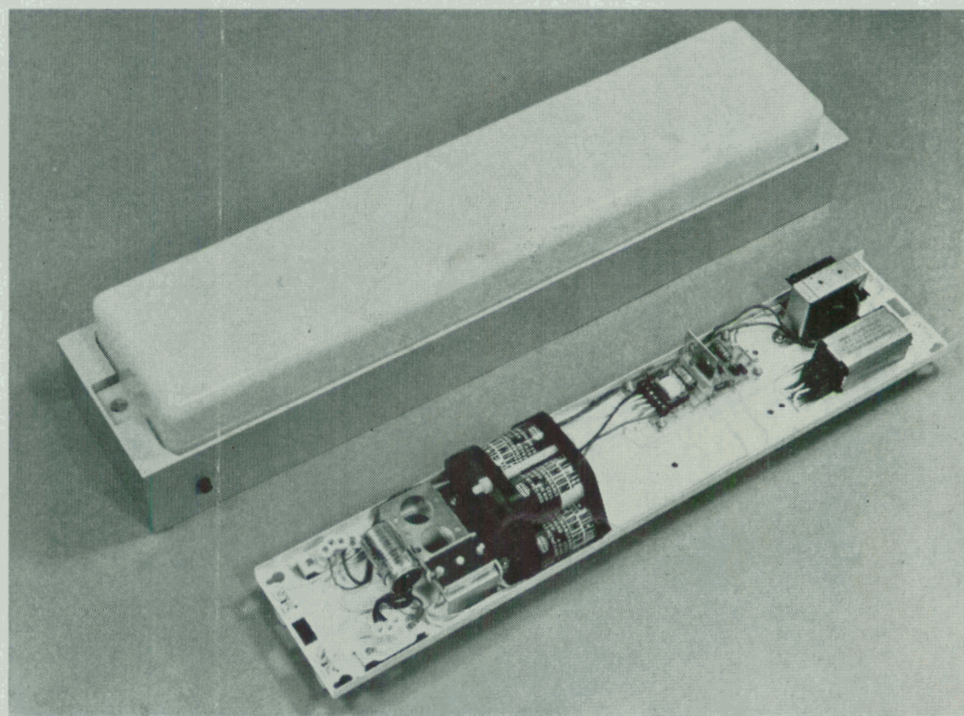
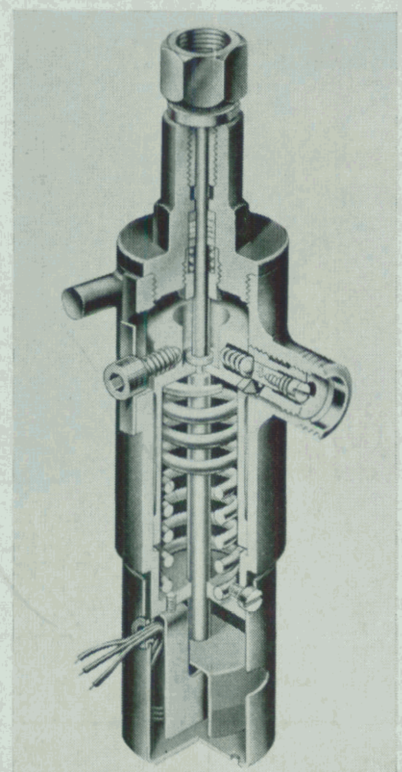
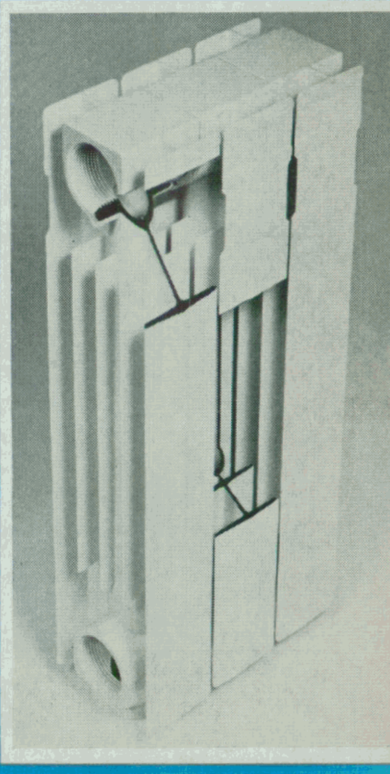
HE
Hospital Engineering

NOVEMBER 1975

INTERNATIONAL FEDERATION ISSUE







Institute of Hospital Engineering

'Hospital Engineering' is published ten times a year by Peter Peregrinus Limited (PPL is a member of ESIP)

Individual copies cost £1.50 (postage paid)

The annual subscription is U.K.: £13. Overseas: £15. Americas: $36.

Average circulation per issue (January-December 1974): 2169 (ABC)

Editor
David Mackin, B.Sc.

Graphics Manager
M. C. Partridge

All correspondence relating to the Journal should be addressed to:
'Hospital Engineering',
Peter Peregrinus Limited,
PO Box 8, Southgate House,
Stevenage, Herts. SG1 1HQ, England
Telephone: Stevenage 3311
(s.t.d. 0438 3311)

Advertisement Manager
Barry Wietz,
Advertisement Department,
Peter Peregrinus Limited,
Station House, Nightingale Road,
Hitchin, Herts. SG5 1RJ
Telephone: Hitchin 53331
(s.t.d. 0462 53331)

Subscription agent for the Americas: International Scholarly Book Services Inc., 10300 South West Allen Boulevard, Beaverton, Oregon 97005
Telephone: (503) 620-0721

UK ISSN 0046-7960

The Institute of Hospital Engineering,
20 Landport Terrace,
Southsea, Hants. PO1 2RG, England
Telephone: Portsmouth 23186
(s.t.d. 0705 23186)

Secretary
J. E. Furness, V.R.D.

The International Federation of Hospital Engineering,
24 Nutford Place,
London W1, England

INTERNATIONAL FEDERATION ISSUE

No. 16

Hospital Engineering

Incorporating 'The Hospital Engineer'

Vol. 29
November 1975

The Journal of The Institute of Hospital Engineering

Contents

Special features

News features

Departments

Front cover (Top): A 21 in Churchouse emergency light showing the gear tray in the foreground (photo: C. M. Churchouse Ltd.) Left: Sections through the new Aelrad aluminium die-cast radiator (photo: Acoustics & Envirometrics Ltd.) Bottom: The Sarco LH10 high-limit cutout (photo: Spirax-Sarco Ltd.)

INTERNATIONAL FEDERATION ISSUE
No. 16
HE
Hospital Engineering
Vol. 29
November 1975

6th National Convention of French Hospital Federation

4th Congress of International Federation of Hospital Engineering

The 6th National Convention of the French Hospital Federation will be held in Paris, Porte de Versailles from Sunday, 11th January to Friday, 16th January 1976, with the sponsorship of the Hon. Minister of Health. The 4th Congress of the International Federation of Hospital Engineering will take place at the same venue.

CONGRESS VENUE
The Congress venue will be the Town of Paris Exhibition Grounds, at the Porte de Versailles, where all the working sessions and the exhibition of hospital techniques will take place.

PROGRAMME
The programme of the working sessions is summarised as follows. The official opening will occur on Monday, 12th January 1976 at 9.30 a.m.

EXHIBITION
The exhibition will be opened from Sunday, 11th January at 9.30 to Friday, 16th January at 6 p.m.

CONGRESS LANGUAGES: French, English
- Simultaneous translation during working sessions.
- Working documents will be written exclusively in French.
- Minutes to be published later will also be written exclusively in French.

6èmes Assises Nationales de la Fédération Hospitalière de France

4ème Congrès de la Fédération de l'Ingénierie Hospitalier

Les 6èmes Assises Nationales de la Fédération Hospitalière de France auront lieu à Paris, Porte de Versailles, du dimanche 11 au vendredi 16 janvier 1976, sous le haut patronage de Madame le Ministre de la Santé.
Le 4ème Congrès de la Fédération Internationale de l'Ingénierie Hospitalier se déroulera dans ce cadre.

SIEGE DU CONGRES
Le siège du Congrès sera le Parc des Expositions de la Ville de Paris, à la Porte de Versailles, où se tiendront toutes les séances de travail et la grande exposition des techniques hospitalières.

PROGRAMME DES TRAVAUX
Le programme des travaux et le calendrier des séances sont résumés ici. L'Inauguration Officielle aura lieu le lundi 12 janvier 1976 à 9h. 30.

EXPOSITION
Elle sera ouverte du dimanche 11 janvier 1976 à 9h.30 au vendredi 16 janvier 1976 à 18 h.

LANGUES DU CONGRES: Français, Anglais
- Traduction simultanée pour les séances de travail.
- Les documents de base seront exclusivement en langue française.
- Il en sera de même pour les comptes rendus qui seront publiés ultérieurement.

RESTAURANT

No special booking for the restaurant of the exhibition grounds.

HOUSING

Other important congresses will be held in Paris over the same period. It would be advisable that each attendant make his own booking at an early date.

THURSDAY, 15-16th JANUARY, EVENING

A dinner-dance will take place on Thursday, 15th January, at 8 p.m. in the rooms of the Pavillon d'Armenonville in Bois de Boulogne (near Porte Maillot). Tickets (charge: 100 FF) will be sold at the congress reception desk from Sunday 11th January, to Wednesday, 14th January.

REGISTRATION FEES

The registration fees (120 FF) must be paid in French currency at the reception desk of the Congress. These fees include materials and congress documents.

11th January
- 9.30 — Opening of the exhibition and reception of participants

12th January
- 9.30 — Opening address by the Hon. Minister of Health
- 15.00 — Working session: Reality of the French hospital

13th January
- 9.30 — Programme and management plan of the hospital: role of the management team
- 15.00 — Conventional and industrialised hospital buildings: advantages and disadvantages

14th January
- 9.30 — Medical and paramedical bodies and technicians: actions and interactions around the patient
- 14.30 — Announcement of awards of the French Society for Hospital History and presentation of recipients
- 15.30 — Equipment maintenance in the hospital economy

15th January
- 9.30 — Management team training and improving
- 15.00 — State-of-the-art techniques in hospital media

16th January
- 9.30 — Participation of industry to the hospital equipment expansion: research, prototypes and normalisation
- 15.00 — Future of hospitals

RESTAURANT

Il n'y aura pas de réservations particulières au Restaurant du Parc des Expositions.

LOGEMENT

Il y aura pendant cette période d'autres Congrès importants a Paris. Il sera nécessaire que chacun fasse personnellement ses réservations assez tôt à l'avance.

SOIREE DU JEUDI 15 JANVIER

Un diner dansant (tenue cocktail) aura lieu le jeudi 15 janvier, à 20 heures, dans les Salons du Pavillon d'Armenonville au Bois de Boulogne (près de la Porte Maillot). Les cartes seront en vente (100 Frs) au Secrétariat du Congrès, du dimanche 11 au mercredi 14 janvier. Les participants voudront bien remplir la section du bulletin d'inscription se rapportant à cette soirée afin que les organisateurs puissent apprécier le nombre des congressistes susceptibles d'y assister.

DROITS D'INSCRIPTION

Le droit d'inscription, soit 120 FF, devra être versé en monnaie française dès votre arrivée sur les lieux du Congrès au Centre d'Accueil des Étrangers. Vous recevrez, en échange, la serviette et les documents du Congrès.

Dimanche 11 janvier
- 9h.30—Ouverture de l'Exposition et Accueil des Congressistes

Lundi 12 janvier
- 9h.30—Inauguration par Madame le Ministre de la Santé
- 15h.00—L'Actualité de l'Hôpital en France

Mardi 13 janvier
- 9h.30—Programme et plan directeur de l'hôpital: Rôle de l'Équipe de Direction
- 15h.—Constructions hospitalières classiques et industrialisées: avantages et inconvénients

Mercredi 14 janvier
- 9h.30—Le corps médical et paramédical, les ingénieurs: actions et interactions autour de malade
- 14h.30—Proclamation du palmarès et remise des prix aux Lauréats de la Société Française des Hôpitaux
- 15h.30—La maintenance des equipements dans l'économie de l'hôpital

Jeudi 15 janvier
- 9h.30—La formation et le perfectionnement de l'equipe de direction
- 15h.—Techniques de pointe en milieu hospitalier

Vendredi 16 janvier
- 9h.30—Participation de l'industrie au développement de l'equipement hospitalier: recherches, prototypes et normalisation
- 15h.—L'avenir des hôpitaux

For further information write to Fédération Hospitaliere de France, 83 à 87, avenue d'Italie, 75013 Paris, France.

