuggling, the Saudi's issued a decree whereby every container was to be emptied at the sea port, thereby destroying the whole concept of secure packaging.

How do you offload the 20 tonne container at site if all you have is a ten tonne fork lift?

Transit damage is an ever constant worry. Ten weeks for the manufacturer to deliver, two weeks to despatch, three weeks to ship, a week or more to clear and the long awaited plant item is on site — smashed to pieces. Insurance doesn't progress the contract.

Faced with fixed price considerations, early ordering ought to be the name of the game. It is really worth it though if the material will corrode away through exposure in the desert? Another dilemma.

Arguing that duty should be 3% and not 20% with a hard pressed Saudi customs official is not the best way to expend the expatriate managers time either.

I have not exhausted the list of problems that I could identify but I think these suffice as an insight into the hazards facing the contractor who sets foot in the Middle East to perform a fixed price contract. Clearly such contracting for those who wish to accept the challenge is rather like the hungry man who has an egg in his pocket. If he wishes to have breakfast he has to crack it!

Two Dutch visitors to the 8th International Congress describe their Australian experience.

Two views of Melbourne

ARIE VAN KRIMPEN — congress delegate

Not yet recovered from 'jet lag' I was dragged into the fast running river of the Melbourne Congress, and from that moment it was a time never to forget — full of meetings, hospital visits and hospitality. At first it was a great pleasure to meet old friends and to make new ones. Some of their names were old ones from years before, others I had read of either the International or Australian journals.

As most of the success depends on first impressions I must say that it was an excellent start, with a wonderful welcome to Australia. At all the functions there was an abundance of delicious Australian food, and perhaps to give the visitors an insight to Australian culture, there was on the first day a fine young quartet playing classical music. It was understandable, but a pity that some of their playing was drowned by the buzz of conversation.

In his opening speech, Dr Blewett, the Australian Minister of Health underlined that Australia also has not escaped the necessity for stringent economic measures in the health field, and although it is a pity for the Australian hospital engineer, the pain is shared by their Dutch colleagues. There was a great variety of papers presented, with some of those concerned with ventilation containing weather figures hard to believe by people from the hot countries present. Incineration or landfill of hospital waste was again under scrutiny and this resulted in animated discussion of what has almost become a sacred subject.

During the Congress there was considerable discussion of special systems for the larger hospital, but I found it a pity that no one covered the case of the small to mediuim hsopital with a small staff and

SOMMAIRE FRANCAIS

Deux points de vue sur Melbourne

Les auteurs, de nationalité néerlandaise, ont assisté au 8e Congrès internationa. M. Van Kimpen a trouvé intéressant de comparer les problèmes australiens de la gestion d'hôpitaux à ceux qui existent en Hollande et a eu plaisir à rencontrer d'anciennes connaissances et à faire de nouveaux amis. Mme Van Krimpen fut impressionnée par la merveilleuse diversité des paysages au cours de ce voyage, par l'hospitalité des Australiens et par les nombreauses invitations qu'elle a eu plaisir à recevoir.

limited administration. A review of how to manage the daily affairs of such hospitals touching on energy conservation and preventive maintenance would have been well received. We in Holland have a working party striving for the design of a software programme for hospital engineering management for such hospitals, and we hope for support from our government.

I was pleased to have the opportunity to visit Austin Hospital where I was shown around by John Kovacs and Bill Geerlings, and after the Congress I visited the Royal Prince Alfred in Sydney, which I inspected with Col. Erickson, the Engineering Manager. On tour, we called on Jim Meldrum at Kempsey Hospital who showed us his brand new Intensive Care Unit and his energy management system. Later that day we dined with the Meldrums in their delightful bush setting home.

Back in Melbourne and with time fast running out, we lunched with Bruce Noseda and Jim Turnour prior to inspecting their Alfred Hospital. During this Congress tour which covered more than 5,000km. I noticed differences between our hospitals; in Holland we work with unattended or part attended steam boilers, but with considerable safety devices, especially for gas leakage. In one large hospital I saw the predicament of the staff in wishing to enlarge the emergency department which was housed in a building with load bearing brick walls.