Scheme for a planned-preventive-maintenance system

by D. J. BRAGG

Terrotechnology (plant engineering) techniques may change very little, but costs are going up. Any method of extending the working life of plant and machinery, which does not involve excessive cost, must be developed with maximum effect. Planned preventive maintenance is a method of obtaining this extra life. It will also keep plant in good working condition and result in 65-70% fewer breakdowns at the end of an initial 2-year period. The work load will be spread evenly over the year and accurate budgetary control with positive calculation of staff requirements are provided as well.

Planned preventive maintenance (p.m.m.)

Planned preventive maintenance (p.m.m.) is the careful lubrication and servicing of equipment, frequent inspection, immediate repair of defects detected before they have developed to a critical stage. The works factory or hospital to be covered by p.m.m. is referred to as the cost centre. This cost centre may be subdivided into as many units as is deemed necessary or practical. It is then necessary to make an inventory of all items of plant and services to be covered by p.p.m. These items of plant should be lettered or numbered wherever possible.

From the inventory of plant, a schedule from which frequency and an estimate of time required to carry weekly, three weekly, six weekly, quarterly, half yearly, yearly etc., p.p.m. can be acquired. By careful addition of these hours for each item, in each unit, of any given cost centre, staff requirements may be accurately assessed.

The next step is to provide a progress and planning chart to allow a quick and simple method of assuring the sequence of work on the appropriate week, a 'bring-up' calendar may be used with great success at this point. Great importance should be attached to the provision of a clear and concise maintenance manual, providing the craftsman with brief but accurate instructions of the work to be carried out, and safety precautions to be taken. The final step in the implementation of the scheme is the provision of the p.p.m. work sheet. This may be compiled by machine or by hand.

At this point it should be stated that the use of a notification slip, to inform various units of p.p.m. visits, is invaluable, as too often this is ignored, resulting in costly waste of time in waiting for access. A valuable adjunct to a p.p.m. system, rarely used, is plant history cards and files, which can be invaluable for stores control, and when major overhaul or breakdowns take

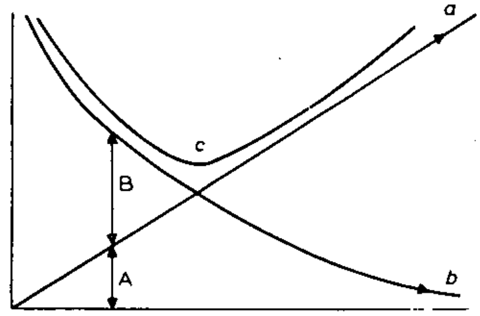


Fig. 1 *a* represents the amount and cost of p.p.m. being carried out on a given item of plant
b represents the number and cost of breakdowns on the same item of plant
c represents the total cost of p.p.m. and breakdown maintenance on this item of plant
A + B = C

Mr. Bragg is with the Engineering Department, Cardiff Royal Infirmary, Newport Road, Cardiff CF2 1SZ, Wales.

place, or even in identifying misuse which causes reoccurring faults.

However, having once implemented a p.p.m. system, it must not be left without some method of updating, revising and indeed providing a maintenance scheme for a planned preventive maintenance system. When a system of planned preventive maintenance has been implemented a determined effort must be made to ensure that the system is being effectively carried out, with special emphasis on whether the system is comprehensive enough or too comprehensive.

For example, it may be found that a piece of equipment, e.g. a steam trap, which might be scheduled for dismantling and cleaning on a six-weekly frequency, may be found not to need servicing six weekly, depending on the state of the trap. A method must be devised whereby it can be determined whether an item of plant is being over maintained or under maintained. If an item of plant is being over maintained, the cost of breakdowns will be virtually nil but the cost of p.p.m. on this item of plant will become prohibitive, and also restrict valuable labour resources from other duties. If the item of plant is being under maintained, breakdowns will take place often and production 'down time' will be high, althought the p.p.m. cost will be low.

It may be clearly seen from Fig. 1 that the point which the plant engineer must aim for is the point at which curves *a* and *b* cross, and curve *c* (being the total cost) is at its lowest for the item of plant being considered.

A simple and efficient method of determining the correct balance of p.p.m. and breakdown maintenance must now be provided. The method to be described will allow this type of close control on a month-to-month basis by using a cost-coding system, which, combined with the plant history card and file, will give a comprehensive control of plant p.p.m.

With the advent of the computer, and in recent years a high degree of sophistication, most firms considering a system of planned preventive maintenance have access to a computer, mainly used in various aspects of accountancy etc. With a slight variation and addition to existing codes an invaluable service can be provided to the plant engineer and hence management.

Table 1 is an existing cost coding system in a local hospital complex that will lend itself to almost any computer system in industry. Column 2 represents a department which management requires the cost of maintenance. These numbers, as may be seen, are of a two digit nature, ranging from 01 to 99.

Column 3 represents any given area inside the cost centre. The boundaries of the unit must be clearly established by either a wall, an item of plant or a painted line etc. These numbers range from 001 to 999, thereby enabling any given cost centre to have 999 units or departments.

Column 4 represents an item or group of items of plant, e.g. a motor would represent one item of plant, 20 isolating valves another item of plant. This range of numbers also runs from 001 to 999, thereby enabling 999 items of plant in any given unit of any one cost centre.

Table 2 represents a monthly computer sheet, a copy of which, it is suggested, should be provided to the plant engineer, this return sheet being the basis of the maintenance scheme of the p.p.m. system. Columns 2 and 3 are as above.

Table 1

Column 2		3			4		
cost centre			unit			Item	
0	1	0	0	1	0	0	1
0	2	0	0	2	0	0	2
0	3	0	0	3	0	0	3
0	4	0	0	4	0	0	4
0	5	0	0	5	0	0	5
0	6	0	0	6	0	0	6
0	7	0	0	7	0	0	7
0	8	0	0	8	0	0	8
0	9	0	0	9	0	0	9
1	0	0	1	0	0	1	0
1	1	0	1	1	0	1	1
1	2	0	1	2	0	1	2
1	3	0	1	3	0	1	3
1	4	0	1	4	0	1	4
1	6	0	1	6	0	1	6
1	7	0	1	7	0	1	7
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
9	6	9	9	6	9	9	6
9	7	9	9	7	9	9	7
9	7	9	9	7	9	9	7
9	8	9	9	8	9	9	8
9	9	9	9	9	9	9	9

Column 2 (cost centre) represents the works/factory/hospital, of which the plant engineer requires the cost of maintenance. **Column 3 (unit)** represents any given area inside a cost centre, which must have clearly defined boundaries, e.g. a wall, an item of plant or painted line. **Column 4 (item)** represents the number of any given item of plant; e.g. a motor would represent one item of plant, 20 isolating valves would represent another item of plant.

In the first line of Table 2 the code numbers in column 2, 3, and 4 are all recorded, this signifies that the cost recorded in columns 1 and 5 represents the cost of item number 006, in unit number 050, in cost centre 03. Column 1 represents the previous month's expenditure on this particular item, and column 5 represents the present month's expenditure on this item.

Therefore, it may be seen at a glance when repairs are becoming costly, and thereby possibly that p.p.m. is not being carried out frequently enough. If the frequency of the p.p.m. on this item is then shortened from, say, six weekly to three weekly it should rectify this breakdown expenditure; however, if the breakdown expenditure is still excessive, it would suggest that this item of plant should have even more frequent maintenance. If this does not rectify the matter, it would suggest that this item of plant had outlived its useful life. Conversely, if the above code showed consistently no breakdown expenditure on this item of plant, it would suggest that the p.p.m. is being carried out too frequently, and should be adjusted accordingly until the correct frequency is achieved.

Table 2

Column 1	2	3	4	5	6	7
cost previous month	cost centre	unit	Item	cumulative item cost	cumulative unit cost	cumulative centre cost
0·00	0 3	0 5 0	0 0 6	10·42		
14·00	0 3	0 5 0			50·42	
100·00	0 3					452·42
0·00	0 3	0 6 1	0 0 2	2·92		
100·00	0 3					455·34
7·00	0 3	0 5 0	0 0 1	14·00		
21·00	0 3	0 5 0			64·42	
128·00	0 3					469·34
0·50	0 7	1 1 4	0 6 1	18·4		
30·00	0 7	1 1 4			4·32	
51·30	0 7					118·60
11·50	0 7	1 1 4	1 0 9	55·00		
11·50	0 7	1 1 4			59·32	
106·30	0 7					173·60

If the plant engineer spends 1 h/month in studying these monthly computer sheets as described above, it will become increasingly easier to spot at a glance when the previously mentioned adjustments become necessary, thereby allowing instant knowledge and control of the p.p.m. system on a month-to-month basis.

The additional beneficial information and thereby control can be acquired from the system given in Table 2 and is as follows. The second line down shows columns 2 and 3, codes completed (cost centre 03, unit 050). Column 1 shows again the cost of the previous month's expenditure of this unit in this cost centre. Column 6 *gives the cumulative cost of this unit, from the first* month of the current financial year.

To differentiate between p.p.m. and breakdown maintenance on the monthly computer sheet, it is suggested that the (prefix or suffix) of P is used on all p.p.m. worksheets. This will give a clear indication of the type of maintenance on the computer handout (Table 2). Breakdowns therefore need no prefix or suffix, and if the letter P is not available on the computer, any letter will suit.

The third line down shows column 1 only complete (cost centre 03); again column 1 shows the cumulative cost, this time being the previous month's expenditure for the complete cost centre. Column 7 shows the cumulative cost of running this particular cost centre for the current month of the current financial year. The fourth line down of Table 2 shows further examples of this type of cost control.

Close examination will show that column 7, for any *one cost centre, will represent the addition of columns 5* and 6 for the same cost centre, and any unit or item in that cost centre. This will allow close and very accurate cost control of any one item, unit or cost centre as needed, but, most important, will provide an experienced plant engineer with an accurate and effective maintenance scheme for a p.p.m. system.

Projet de systeme planifie de prevention et de maintenance

Même si les techniques de terrotechnologie (ingénierie des installations) ne changent guère, les prix de revient, quant à eux, ne cessent d'augmenter. Toute méthode qui contribue à prolonger la vie utile des installations et des machines, sans entrainer de frais prohibitifs, doit être mise au point afin d'obtenir les meilleurs résultats possibles. La maintenance préventive planifiée permet d'obtenir cette prolongation de la durée utile. Elle permet aussi de maintenir les installations en bon état de marche et de réduire de 65 à 70% les pannes à l'expiration d'une période initiale de deux ans. La charge de travail sera ainsi répartie équitablement pendant toute l'année, ce qui permettra d'assurer un contrôle budgétaire précis et de procéder à l'estimation réelle des besoins en personnel.

Ein geplantes Vorsorgewartungssystem

Die terrotechnologischen (anlagetechnischen) Verfahren ändern sich vielleicht sehr wenig, aber die Kosten steigen. Methoden, die eine Verlängerung der Lebensdauer von Anlagen und Maschinen gestatten, aber nicht allzu viel kosten, müssen so effektiv wie möglich weiterentwickelt werden. Die geplante Vorsorgewartung ist eine Methode, die eine längere Lebensdauer gewährleistet und auch dafür sorgt, daß die Anlagen in gutem Betriebszustand erhalten bleiben, so daß bis zum Ende der ersten Zweijahresperiode ein Rückgang der Versagensquote um 65–70% zu verzeichnen ist. Die Arbeitslast wird gleichmäßig über das ganze Jahr verteilt und es wird auch für eine genaue Etatüberwachung mit positiver Errechnung der Personalanforderungen gesorgt.

Schema per un sistema pianificato di prevenzione e manutenzione

Le tecniche della terrotecnologia (meccanica degli impianti) possono cambiare molto poco, ma i cost aumentano. Qualsiasi metodo che possa prolungare la vita operativa di impianti e macchinari e che non comporti costi eccessivi deve essere sviluppato per la massima efficacia. Una manutenzione preventiva pianificata è un metodo per ottenere questo ulteriore periodo di vita. Essa inoltre manterrà gli impianti in buone condizioni d'esercizio, ridurrà la percentuale di guasti del 65/70% al termine di un biennio iniziale. La mole di lavoro sarà distribuita in modo uniforme durante l'anno e si procederà anche ad un accurato controllo delle stime con positivi calcoli sul personale necessario.

HE Technical news

New company to sell fluidised-combustion expertise

Combustion Systems Ltd. and Babcock & Wilcox Ltd. have agreed to participate in a joint enterprise to develop and commercialise British expertise in fluidised combustion, particularly for the generation of steam and power.

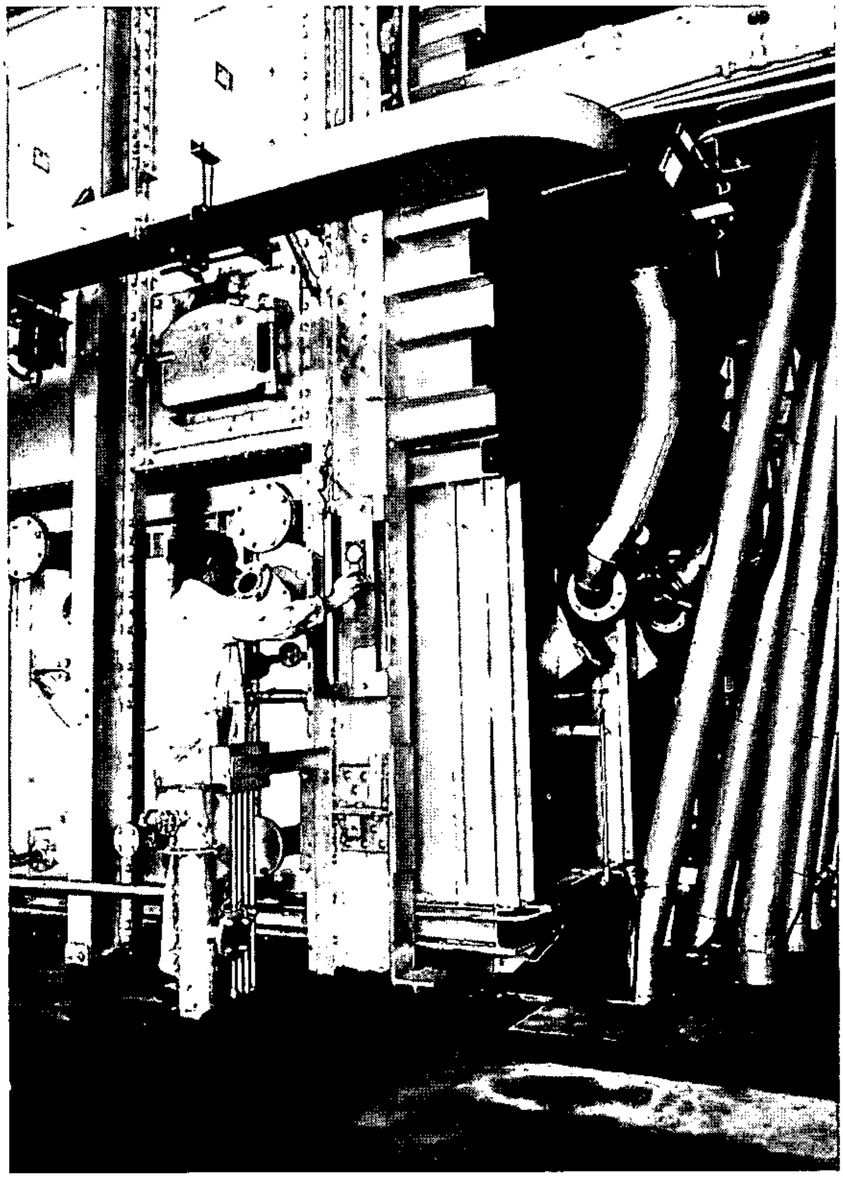
The new company is unnamed at present, but it is to take over the operation of a fluidised-combustion water-tube boiler which was built by its parent companies at the Babcock & Wilcox Renfrew establishment to evaluate the mechanical techniques that the parent companies have developed to make the best use of fluidised combustion, a process that has been available for some time.

Several experiments still have to be performed on the boiler, but it is hoped that a boiler system operating at atmospheric pressure will be available in the near future. More sophisticated experiments are required for a pressurised-boiler system, and so a commercial pressurised system will take longer to produce.

Fluidised combustion is achieved by blowing a gas through a bed of granular, ash, so that each grain is buoyant and the ash becomes fluidised, i.e. behaves like a fluid. Solid, liquid or gaseous fuel may be injected into the fluidised bed and combustion is very rapid.

Other particles may be incorporated with the fuel or ash, e.g. graded limestone or dolomite, to absorb sulphur dioxide during combustion. Further advantages of the technique are that it allows fuel, irrespective of its ash or sulphur content, to be burned efficiently at high combustion intensities, and, since the combustion temperature is kept down and maintained by passing a working fluid through the heat-transfer tubes located in the fluidised bed, with minimum formation of corrosive products that attack the metals in a conventional boiler. Also, fluidised combustion allows the heat transfer area to be decreased, so that the overall plant size can be shrunk to produce significant cost savings.

Most important, however, is the fluidised-combustion boiler's ability to use any grade of fuel, a feature that is an important selling point, and will become even more important as the world's existing stocks of high-grade fuel become more expensive and eventually exhausted.



20 500 kg steam per hour fluidised combustion water-tube boiler. The boiler is a converted cross type at the Babcock & Wilcox Renfrew works. The fluidised bed is 0·9 m square and is designed to burn both solid and liquid fuels with facilities for sulphur retention during combustion

Packaged deal to be offered by Electrolux Laundry division

Electrolux (Commercial Equipment) Ltd. has formed a new division to deal with all aspects of onpremises laundry in hospitals, hotels, universities etc. The new On Premises Laundry Division will offer a complementary package concept covering cost saving projections, laundry design and planning, the supply and installation of equipment systems and the supply of linen and detergents.

As part of the OPL Division facilities Electrolux will also be running an advisory service, through which commercial organisations and local authorities with laundering problems can have, without obligation, an assessment of the benefits of OPL for their particular requirements.

Report on a course held at Regent Centre Hotel on the 12th March 1975

Efficient use of energy

After the Yom Kippur war of autumn 1973, it was realised by most oil importing countries that dependence on ever increasing quantities of oil, formerly cheap but now expensive, was unrealistic.

Energy will be increasingly expensive, energy conservation will be vital, and overall growth in demand will be reduced, possibly with some effect on life style. Everyone will consider the efficient use of energy from a different viewpoint, but I think we will agree on the importance and need to achieve the most effective use of a commodity that is rapidly increasing in cost and will steadily become less readily available in the years ahead.

There is really no excuse for tolerating wastage, and the essential steps in efficient use of energy should be examined as a matter of priority. These steps are broadly as follows:

- *identification of areas of waste*
- investigation and measurement of factors involved, where and when necessary
- quantification of losses
- recommendations and courses of action
- presentation of the case for action
- implementation of recommendations
- follow-up to ensure that savings are in fact being affected (strict management control)
- setting targets.

Energy savings fall into broad categories, and these are effected by:

- improved operation and maintenance
- modification and additions to existing plant involving small or modest capital outlay
- installation of new plants involving considerable outlay.

Economies can be made in all areas from the simple 'switch off something' approach to detailed surveys of heating efficiency and actions to correct anomalies. One thing that is perfectly clear is that authority and discipline are necessary to keep the programme moving. Regular monitoring is necessary to ensure that efforts are being maintained. Energy must be considered in all future planning projects, not only in the buildings, heating and insulation, but in the machines etc. to do the job.

Energy conservation has an unfortunate connotation, for regrettably many people immediately think of a 'switch off' campaign; not that switching off is unimportant, on the contrary, worthwhile savings can be obtained in this way. However, for a great many years energy cost reduction has a very important role, and perhaps if management could think in terms of money, the effect of energy savings and the concept of energy conservation would be better received. What must be publicised is that the rate of return on money invested in energy saving is often high.

Seldom are procedure changes simple, and experience shows that it is the combination of skills and viewpoints combined with the necessary compromises that produce energy savings. These energy savings are essentially practical and a great deal depends on the enthusiasm that must operate from the highest level down through the organisation. It is seldom a single or 'one-off' operation, and vigilance is required to ensure that efficiency standards are maintained.

Every organisation should set targets or yardsticks for assessing performance, and although improvements can often be effected by visual observation, irrespective of experience, no one can visually assess performance. Measurement of performance is essential. In some cases, continuous monitoring is justified, and in others periodic checking may be sufficient, but ultimately measurement is the essence of investigation and control.

Inevitably, when effecting economies, many problems have to be faced, and a great deal falls on the shoulders of all personnel. In many enterprises, looking after the energy 'bit' is a fulltime occupation, and someone is appointed for this specific task. It can be simply a part of the work's engineer or management's function, but, ultimately, whoever has the responsibility must have strict control. Superficial examination by experienced people will produce areas worthy of study, but often it will require close investigation to produce the evidence to enable savings to be quantified and the costs of implementing recommendations properly assessed, so that management can take decisions on a proper basis.

During the course it was said that there are basically two types of organisation. The first is well run from an organisational point of view, and strict control is maintained on costs. In these instances, whoever is responsible for the heating, keeps a very careful check on the various heating costs, making sure that the thermostats are correctly set. Time clocks called for heat over the shortest possible period through the normal working day, and the equipment itself is adequately maintained. There are regular temperature checks taken in working areas, so that if excessive temperatures are found in an area, remedial action can be taken immediately. There is also strict control over the use of doorways, which can add more to the heating costs than any other single factor in a building. In other words, there is *strict management control* on the use of resources.

The second type of organisation is clearly not well run and there is no control or check on heating costs. There is no attempt to repair or replace parts of a building structure that has been damaged and causes excessive heat loss. Doors are left open with the resultant ingress of cold air, apart from which plant is badly or not maintained at all, and usually time clocks are wrongly set and thermostats have been adjusted by the

---

This course was organised by the University of Newcastle upon Tyne in association with the Institute of Fuel and the Department of Energy.

personnel to excessively high temperatures. Considerable savings on heating costs can be achieved, but without strict management control, they would be totally ineffective.

A vital part of this total picture is the cost of heating office and working areas to provide a satisfactory environment. Heat is carried out of a building by air currents that flow through any available opening. This is caused by both wind effects and convection. The worst case is where ventilators installed for summer ventilation, cannot be closed. They release a large percentage of the heat supplied by the heating system. Heated air escapes through:

- noncontrollable ridge vents
- cracks in roof sheets and faulty glazing seals
- incorrectly sealed eaves joints
- powered extraction equipment installed for summer ventilation but left running during winter
- the entire roof fabric by increased conduction owing to excessively high roofspace temperatures.

Cold air enters through open or cracked windows, doors and general cracks in the building's structure. Doors left open unecessarily are obviously a major source of heat loss from a building.

The effect in terms of increased running costs can be substantial. In the past, numerous methods have been recommended to obviate this problem, but reaction has often been that the cost involved in implementation is excessive. Since fuel has become so expensive, this argument no longer holds. The following methods of solving or alleviating the problem are suggested: rubber doors, automatically closing doors, cold-air curtains and air locks. Conduction losses through the roof should be kept to a minimum, as, owing to natural convection, temperatures at roof level are always higher than those at working level. Heat transfer through a structure is directly related to the difference between inside and outside temperatures. Thus heat loss by conduction through the roof is far greater than through the walls, because of the greater temperature difference.