Those hospitals I visisted had a high standard of cleanliness, and I was impressed with the wide corridors. From what I saw in the particular hospitals, our Dutch hospital beds are more suited for the nursing staff, and further developed, with facilities such as head and remote control by the patient, by means of a gas pressurised spring system, with combination wheels and lifting legs. Overall however, the Australian hospital engineer is better served with standards documentation and guidelines which are at his disposal, and this must make for less confusion as to the best and allowable methods.

And now, almost at the steps of the plane I must congratulate the Institute of Hospital Engineers of Australia for their successful Congress with its excellent organisation, and give thanks for your hospitality we received during the Congress. It was a great experience for my wife and myself to meet you all and we trust that when colleagues come to Europe we will be able to reciprocate. You are all welcome.

ROSA VAN KRIMPEN — social delegate

We had looked forward to this journey for a long time, and at last Thursday 15th of November had come. But it was to be a great disappointment for us all to be told at 10pm that our plane was fog bound in London and we would not be leaving for Australia. A bus eventually picked us up and transported us to a hotel in Leiden where we had dinner at 2am! That day, Friday, we were informed that a plane of Lufthansa would take us to Frankfurt where we would take an M.A.S. plane for Australia.

It was my first flight and the whole world turned around when the plane drew up. But you get used to it quickly and it was wonderful to see the sun rise above the snow like clouds. The effect of the cool moon at night, shining so silent and mysterious rivalled that of the bright sun next day. We flew over India which looked so peaceful with its impressive deserts, on to Dubai where we came to earth the first time, the town looking like a fairy story scene. Soon we were flying over the Malaysian forests with its beautiful blue-green lakes but dirty brown rivers, and later on the geography books from school came alive at the sight of the palms. On from Kuala Lumpur and rain to Melbourne after a long trip of six and a half hours with the heat of central Australia vibrating the plane. It was 32° and sunny when we emerged from customs to a warm welcome from our long time friends Fred and Peggy Green.

We had left Holland in a grey colour, freezing with cold, and arrived to where warmth and flowers in the most beautiful colours were wooing in the many parks and gardens we passed on our way to the Green's home in the south of Melbourne. After a short sleep we went to the reception at Melbourne's Southern Cross hotel, to a wonderful cold buffet and a most pleasant evening altogether.

Next morning the real serious business of the Congress got underway, with the President of the International Federation of Hospital Engineering, Mr Bob Cottrill the first speaker. He was followed by Mr John Cherry, the Australian Institute's President, and then the Australian Minister of Health, Dr Neil Blewett opened the Congress. It was all very impressive, but we ladies were to leave after morning tea for a sight seeing tour of Melbourne which took us by bus to points of interest such as Captain Cook's cottage and Como House, which accommodated Queen Victoria in former years. That night we had an informal meeting at the Southern Cross in the form of a trades night which was a great success with many exhibitors and visitors.

Next day we journeyed to the country centre of Ballarat and to the village of Sovereign Hill, where it was interesting to see how people lived in those early days. We learnt how to find gold, but alas were not to find any that day. It was to be found however in the friendships we made during the Congress days, and among the beuatiful poppies in the gardens of Ballarat. Wednesday saw us lunching at Ferntree Gully where I saw the Westmorelands, Alan and Joan, and Ian and Lynne Thompson looking to everyone's appetite and well being. Later there was a barbecue in the hills where we saw many beautiful rhododendrons, many tall tree ferns and numbers of native birds. Next was to be the high point of the Congress socially, dinner in Melbourne's 'Great Hall' with the added lustre of beautiful classical music. Peggy and I had a restful day, with some shopping prior to the sparkling dinner dance at night. Off to Philip Island on the Saturday to a wonderful lobster dinner then to the beach to watch the fairy penguins return to their babies after a day at sea.