Three years ago, the most important factor considered

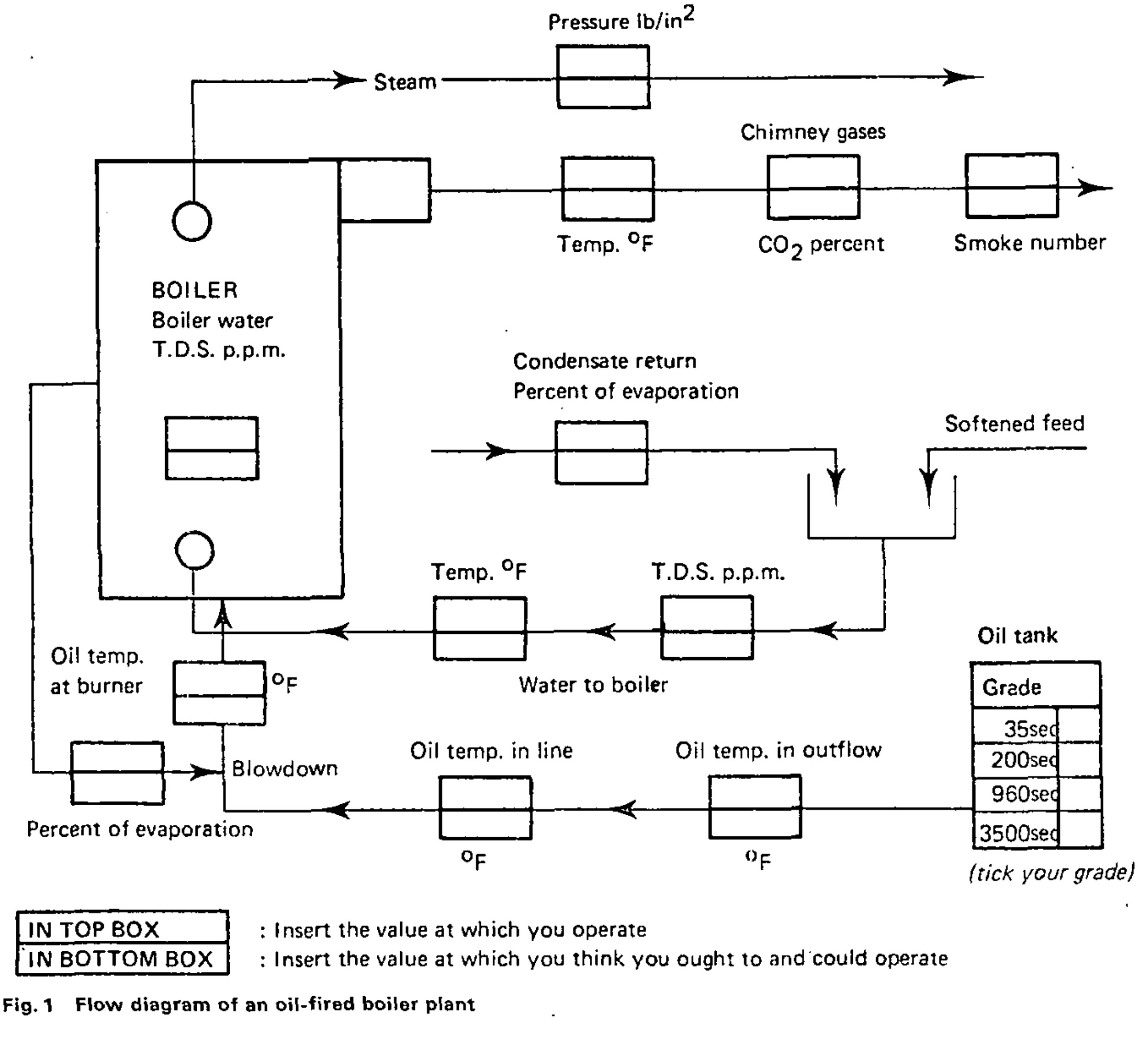


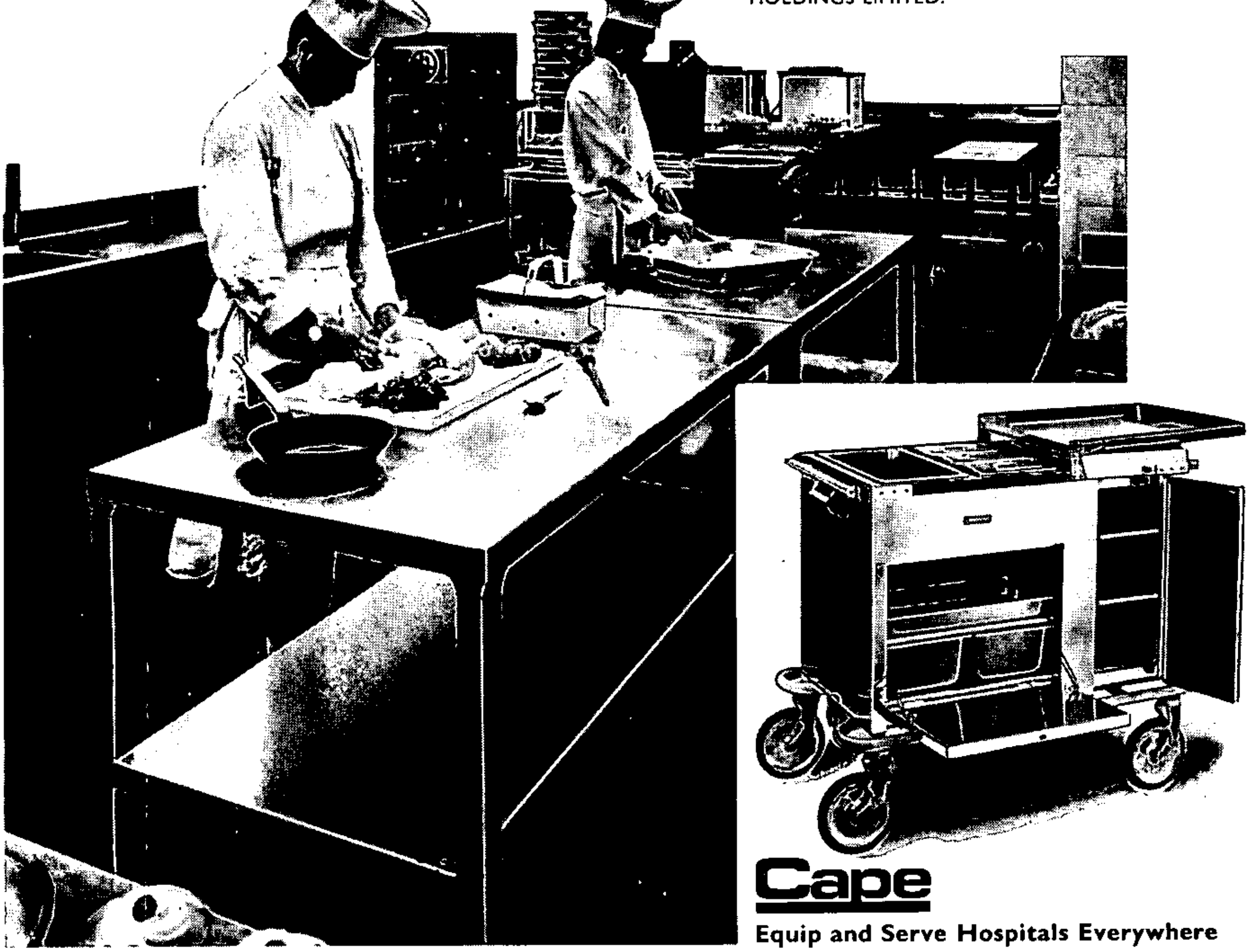
Fig. 1 Flow diagram of an oil-fired boiler plant

Cape

Food preparation and distribution equipment that's efficient, hygienic and hard-wearing

Cape distribution equipment ensures that food is maintained in optimum condition whilst being dispensed throughout the hospital.
The range includes bulk and plated meal conveyors, serving counters and collection and delivery trolleys.
Equipment for the preparation of food includes sink units, trays and containers and a wide range of tabling and storage racks.
For full details contact:-
CAPECRAFT LTD. The Cape, Warwick, England, CV34 5DL Tel: 0926 46421

A member company of CAPE (Warwick) HOLDINGS LIMITED.



Cape

Equip and Serve Hospitals Everywhere

at the time of selecting new plant would have been the capital cost, because, with relatively low interest rates and fuel costs, this represented a very big percentage of the total cost for heating over say a ten-year period. Now, with the enormously escalated cost of fuel, and increasing interest rates, the balance has changed very considerably. It is vitally important to select a system that gives the highest possible efficiency, and a constant efficiency over its useful life. As we are now aware of the impending energy crisis and of the need for decreasing fuel and energy consumption, there is some scope for reducing boiler-fuel consumption.

It is clear that what was formerly the cheapest available fossil fuel, oil, will in future be the most expensive with the price of crude oil having risen from \$3 a barrel in early 1973 to \$11 a barrel in 1974.

Heat means money, and the most economic and profitable operation of plant is of prime importance. To this end, every attempt should be made to recover as much of the available heat in the fuel as possible, in addition to that released in the boiler or furnace. This can be achieved by using the hot flue gas to preheat the combustion air in a preheater, or the feed water in an economiser, or possibly to raise low-grade steam in a waste-heat boiler, if required.

Excess air and exit gas temperature are the main factors affecting boiler efficiency. Exit temperature can be kept low by keeping the heating surfaces of the boiler clean, and using 20% excess air (13% CO_2) in the burner as a figure at which to aim. This latter point is realistic only from full load down to about half load, below which it will be found that 20% excess air will result in poor combustion exhibited by smoke and perhaps burner instability. There are two reasons for this. First, as load decreases, the quantity of air flowing through the burner and hence its velocity decreases. The effectiveness of mixing fuel and air for combustion depends on the air velocity in the burner, and if this is too low poor combustion will result. It is for this reason that excess air needs to be increased at low load to maintain, at least in part, the optimum velocity in the burner. Secondly, the air damper will be moved by rods or cables and joints will be involved. These devices possess some degree of lost motion (which will tend to increase with wear), and the burner will need to be set with sufficient excess air to ensure that, owing to imperfections in the linkage, smoke will not be produced or the flame become unstable.

Losses due to partially burned fuel oil should be well below 1% of the fuel fired and will be shown up by smoke production. Smoke visible at the chimney outlet can mean heavy losses, and smoke numbers exceeding about five on the Shell–Bacharach scale should not be tolerated. Smoke also settles on the heating surface as soot—a thickness of only 0·2 mm can cause the exit temperature to rise by some hundred degrees centigrade and thus cause a substantial loss. It may be noted that the efficiency drops by 1% for every 20 deg C rise in exit temperature.

A boiler working for long periods at low load will show an efficiency well below the maker's claim. No amount of tuning can alter this, but modification of the operating schedule of the boiler and user plant might improve matters. Persistent long periods on low load indicate the need for an additional small boiler to cover such periods.

Fig. 1 is a flow diagram of a boiler plant being operated on oil. In each flow line there is a box divided into an upper and a lower half. In the top half, fill in a figure appropriate to your present average working conditions, then:

(*a*) Work out the efficiency of the boiler plant by calculating the losses and deducting the total of these from 100%. Call this 'efficiency 1'. In the bottom half of the box, fill in an improved figure at which you are prepared to work.

(*b*) Recalculate the efficiency of the plant on these new figures, giving reasons for any limitations you impose. Call this 'efficiency 2'. State the adjustments you would make to achieve the improved efficiency.

NOTE: It is preferable for you to use the actual figures in (*a*). This exercise can bring to light some very interesting points that are indeed food for thought.

A. R. PATTINSON, T.Eng., M.I.Hosp.E.

RoSPA guide to safety

The Royal Society for the Prevention of Accidents has a guide setting out the obligations of management under the new Health & Safety at Work Act. The booklet, entitled *Safety at work—a guide for management*, discusses the safety committee and joint consultation; the investigation of accidents and dangerous occurrences; statistics; safety techniques such as damage control, safety sampling, incentive schemes, total loss control and safety audits; various ways of influencing personnel through the media of clubs, publications and posters, safety weeks, works notice boards, films and lectures. Safety in commerical premises and fire hazards are also dealt with.

Safety at work is available at £1·12 per copy from RoSPA, Royal Oak Centre, Brighton Road, Purley, Surrey CR2 2UR.

Fuel firing course

A fuel firing course designed to instruct engineers, supervisory staff, technical personnel and operators associated with, or responsible for, fuel-fired plant, in the safe, efficient and economic operation of equipment, will be conducted by the National Industrial Fuel Efficiency Service Ltd. at the London Park Hotel, Elephant and Castle, London, SE11 4QU on the following inclusive dates:

December 8th–12th 1975
January 19th–23rd 1976
February 16th–20th 1976
March 15th–19th 1976
April 26th–30th 1976
May 17th–21st 1976

Among the proposed subjects will be: characteristics and combustion of solid, liquid and gaseous fuels; fuel storage and handling; coal-burning, gas-burning and oil-burning equipment; dual-fuel firing; furnaces; gas-burner and oil-burner controls; smut emission and low temperature corrosion; flues, chimneys and Clean Air Act regulations; steam boilers; packaged and hot-water boilers; water treatment; boiler and burner efficiency and general fuel economy.

The fee per member, including accommodation (subject to any increase in hotel charges above current rates), is £150 per course (excluding v.a.t.).

Enquiries and bookings should be made to R. V. Evans, the course director, National Industrial Fuel Efficiency Service, Orchard House, 14 Great Smith St., London, SW1P 3BV, telephone 01-222 0961.

Product news

Silver-recovery process

The Silver King Manual silver-recovery unit can extract either part or all of the silver contained in the hand-tank fixing solutions used in photography, film and X ray laboratories. The machine circulates the fixing solution through flexible pipes to the recovery unit and, through a

preset time control, ensures that only the desired amount of silver is removed from the solution before it is returned to the fixing tank. The manufacturers estimate that, for example, the unit will recover 30 troy oz of silver from 1000 35 x 43cm medical X ray sheets.
Photographic Silver Recovery Ltd., Wilmott House, Hampden Road, London N8 OHG, England

Steam air-humidification equipment

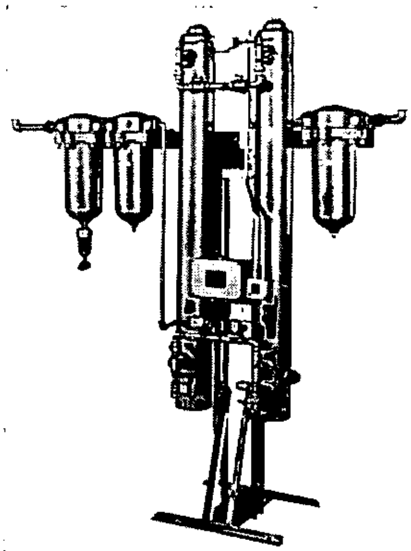
The D100 and D750 air-humidification units are suitable for duct installation in any heating, ventilating or air-conditioning system that uses a steam boiler as the heat source. The units provide sterile condensation-free outputs of 120 kg/h maximum and 750 kg/h maximum, respectively, at saturated steam pressures of 0·2–4 bar. Both models can be used with all pneumatic, electric or electromagnetic regulating systems, provided that the control circuit will automatically close, or keep closed, the regulating valve if no control voltage is present, no compressed air is available, no air flow is present in the duct, the operating temperature is inadequate, or the maximum moisture monitor responds. The systems are suitable for installation in both new and existing air-delivery systems.
Fecon Ltd., Fecon House, Garth Road, Morden, Surrey, England

Building automation system

The VISONIK 100 building-automation system has a modular design to facilitate tailoring of the system to suit specific installation requirements while allowing choice in the selection of functions. A print-out can be obtained at any time of individual points, plants, selected parameters, status information, and three priority print-outs for alarms. It is possible to connect up to 50 information points of any type of function to each substation. At the control desk, alarms are automatically displayed, signalled acoustically and printed out. A switching programme allows motors, lighting or plant to be switched on and off at predetermined times. Various parameters (temperature, humidity, pressure) can be displayed and recorded; set points can be remotely controlled and up to 100 subplants can be selected using a slide projection system.
Landis & Gyr-Billman Ltd., Victoria Road, North Acton, London W3 6XS, England

Air purification sets

The Doulton–Dollinger air purification units passes air through four stages: a prefilter to remove gross contamination, an active carbon bed to remove oil vapour, a



continuously reactivated duplex dryer to remove moisture and an after filter to remove remaining particulate matter down to 0·3 μm. The ten units in the standard range will handle flows from 0·28 to 28·4 m^3/min at a pressure of 7 kg/cm^2.
Doulton Industrial Products Ltd., Industrial Filtration & Engineering Division, Filleybrooks, Stone, Staffs, England

Flexible conveyors

Two flexible, gravity-feed roller conveyor systems made in Japan will be sold in the UK as Roller carpet and Roller way. P.V.C. roller bearings, polypropylene support members and a 105 mm pitch help to minimise noise. Corner sections adjustable to any angle will be available. The maximum capacity of Roller carpet is 100 kg/m. Roller way is similar in construction to the carpet, but it can be flexed horizontally and laid around curves. It is not suitable for suspension above ground level.
Mitsui Machinery Sales (UK) Ltd.

Filtration dictionary

A working group of the Filtration Society has compiled a dictionary listing over 550 definitions of terms used in filtration technology; including liquid/solid separation, air/gas/dust filtration, filter media, equipment engineering, particle technology and contamination control. The dictionary is £5 to members of the Filtration Society and £7 to nonmembers.
Uplands Press Ltd., 1 Katharine Street, Croydon CR9 1LB, England

Waste compactor

The W2 waste compactor uses a screw-driven force of 3t to reduce waste, on average, to one-fifth of its original bulk. There are two methods of entry: a chute door (610mm x 458mm) at arm height for normal throw-away rubbish and a large-capacity bin (533mm x 533mm x 533mm), which slides out at ground level for the intake of heavy or awkward loads. In both cases rubbish is ultimately compressed into 500mm-square plastic-wrapped cubes. The rubbish in the compactor is continually subjected to compaction and remains sealed under the ram.
Columbus Dixon Ltd., Lancelot Road, Wembley, London, England

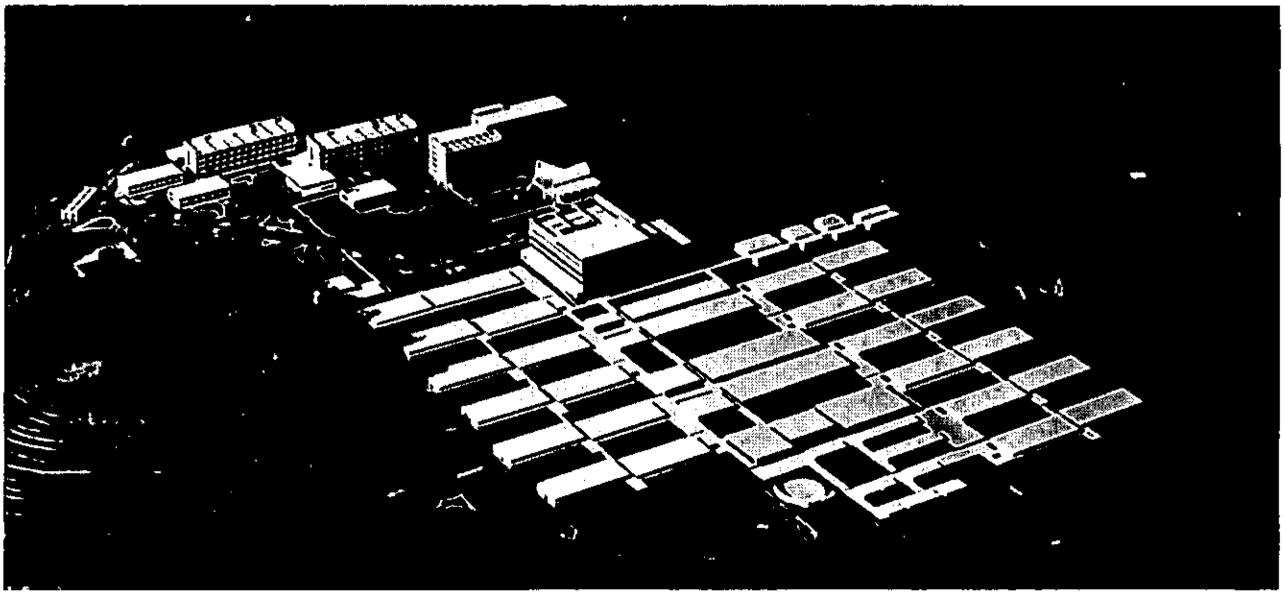


Fig. 1 Model of a high-capacity rehabilitation centre outside Athens

Rehabilitation centres for handicapped children

by AFRODITE KOUROUKLIS

The design of centres for subnormal children poses special problems for the architect. In this article, the author first discusses the problems faced by the subnormal child and then elucidates the solutions that the architect has to find when designing buildings for these children. The solutions discussed in the early part of the article are illustrated by reference to a new centre for subnormal children now being built near Athens.

Rehabilitation centres for disabled children are of special interest for their architectural and technological features. At the same time it is a subject that emphasises the value of human existence above everything else, a fact that often escapes our notice in this age of vertiginous scientific and technological developments.

Before presenting the subject I would like to specify the type of rehabilitation centres and the form of disability to which I will refer.

The subject covered here is the subnormal child and, in particular, the spastic child.

The term subnormal is a general definition which encompasses, directly or indirectly, all forms of handicap: motor, psychological or mental.

The word disabled will be used, as is normally the case, in the general sense to indicate a certain defect or abnormality since it is thus possible to cover the many varied forms of disability, several of which are usually concomitant, especially in spastics.

To understand and study the subject we must know

- what is a spastic
- what special care he requires
- the importance of the correct diagnosis and classification of cases
- the importance (for prevention) of parallel research in the causes of the disease.

Spastics are individuals suffering from cerebral palsy occurring at a young age in the form of motor and postural ataxia and due to a lesion or an impairment in the physiological development of the part of the brain which controls movement. Although the causes of this lesion are not yet known, statistical data show that it has no relationship to sex, race, age of parents or social background and affects humanity as a whole.

These children, although their mental development is above average, because they cannot control the expression on their face, very frequently look like imbeciles or fools. This complicates their condition even further and leads to their deterioration into other forms of disability, of a mental or psychological character (co-operativeness, adaptation to the environment etc.).

It is well known that even a simple physical infirmity can create considerable emotional problems if the disabled person is not helped so that he can adapt to his disability and learn to face and control it.

Sigmund Freud in 1901 in his paper 'The psychopathology of everyday life' emphasised how superficial

This article is based on a paper presented at the 3rd International Congress of Hospital Engineering, Athens, 1974

and almost inexistent is the distance, until then considered as insurmountable, between physiological and nonphysiological mental conditions; and he was not referring to disabled, but to healthy persons.

Until quite recently, there was complete lack of knowledge of the disease, which was often rejected as such even by the closest relatives, who tried to hide away the disabled person and isolate him from society. Today, the situation has changed and it is now accepted internationally that mentally retarded persons have the fundamental right to receive adequate treatment (training, exercise and rehabilitation).

In almost all countries today, there are special services and organisations for the mentally retarded and there are provisions drawn up by the United Nations stipulating their general and special rights and the application and observation of the required treatment.

In spite of all this and notwithstanding the campaigns and efforts of the World Health Organisation and the various agencies, a wider publicity is required and information and familiarisation of the public with this problem because there are still deep-rooted prejudices even today and even in developed countries.