That was the end of the Congress, but next day we were to get lost finding the Cherry's farm, and arriving after all their guests had left to a gracious welcome. We saw something of Melbourne before heading North around the coast to Sydney and then on to Queensland and its Gold Coast. We travelled many kilometres, visited a real Dutch Windmill for dinner, wonderful Australian beaches, glorious gum trees, native plants, many cockatoos, some goanas, many sheep of course, cattle, horses and lonely farm houses.

In short, when we returned to Melbourne after a long trip of some 5,000km. over which we were driven by Fred Green, who is a far better driver than he is a breakfast cook, (you should try his "anglo saxon" porridge!), we can say that we have seen a large part of the real Australia; it was great! And we are truly grateful to our friends who made all this possible. Many, many thanks for all of this and to the wonderful people of the Congress who made us so welcome.

Mr & Mrs A van Krimpen (far right) seen at the IFHE 8th International Congress dinner dance.

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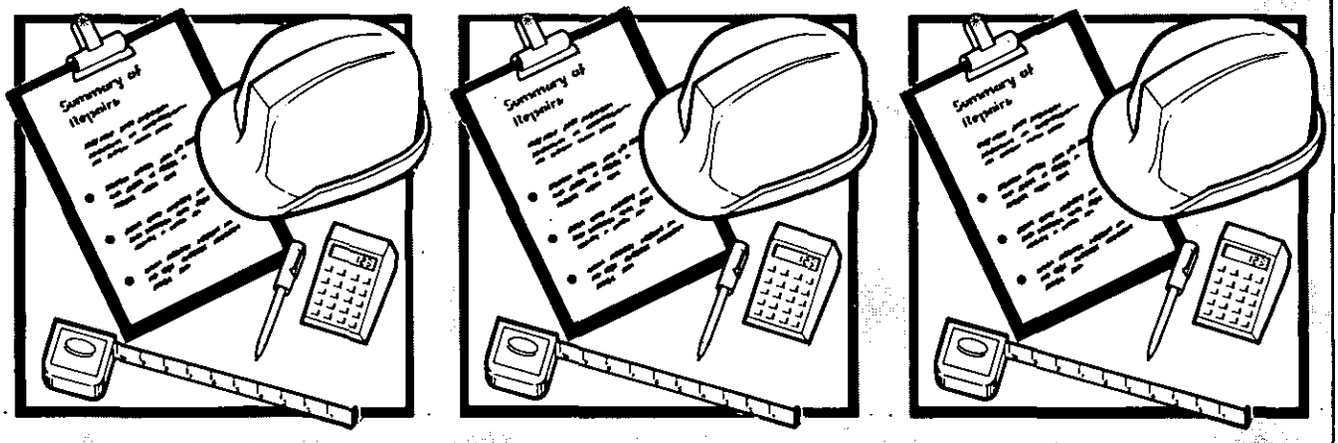

PROVISIONAL PROGRAMME

9.30 a.m. Coffee and registration

A regional general manager
The changing role of works within the overall management structure

Ben Williams
District works officer, Kidderminster HA
The function of works at district level

Bill Nicholas
District works officer, Peterborough HA
The training of works officers

Peter Tankard
District works officer, Oxfordshire HA
The reviews of the DHSS and NHS works divisions

Mike Meager
Assistant chief architect, DHSS
'Conserve or rebuild?'

David Hanson
Regional works officer, South Western RHA
An overall view of the responsibility of works

Mike Smith
District works officer, Gateshead HA
'Making the estate work'

4.30 p.m. End

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The author is Senior Engineer, Hosplan, New South Wales Hospitals Planning Advisory Service, Rozelle Hospital, Lilyfield, NSW.

Fluidized bed boiler at the Royal Alexandra Hospital for Children, Camperdown

J W ELLIS

A fluidized bed boiler has been installed at the Royal Alexandra Hospital for Children, Camperdown, N.S.W. This paper describes the reasons for developing a project to demonstrate that a fluidized bed coal fire combustor can be incorporated with a modern packaged steam boiler. The boiler and combustor are of Australian design as suitable proven designs from overseas were not available.