People are often afraid of mixing with retarded individuals because they believe that they are maniacs, or aggressive. We now know how untrue these beliefs are and what untoward effects they have on these individuals who are completely harmless, sensitive and emotional in their effort to reach a certain equilibrium

Buildings index letters as in Fig. 2

ΠΥ–ΚΔ	special unit hospital e.c.t.
ΚΛ	children's accommodation
ΕΘ	central department: work therapy
ΦΘ	central department: physiotherapy
ΘΦγ	central department: watertherapy, swimming pool
Α	school's auditorium
ΣΧ	school
ΥΘ	school's open-air theatre
ΚΔ	outdoor swimming pool
Κ	central multistorey building
ΤΣ	technical workshops
Ν	church
ΑΝ	nurses' home
ΣΑΝΕ	visiting sister nurses' home and school
ΣΒ	nursery nurses' home and school
ΟΙ	doctors' quarters
ΟΦΜ	visiting mothers' accommodation
ΟΠ	staff members' (male, female) home
ΝΤΠ	kindergarten for staff's children
Θ	porter's lodge
ΥΚ	existing building (directors, guests)
Ε	small church (existing)

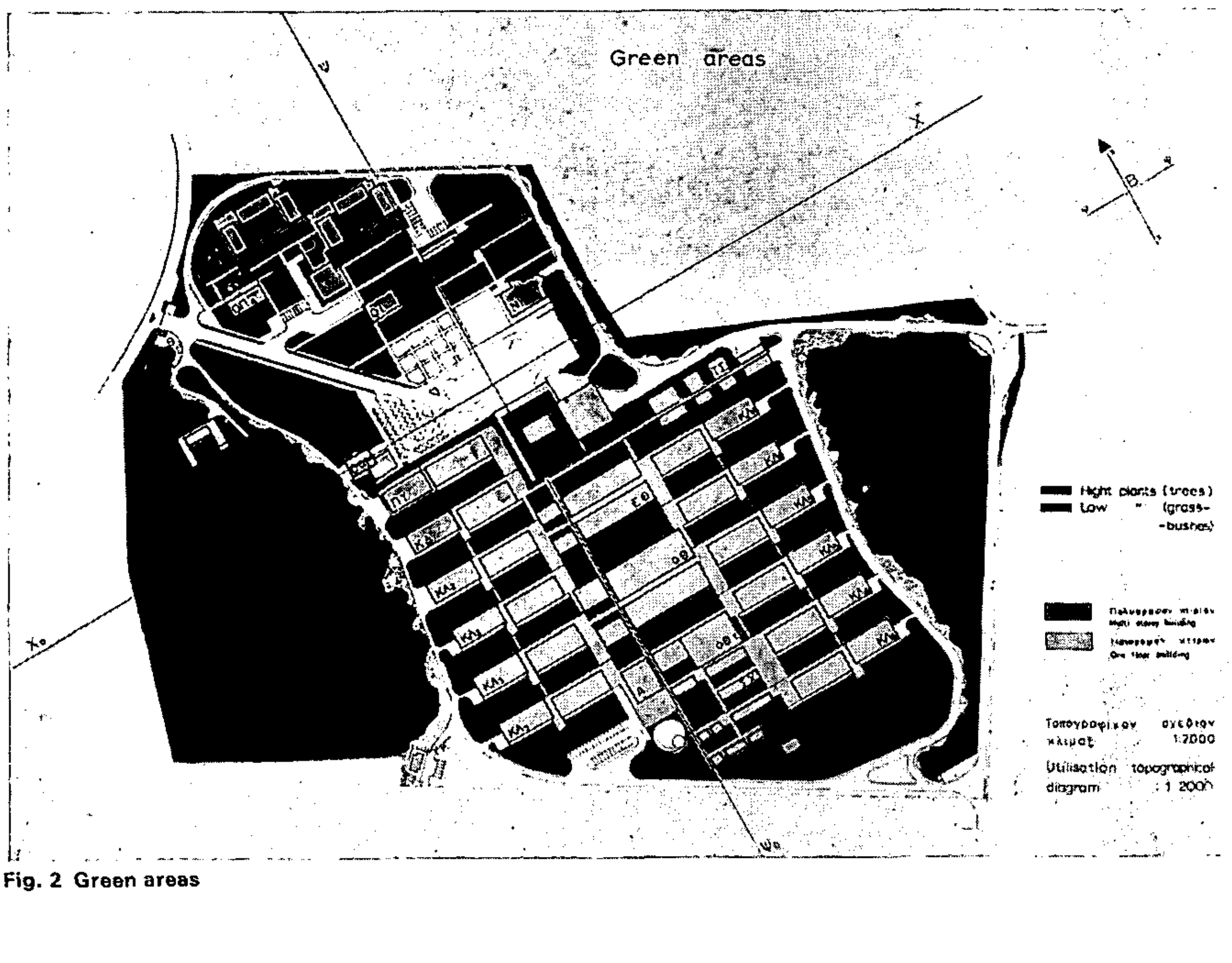


Fig. 2 Green areas

for which it is essential that they mingle with society and be accepted by it.

A common characteristic of all children known as retarded is a lack of harmony between the various components of their personality. The purpose of the people working for the creation and operation of these specialised centres is to restore this harmony, and to help these children, whatever their disability, to lead a normal life, to become integrated in society in the best possible way and make use of their capacities, even if these are severely impaired.

The importance of this question as a humanistic, social and governmental problem is now fully understood, and adopted solutions are an indication of the degree of development of a country. The social element involved in mental health clearly arises from the formal definition of mental health, described as 'the correct adaptation of a person's mind to his environment and depending on physical, psychological and social factors'.

Buildings and the environment as a whole can have a positive effect on all forms of child disability as regards health, education and development. However, whereas for simple physical handicaps there are standard facilities that can easily be completed with logic and some simple measurements, there are no such standards for the establishment of centres for persons suffering from complex handicaps. And handicaps are in most cases complex, one usually resulting from the other.

It would therefore be sheer utopism to believe that one can fully conceive the needs, the thoughts and feelings of children of different ages suffering from varying handicaps in form and degree.

This does not mean however that the problem cannot be solved and many useful results achieved in the effort to create the best possible environment.

The architect who will undertake to create such establishments must, to be successful, use all his understanding, sympathy and imagination and be ready above all to carry out extensive studies and research.

To examine the problem in depth he must first of all study existing buildings in his country or abroad and acquire personal experience of disabled children and their needs. He must study pertinent literature, keep himself informed on the work carried out by other people and be ready to co-operate, with engineers, doctors, psychologists, sociologists, educationists, administrative staff etc.

At the same time, the architect should be careful not to be influenced by given solutions and concepts, so as to be led to copy existing systems. He should not forget that the whole subject is very complex and notwithstanding continuous research in this field, there are no certain criteria that could be used. To be truly creative the architect should never fully rely on other people's ideas or embrace the views of isolated designers but should always base his decision on his personal judgement and evaluation for the objective consideration of any requirements.

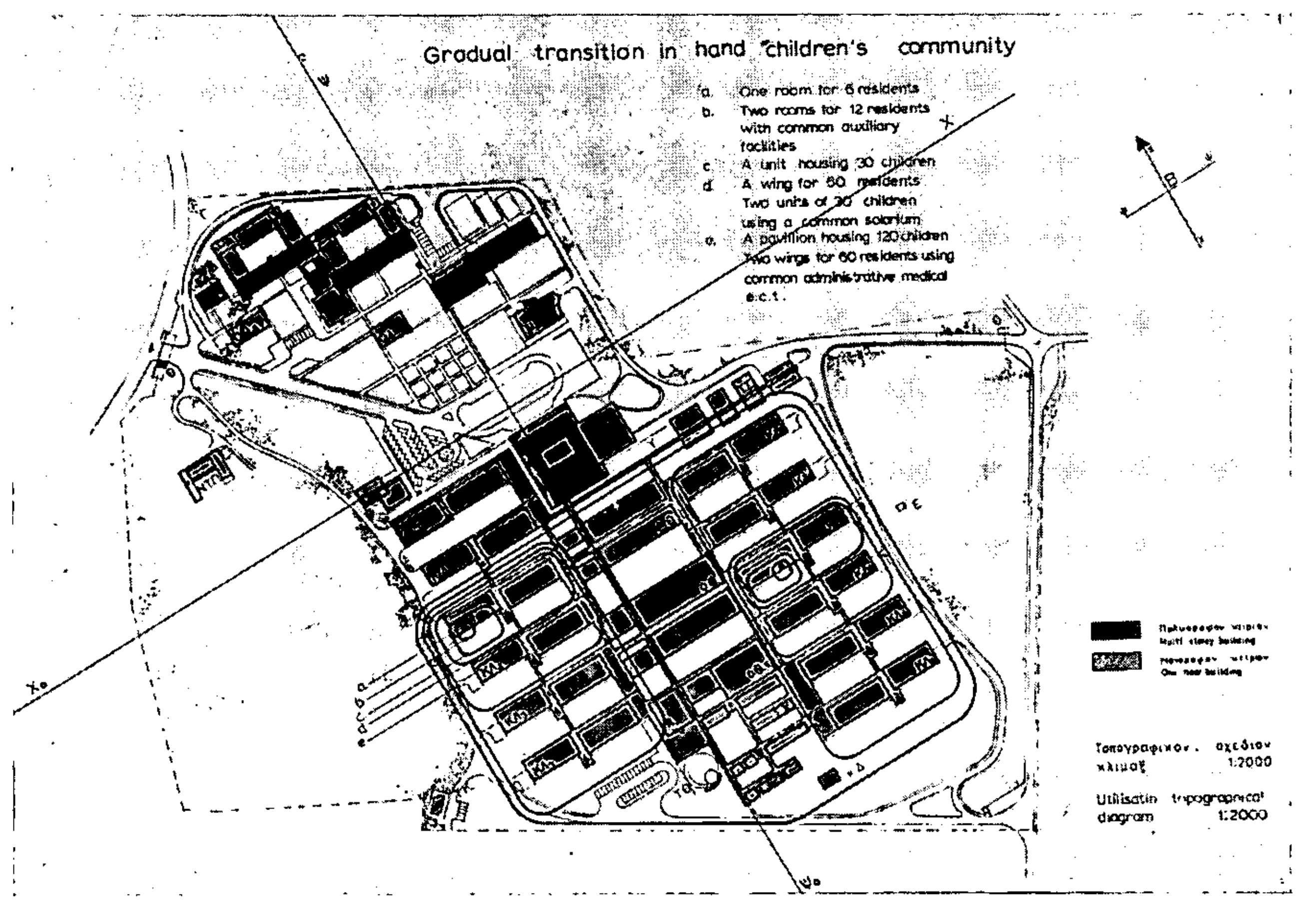


Fig. 3 Gradual transition in hand children's community

Co-operation with all other responsible persons should be based on respect and understanding. Since quite frequently the various specialists (who aré not technical people) cannot clearly state what their need is, the architect must master the necessary knowledge in order to understand their needs. He should be particularly careful that, in his efforts for better understanding and research, he does not neglect some specialised fields, since it would be a great mistake to base his work on data derived from his personal experience and not on the research work carried out by specialised researchers concerning behavioural aspects etc.

Types of centre

We can distinguish the following types of rehabilitation centre for disabled children:

(*a*) residential centres
(*b*) training schools
(*c*) hostels
(*d*) sheltered workshops
(*e*) special-care units.

I am not going to refer here to the appropriateness of each type, to their design and their integration in various care programmes, since criteria governing the selection of one or the other type, their operation and construction may vary greatly from country to country. These criteria will greatly depend on the structure of each country, its level of development, the form of administration and the social and economic conditions in that country.

When modern developments are being considered, it is essential to take into account the background of each country so as to make sound decisions. For example, in highly developed countries we find rehabilitation centres of the training-school rather than the residential-home type, because the need of children to be in contact with their family has been correctly understood and evaluated. This requires of course a certain standard of living, more available funds, a higher degree of cultural development in the family and the child's environment so that appropriate care and behaviour may be achieved. It is evident that, in the absence of these conditions, the adoption of such a solution would not be possible and were it applied it would most certainly neutralise the beneficial effects resulting from the children's stay in the rehabilitation centre. Further, it may create severe mental shock to the children and feelings of anxiety and a burden in the family. However, in spite of the social-welfare systems in force varying in each country, the difference in mentality deriving from the climate and the way of life, economic factors etc., which all greatly influence planning of such centres, there is a general recogniton and common understanding of the basic problem.