Background

Coal is the major energy source for public hospitals in NSW, representing 44% of gross energy consumed. A more dominant position was held by coal 20 years ago and earlier, with ground being lost in the intervening years to oil, natural gas and electricity. This declining trend for coal is in line with commerce and industry and will continue for possibly another 20 years. By then the dominance of oil and natural gas will have peaked and coal will once again become an important energy form. To ensure that the full benefit of coal can be made in the future, new industrial coal burning techniques are being developed.

Large boilers in power stations use pulverized coal burnt in suspension. Small boilers of the size used in hospitals have relied on mechanical stoker designs. When assessing these small boiler designs the coal fired boiler has, in recent years, ben unfavourable owing to

- high capital cost, about twice that of oil and gas fired plant
- present manning regulations which require full attendance of solid fuel boilers in NSW
- maintenance costs for coal fired boilers are higher than those for oil and gas fired equivalents.

Despite the reserves and availability of coal in NSW, these factors have ruled out coal fired boilers in NSW in recent years. It is now seven years since a coal fired steam boiler was commissioned in a NSW hospital. Fluidized bed combustion of coal is seen to offer a way of reducing present penalties. In recent years several designs of fluidized bed boiler have become commercially available in Europe and the United States. In November 1980 a National Energy Research, Development and Demonstration Programme (NERDDC) Grant was applied for in the joint names of the NSW Department of Health and the Department of Chemical Engineering at the University of Sydney. The grant was to fund the installation of a 3MW fluidized bed boiler in a Sydney hospital to demonstrate the relevance of the technology under Australian conditions. Associate Professor J. R. Glastonbury, then Associate Professor of Chemical Engineering at the University of Sydney and Energy Consultant to the Department of Health formed a Technical Advisory Committee to specify the boiler and direct the project. The Committee met for the first time in January 1981 and adopted two issues of policy. One was that the project be one of demonstration and not of development. This meant that only boilers of proven design would be considered. This the Committee deemed to be a minimum of 2000 hours of operational experience.

The other issue was that the boiler be suitble for unmanned operation. This was seen to be one way of overcoming the disadvantage of manning costs. As Manning regulations do not favour fire tube designs for unmanned operation the boiler would need to be specified as a water tube boiler. This led to a specification being prepared for proven designs of water tube fluidized bed steam boilers with at least 2000 hours of successful operation.

Pre-registration of tenderers was sought in March 1981 by public advertisement and by letter to 38 companies known to have some interest in fludized bed technology. In all, ten serious responses were received. Of these only two could be seen to fulfil the two policy objectives. These two companies were invited to submit full tenders by August 1981. Assessment of these tenders showed that overseas experience was not as advanced as hitherto believed. There was concern over the lack of operating experience, ability to meet some local statutory requirements and the overall prices quoted.

In reviewing tenders the Committee concluded that as the prices for overseas designs were excessive the installation of a demonstration boiler would seriously detract from the credibility of the project. The Committee remained steadfast in its belief for the need to demonstrate the technology in packaged boilers under Australian conditions. This led to their decision to investigate the practicability of a design and development proposal based on Australian expertise. The concept was accepted by NERDCC and became the basis for the present project.

Present project

In May 1982 a specification was forwarded to six Australian companies for their expression of interest. All were associated with the design and manufacture of fluidized bed combustors or boilers or both. All but one sought further association with the project. The specification called for the design, supply, installation and commissioning of a 3MW fluidized development and demonstration boiler at the Royal Alexandra Hospital for Children at Camperdown. This site was selected as there was an ongoing need for steam on site and the boiler house, which housed two Babcock and Wilcox coal fired boilers, had room for the new boiler without building extensions. Seven tenders were received and the Pyrecon submission using a Maxitherm boiler was assessed to be technically the best design at the best price. In November 1983 a NERDDC grant of $852,518 was announced, based on an application using the Pyrecon quotation. An order was placed with Pyrecon in December 1983 and commissioning took

SOMMAIRE FRANCAIS

Chaudiere a lit fluidise

Une chaudière à lit fluidisé de 3 MW est en cours d'installation au "Royal Alexandra Hospital for Children" de Camperdown dans les Nouvelles Galles du Sud. Cette chaudière entre dans le cadre d'un projet de développement financé par une subvention du NERDDP, dont les objectifs sont les suivants:

- l'intégration, à une chaudière compacte connue, d'un système de combustion à lit fluidisé, bien établi sur le marché, afin de produire la première chaudière à lit fluidsé de conception australienne.
- la démonstration des performances techniques et économiques de la combustion fludisée de plusieurs types de charbons dans les chaudières compactes.
- la preuve du fait que les chaudières compactes à lit fluidisé conviennent à un fonctionnement sans surveillance.