We are constantly being reminded of how special and delicate the problem of architectural design is and and of the importance of the psychological factor and the need to create the appropriate environment both

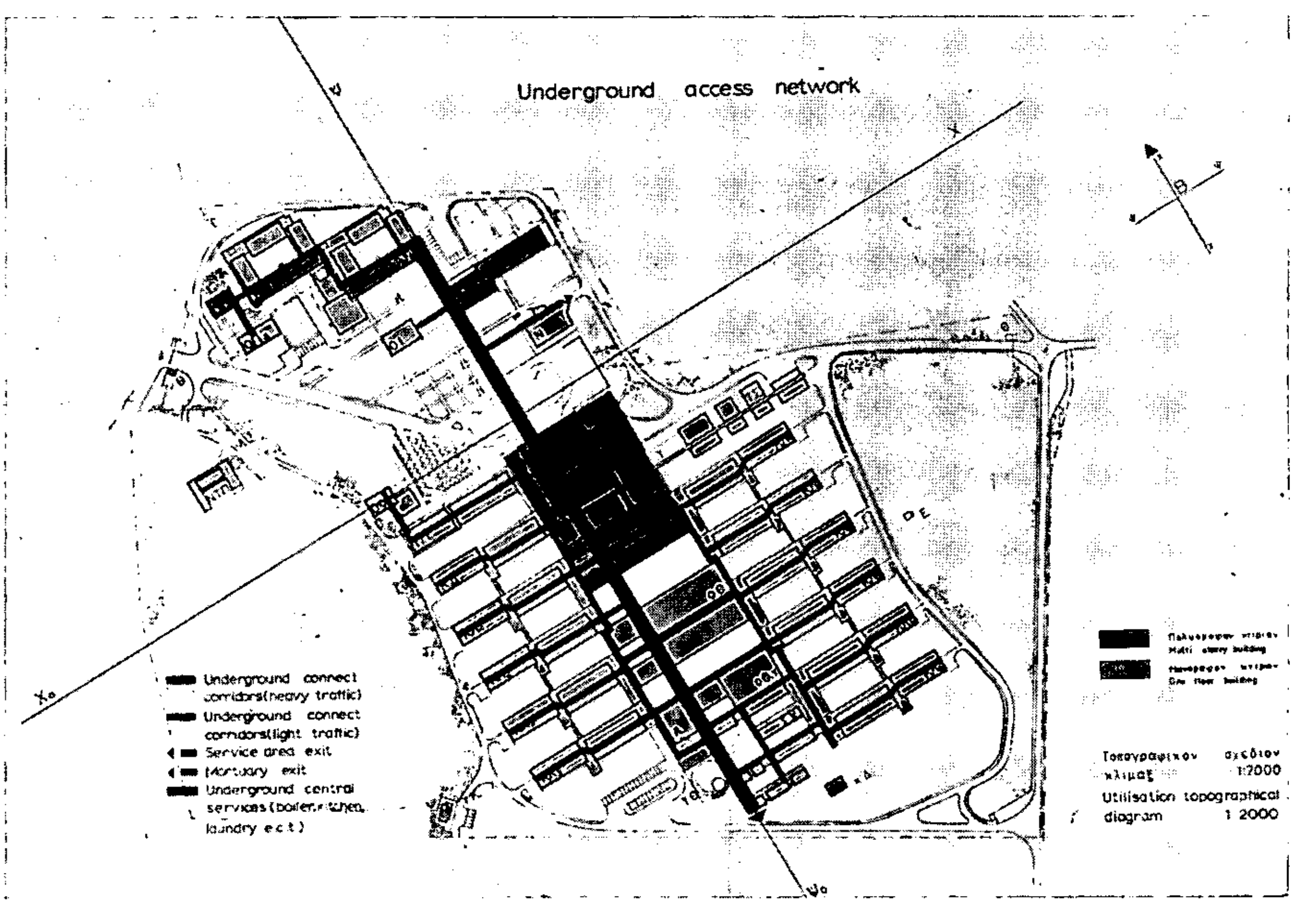


Fig. 4 Underground access network

for the children and the nursing staff. To be successful the final design should meet the following requirements:

(*a*) *As regards the children*

(i) It should be built to the children's measure (so as not to frighten them).

(ii) Facilities should alleviate and not emphasise their handicap.

(iii) It should create a family atmosphere which is of major psychological importance.

(*b*) *As regards the staff*

(i) Facilities should be designed so as to provide maximum assistance in their work.

(ii) Pleasant working surroundings should be created.

Special efforts are made so as to provide the staff with all necessary amenities, since their work is highly responsible and tiring. The importance of the staff's behaviour for the treatment of disabled children has been recognised and for this reason it is essential that their working condition be such as not to affect their morale.

Disabled children are very sensitive and the people working with these children face a most responsible and tiring task. So both the children and the staff need a special environment.

An appropriate environment

When an architect speaks of 'creating an environment' he is using this term in a broad sense:

(*a*) the large-scale environment (buildings, open space)

(*b*) the small-scale environment (structural elements, equipment, fittings etc.).

He is also using it in an integrated sense as regards the various elements through which we become aware of the environment, i.e. form, lighting, heat, sound, texture of materials, colour etc.

All these factors are of great importance and it is believed that they can even serve as diagnostic and therapeutic tools in the treatment of disabled children.

Apart from standard facilities, there are some general principles that can be used in the creation of the appropriate environment and which are the result of many years experience:

- the creation of an atmosphere of security and familiarity
- the elimination of uncertainty
- sincerity in expression
- encouragement and assistance to children to facilitate their participation.

To achieve the above objectives the following solutions are available:

(*a*) Avoid the institutional atmosphere: no padlocked doors, overt prohibitions, impersonal and uniform elements; protection and security measures should be as much as possible invisible and elements used should not be of a standard type but suited to each group of handicaps.

(*b*) Light or semipermanent installations should be avoided since they create a feeling of insecurity.

(*c*) Everything should be viewed from the level of the

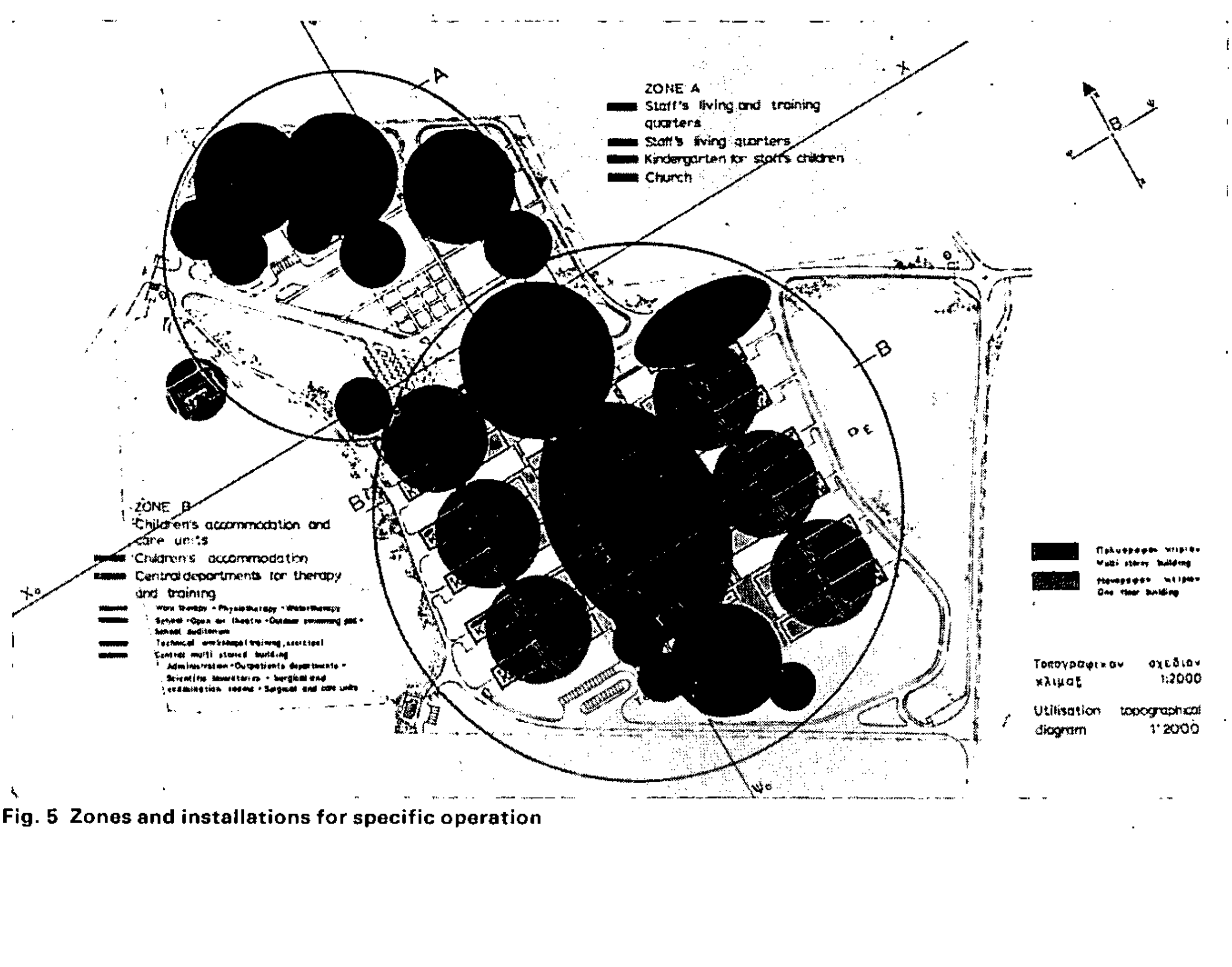


Fig. 5 Zones and installations for specific operation

children so as to create an atmosphere of security, understanding and familiarity.

(*d*) Ambiguities should be avoided: space, surfaces, inside and outside should be clearly delimited. There should be clear indication of transition and distinct zones for each specific operation and use; doors should open in the same way, with a similar system (handles etc.) of easy and adequate operation. Solid, confidence-inspiring materials should be used. Lighting through invisible windows etc. should be avoided since it causes feelings of uncertainty.

(*e*) Attractive elements and toys, for outdoors and indoors, water games of any type, of special attraction for children should be used.

All environmental elements should exercise the child mentally and physically so that, through everyday activities and play, children may reach the highest possible levels of self-service, self-expression and learning. Learning should be based on motivation and not on coercive methods. Much attention should be given to the correct selection, as far as security is concerned, in order to avoid accidents that might lead to worse psychological problems (phobias and discouragement).

An element of major importance is the flexibility of all facilities, buildings, materials, articles etc., allowing for modification and change, especially as much equipment for the handicapped is still going through the experimental stage.

An important question that has lately given rise to severe controversy is the appropriate size for the centres. In the past decade, in the developed countries of Europe and America, people favoured small rehabilitation units for disabled children. Large units were thought to be incompatible with modern concepts, possibly because excessive importance was given to the need for creating a family atmosphere.

In the United Kingdom and other European countries, apart from this tendency and probably because of special circumstances (e.g. distribution of population) rather standardised centres are being built that can receive 60–130 children. These centres are divided according to existing needs into training schools, hostels, sheltered workshops, special-care units, or residential centres distributed in several areas, in the neighbourhood of general hospitals that service these centres.

During that same period, many researchers supported the creation of larger centres combining these individual forms.

The creation of large complex centres presents many substantial advantages and today, as a result of the experience gained from the foundation of small units over a decade and subsequent research, study and statistical work, there is I think a definite orientation toward this view.

The construction of a rehabilitation centre for disabled children in the form of a complex structure, including all required care units, presents the following advantages, on the basis of requirements considered as important for the rehabilitation of handicapped children. Such a centre provides the opportunity:

(*a*) for a more correct diagnosis under appropriate conditions

(*b*) for separating and integrating children in exercise, treatment, learning and vocational training groups in the most appropriate way

(*c*) for staff training in a great variety of cases in the same centre

(*d*) for distributing and redistributing children in appropriate care units without any administrative problems and untoward effects on the children's psychology

(*e*) for creating a society, through transition from smaller to larger and even larger groups, greatly contributing to the children's social adaptation.

Finally there are some evident administrative and economic advantages (concerning construction, operation and maintenance) because of the existence of central treatment and residence facilities which allow for economy in staff, equipment and facilities, without jeopardising the level of care services provided, through the channelling of children at intervals to the various departments (physiotherapy, work therapy, school etc.) The only danger that arises from the establishment of large complex rehabilitation centres and of which we should be aware is the abolition of the family atmosphere, which is so important for the psychology of the child. This is the reason why the architect must be extremely careful as far as this matter is concerned.

PIKPA rehabilitation centre

In Greece today there are a certain number of institutions working for the rehabilitation of disabled children in general. Although the State, through competent agencies, has shown sufficient understanding of the problem involved and granted its financial support, one cannot say that in Greece today the available facilities and the existing possibilities are absolutely satisfactory.

A very promising event is the foundation by PIKPA of the new, high-capacity rehabilitation centre, at Aghioi Anargyroi, in the vicinity of Athens.