L'exposé presente également la toile de fond de ce projet et donne une description de la'équipement en cours d'installation. La mise en service et la remise au client sont prévues pour août 85.

place in September 1984. Project management during installation and commissioning was by Merz & McLellan & Partners.

The particular objectives are to:

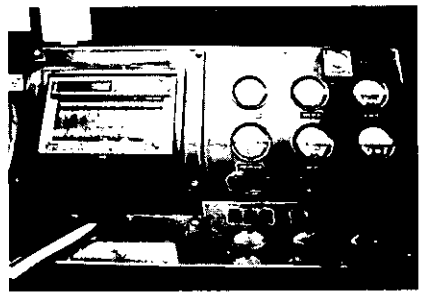
a) integrate an advanced design to fluidized bed combustor with a highly developed packaged boiler to produce the first Australian designed fluidized bed boiler
b) demonstrate the technical performance of the fluidized combustion of coal in packaged boilers
c) demonstrate the economic performance of fludized combustion of coal in packaged boilers
d) demonstrate the suitability of fludized bed packaged boiler design for unmanned operation
e) demonstrate the suitability of the fluidized bed combustor design for fuel flexiblity
d) develop a dust free system for handling of solid fuel and ash by the use of a well engineered design of contained system.

Following commissioning of the unit it is envisaged that there would be at least a two year programme of test work and performance evaluation. Factors to be evaluated include:

— coal types
— load characteristics
— pollutant and grit emission
— thermal efficiency
— operating economies
— manning requirements

Fluidized bed combustion

The combustor is a 1.7m diameter drum lined with refractory and filled with sand. The sand or bed can behave like quicksand i.e. become fludized when air in quantity is bubbled up through it. The bed in this turbulent situation behaves as a fluid thus allowing heat to be quickly and evenly distributed throughout the bed. The fluidized bed, following initial heating by a gas flare, will sustain combustion of coal introduced as a fuel. The heat generated is used to fire a conventional Maxitherm Mini D boiler. This boiler has been modified to incorporate sixteen in bed tubes to gain additional heat transfer. These are water tubes through the fluidized bed.



Control panel.

PRINCIPAL DESIGN PARAMETERS

Output of MCR	4785 kg/h
Steam pressure	1000 kPa
Steam temperature	saturated
Gross heating surface	191m²
Effective heating surface radiant	23m²
Effective heating surface convective	126m²
In bed tube area	7.5m²
Heat transfer rate	20kW/m²

Acknowledgement

The author wishes to acknowledge the contribution to this project of the Technical Advisory Committee under the Chairmanship of Associate Professor J. R. Glastonbury, Dean of the Faculty of Engineering, University of Sydney.

Appendix

SUMMARY OF PROJECT SPECIFICATION

The salient features of the performance specifications for the fluidized bed boiler are:

1 Boiler type

The boiler is to be of the water tube design or a combined water tube and shell type provided metal temperatures can be shown to be not excessive. The boiler and its controls are to be suitable for unattended operation as defined in Draft Australian Standard Document ME/1/11/82-6 Boiler efficiency and operating conditions are to be specified.

2 Design standards

The boiler design is to conform to
AS1200 Boiler Code
AS1228 Water Tube Boiler Code
AS1797 Fire Tube Boiler Code
or equivalent

3 Fluidized bed combustor

The combustor should preferably incorporate submerged heat transfer tubes and be capable of operation on Hunter No. 1 Grade of coal nominally sized — 25mm + 5mm

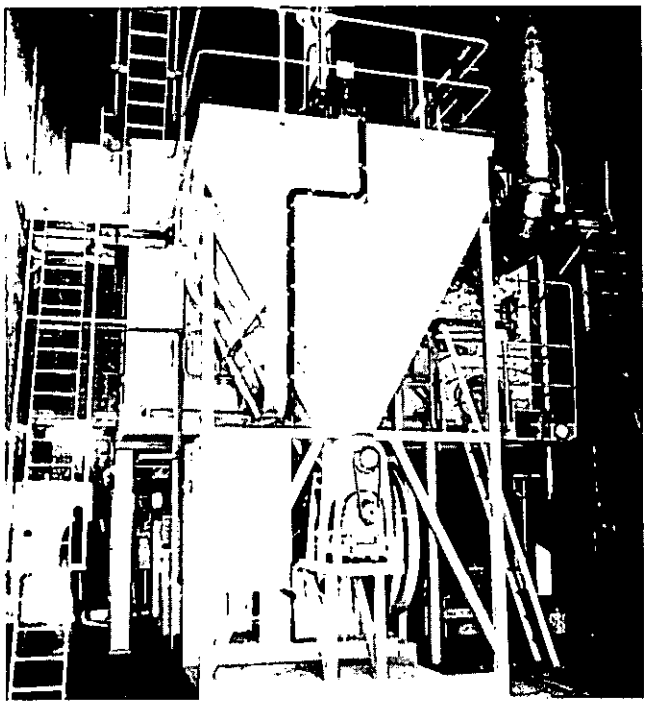
The start up fuel is lp gas and facilities for the maintenance of the bed temperature over prolonged idle periods without the use of auxiliary fuels are required.

4 Environmental constraints

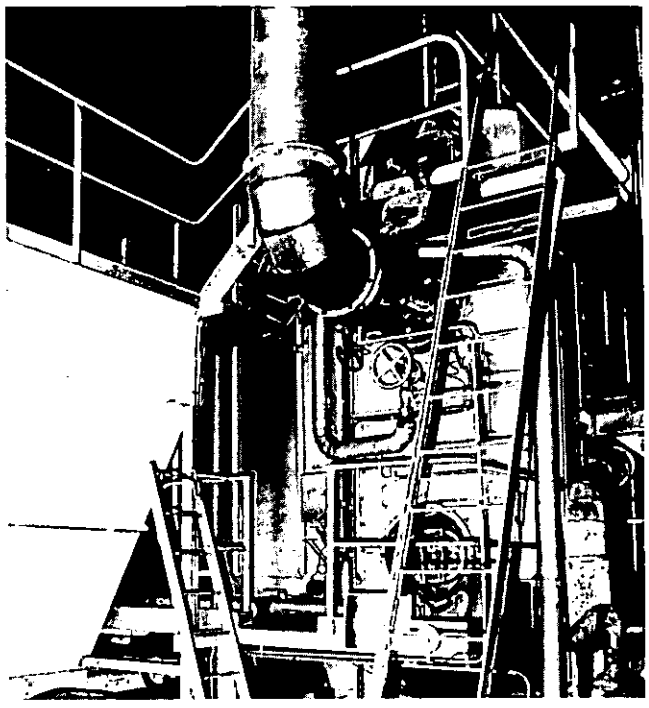
Emissions from the boiler are to conform with the Regulations of the NSW Clean Air Act 1961. Careful attention is to be given to the elimination of noise in the operation of the equipment.

5 Coal and ash handling

A high standard of cleanliness is required in all solids handling operation.



Front view of boiler showing coal hopper and overhead coal feed.



Front view of boiler with annualr combuster and air supply lines seen below.

Product News

Bridos speeds up WIMS operation

True multi-use of micro-computers together with faster response times result from the development work done by Datacall on W.I.M.S. using BRIDOS. Record-locking and file-locking are the essential features provided by BRIDOS that enable up to eight terminals and associated printers to operate on the same installation without the possibility of 'crashing' or data corruption. Using modified hardware the maximum can be increased to sixteen terminals and printers. Benchmark tests indicate reaction speeds for BRIDOS ranging from three to 45 times faster, depending upon the task being carried out, but averaging around seven times faster than the CP/M operating system.

Further information contact: Datacall Ltd, Kirkstall Road, Leeds LS4 2AQ. 0532 459625.

Improved NMR imaging

The Ray Proof Division of Keene International now offers an RF shielded room system specifically designed for hospital NMR diagnostic work. It eliminates unwanted electronic interference that may cause artefacts in the images; it also prevents the NMR's RF energy from interfering with other electronic equipment in the hospital. The Ray Proof Series 84 RF Shielded Room system is made of non-ferrous metals, so external 'electronic pollution' is screened out, leaving the NMR's magnetic field undistorted. It creates a continous conductive shield around the NMR room and patient during diagnosis.

Further details from Keene International Limited, Ray Proof Division, Unit 23 Mitcham Industrial Estate, Streatham Road, Mitcham, Surrey CR4 2AP. 01-640 9214.

Maintenance benefits in nurse call system

Static Systems Group report that its new micro-processor based bedhead nurse call system previewed in June is already meeting with enthusiasm amongst hospital engineers. The key is that the new bedhead unit incorporates removeable cover plates for 'mains' and 'nurse-call' sections so that maintenance can be carried out on each section individually. The crucial part of the system is the first micro-computer controlled nurse call handset, which 'talks' to another micro-computer in the fixed bed head unit.

The new handset will be popular with nurses and patients alike because it is easy to operate. The call button bears a picture of a nurse, so its function is immediately obvious. The push button is easy to operate and a reassurance lamp glows when an alarm call has been made. The handset is of essentially simple construction and has been designed so that the controls can be operated by any finger, or thumb or fist. The two-metre flex plugs in a fixed bed head unit behind the bed, which is interconnected to a nurse's patient indicatoir panel. The revolutionary design of the handset is inspired by guidelines established by a current Department of Health and Social Security study into bedhead services.

Further details from: Static Systems Group, Heath Mill Road, Wombourne, Wolverhampton WV5 8AN. Tel: 0902 895551. Telex: 339796.

Nurse call handset

Management & control systems brochure

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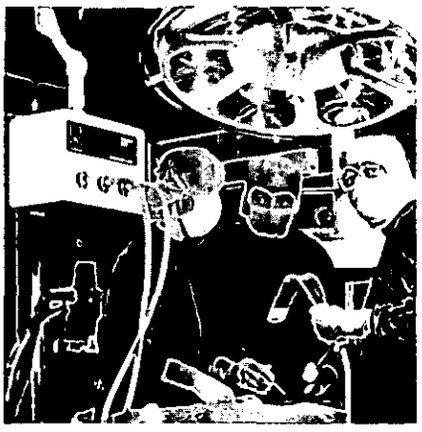

Heraeus Endo lamp

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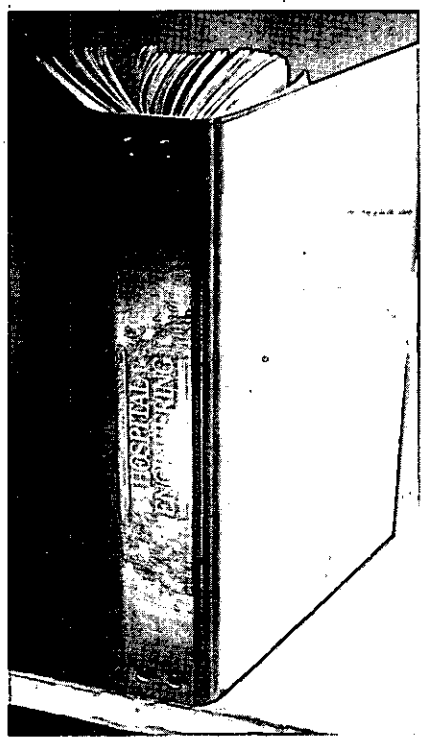

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