The Patriotic Foundation of Social Welfare and Assistance known as PIKPA is the official state organisation 'for the protection of motherhood and childhood' and was founded in 1914 with this exclusive object; it is supervised and subsidised by the Ministry of Social Services. It is a founder member of the International Child Protection Union (with headquarters in Geneva) and several international organisations and is an associated member of the society known as Rehabilitation International of New York.

Apart from its activities in the field of handicapped children, PIKPA in existing similar centres employs a highly qualified and numerous staff and operates training schools for specialised personnel as well as visiting-nurses and nursery-nurses training college.

PIKPA keeps abreast of international efforts and modern concepts for the protection of children and works for the rehabilitation of disabled children in an ideal atmosphere of understanding and fulfilment.

In the field of prevention, PIKPA has founded many supporting institutions: counselling centres for pregnant women and mothers, counselling stations, children's dispensaries, polyclinics, convalescence homes etc. and itinerant medicosocial units for the rural areas.

The new rehabilitation centre founded by PIKPA will receive children up to 16 years of age with motor handicaps, of various causation. The great majority of children housed in this centre are spastics (80%); the remaining 20% include children with other forms of motor handicap, resulting from orthopaedic lesions and other causes (congenital defects, accidents, obstetric paralysis etc.).

The centre receives children with moderate mental handicap, i.e. children of rather average intelligence whose condition may perhaps be improved or even cured.

It is a residential centre which caters for 650 children and includes:

(*a*) the children's accommodation with all auxiliary facilities
(*b*) a central department with extensive facilities for:
  (i) physiotherapy
  (ii) watertherapy with a special swimming pool
  (iii) work therapy
  (iv) a school
(*c*) an open-air theatre, outdoor swimming pool etc.
(*d*) large technical workshops for training and exercise
(*e*) a central multistorey building, including:
  (i) administration
  (ii) outpatients departments
  (iii) scientific laboratories and examination rooms
  (iv) surgical department, three operation theatres etc.
  (v) a surgical care unit (clinic) for 30 children
(*f*) a church for 400 people
(*g*) living quarters (in separate buildings) for
  (i) 400 nurses
  (ii) 20 doctors
  (iii) 170 staff members (male and female)
  (iv) visiting mothers (30 persons)
(*h*) homes and schools for approximately 200 nurses (sister nurses, visiting nurses, nursery nurses)
(*i*) kindergarten for the staff's children
(j) several auxiliary facilities.

The State has been planning this centre since 1968, in order to transfer and expand the existing PIKPA rehabilitation centre at Voula. The design was assigned following a competition among architects.

When we had undertaken the project we tried to understand the role that we would have to fulfil, as architects, for the creation of the rehabilitation centre and in co-operation with the other members of the planning team, which included officials from PIKPA and the Ministry of Social Service, we first of all elaborated the final plan on the basis of which the whole project has been designed.

The decision to create a large integrated centre was arrived at after thorough investigation and study and frequent visits to similar centres all over Europe and we were finally convinced of the appropriateness of this solution because of the aforementioned objective advantages, especially for Greek conditions.

In designing the whole project, we were extremely careful to avoid, because of the large size, the various hazards and to include on the other hand all the elements which are considered necessary to the creation of the appropriate environment (larger and smaller).

As regards the function and the larger environment one could make the following observations.

The positions of the various buildings in the available area have been selected so as to maintain the natural environment with required orientation, correct relation to one another, adequate communication networks to facilitate traffic; all buildings are integrated within a uniform alignment module so as to give an impression of order and uniformity.

An intentional segregation of the whole complex into two distinct zones has been provided. One zone includes accommodation and children's care units with all related facilities and the second the staff's living and training quarters. In this way, the separation of the resident staff from the nursing departments has been achieved; they are housed in independent buildings and thus one has the impression of a co-operating society and not of a compact rigid centre.

Clinics have been built in the form of pavilions on either side of the central departments (work therapy, physiotherapy, school etc.) and are connected by means of covered corridors with them in order to allow for the movement of children and staff under any weather conditions. In this way the feelings of anxiety aroused in children when they have to pass through outdoor areas will be avoided.

Each pavilion is made up of four autonomous units including all necessary space and facilities: dining room, recreation room, games, work therapy and physiotherapy facilities and a room for visiting mothers. Inside each unit there are wide, straight corridors which facilitate the movement and orientation of retarded children by allowing them to perceive the unit as a whole. However, each second door leading to the wards has been built in recess so as to create smaller sections and avoid the frightening impression given by a straight corridor (which is not recommended). Natural lighting through ceiling openings etc. also contributes to the desired effect.

Units are built in pairs, with two wings, and use common administrative medical space.

Each unit houses 30 children. In each room there are six children of different age so that older children may take care of the youngest ones (family groups). There are common auxiliary facilities for each two wards (12 children). Each unit has its own courtyard for outdoor games etc.

In this way we have succeeded in creating a community and there is a gradual transition, starting from the individual space each child has in his room to the family group of six, then 12, 30, 60 (achieved through communicating courtyards and a common solarium) to larger groups in the treatment and exercise departments, school, theatre, church, pool and other outdoor facilities.

There are distinct zones of clear-cut access and a well defined operation. We believe that truth helps the children a lot in developing their liveliness and willingness to co-operate. We believe that children should be fully aware of the fact that people who love them try to help them overcome their difficulties, for in this way they are more willing to co-operate.

In the whole complex we have generally avoided the chaotic and depressing institutional character, without however trying to dissimulate its purpose. We believe that a home character should prevail in some areas (dormitories and circulation areas) but an institution is not a home and its objective should be apparent, as specified in the recommendations issued on this matter by the World Health Organisation. The various

buildings have been designed down to the smallest detail so that they can be easily used by children with various motor handicaps, in accordance with international standards, and they have been integrated in a 1025 module. This was found to be the most appropriate as meeting both international and local requirements and allowing for the better use of materials (tile lining etc.) and required facilities (sanitary etc.). This solution provides advantages in construction, operation and flexibility which are of capital importance, since it provides for the harmonious arrangement of wooden forms, plain facades, easy positioning of the various installations and versatility of the whole composition.

The whole project is permeated by a spirit of simplicity and sincerity and incorporates all aspects which are today considered as correct and constructive. Because of its flexibility, any adjustments and modifications that may be required in view of future developments can be brought very easily, as well as any addition of elements which cannot be included in the formal study or which may be decided during construction or following special tests with the children who will be using the new buildings as they are already housed in the old facilities.

I have tried to present in their proper order present developments and views on the subject as we were able to study them in our effort to find the information we required as architects directly involved with this problem.

I would like to conclude by reminding you once more of the essence of the whole problem: the need for a wider understanding and effort for the adaptation and rehabilitation of disabled persons in life and society.

Centres de reeducation pour enfants handicapes

La conception de centres pour enfants handicapés pose des problèmes particuliers pour l'architecte. Dans cet article, l'auteur expose d'abord les problèmes auxquels doit faire face l'enfant handicapé et étudie ensuite les solutions que l'architecte doit trouver lorsqu'il dessine les bâtiments qui leur sont destinés. Les solutions proposées dans la première partie de cet article sont illustrées en se référant à un nouveau centre pour enfants handicapés qui est actuellement en cours de construction prè d'Athènes.

Rehabilitierungszentren für behinderte Kinder

Die Planung von Zentren für geistig behinderte Kinder stellt den Architekten vor spezielle Probleme. In diesem Artikel erörtert der Verfasser zuerst die Probleme, denen das geistig behinderte Kind ausgesetzt ist. Anschließend wird auf die Lösungen eingegengen, die der Architekt bei der Planung von Gebäuden für diese Kinder zu finden hat. Die im ersten Teil des Artikels erörterten Lösungen werden anhand eines zur Zeit in der Nähe von Athen gebauten neuen Zentrums für geistig behinderte Kinder veranschaulicht.

Centri di riabilitazione per bambini mentalmente ritardati

La progettazione di centri per bambini mentalmente ritardati pone, per l'architetto, problemi particolari. In questo articolo l'autore, dapprima, discute i problemi che questi bambini devono affrontare e quindi spiega le soluzioni che l'architetto deve trovare quando progetta costruzioni per loro. Le soluzioni discusse nella prima parte di questo articolo sono illustrate facendo riferimento ad un nuovo centro per bambini mentalmente ritardati attualmente in costruzione nei pressi di Atene.

New Nigerian Association applies to join IFHE

Earlier this year, the Nigerian Association of Health Engineering was formed. Membership of the association is open to any person who in the opinion of the council has attained or is in the process of attaining professional status in the practice of planning, designing, developing, teaching research and maintenance of health care facilities and is currently engaged in such practice, and its aims are:

(*a*) to promote, develop and disseminate health engineering technology;

(*b*) to compare national and international experience;

(*c*) to promote the principle of integrated design by improved collaboration between the professions;

(*d*) to promote more efficient management of operation;

(*e*) to offer collaboration with other international organisations.

The President of the new association is A. O. Faluyi, an engineer at Lagos University Teaching Hospital. The association has applied for membership of the International Federation of Hospital Engineering.

The problems of the handicapped child

by M. DALLAS
and E. DALLAS-ZAIMI

Greece is making an effort to come at least abreast of other countries in the care of handicapped people, but, even internationally, no clear line has yet crystallised on how to cope with the problems.

An effort was made to examine Greek Government directives so far adopted on the care for handicapped people and the relative constructional programmes applied. By so doing, a method for approaching the subject results, which consists of analysing requirements from:

(*a*) the medical angle, by giving a summary of causes and results of diseases
(*b*) the social angle, by quoting the consequences on the sufferers and on their environment
(*c*) the economic angle, because any different line of approach has an important effect on the funds that have to be set aside for coping with these requirements.

Thus does it become possible to deduce the effects of the problem on the shaping of the layout, city planning and structural form of an organised community, and we are led to the definition of general and special functions. Control of statistical data and natural extensions as well as of extensions occasioned by deliberate policy is of fundamental importance.*

Planning

Any technical problem, faced by specialised scientists, aims at satisfying the corresponding need. Obviously, therefore, deep knowledge and analysis lead to the discovery of the best solution.

In this instance, the problem is set by doctors, social workers and those concerned with education and its effects who come under general Greek social policy, area planning, town planning and finally constructional programmes and means for financing specific projects. Therefore, technical co-operation with the specialised scientists listed above in facing the problems of handcapped children is not merely desirable but a *sine qua non*.

In order to define the architectural, constructional and technological problems of the special buildings required for the care, education and medical treatment of handicapped children, it is wise to investigate the causes of the irregularities which appear and their effects on the bodily and mental development of the children; after which it is possible to determine the functional needs that these buildings shall serve.

It is common knowledge that the causes of most diseases resulting in the existence of handicapped persons are heredity, infectious diseases suffered by the mothers during pregnancy, injuries incurred during delivery of the child or infectious diseases and accidents sustained by the sufferer.

A concrete state policy can reduce most of the aforementioned causes to a minimum. Naturally, freedom of the individual on the one hand and protection of the whole of society on the other are factors which correctly assessed, can provide the ideal point at which the intervention of state policy is desirable.

However, if planners or even plain individuals were simply to visit homes for handicapped children, they would become much more willing to submit to preventive tests, e.g. a check on ancestry, blood tests etc.

The results of these diseases (schizophrenia, mongolism, spastic afflictions etc.) is the handicapping of the sufferers and their inability to develop normally and to follow educational courses. Handicapped children are considered to be those which differ from normal children in the keenness of their sense, neurotic conditions, bodily features, social and emotional behaviour, ability to communicate with their fellow creatures and those suffering from several handicaps at once.

Irregularities

Handicapped children present irregularities in their approach and communication with other people, intellectual diversions, irregularities in the function of their senses, disturbed behaviour, neurotic, orthopaedic and other abnormalities, to varying degrees and intensities and manifested in a variety of ways.

In order to face and help overcome the problems besetting handicapped children, it is useful to classify them, according to the degree of their affliction, in one of the following groups:

(*a*) those capable of being educated
(*b*) those handicapped to a medium degree
(*c*) those heavily handicapped.

For the first and even for the second group, provision is made for their education in schools staffed with special advisers or teachers and visiting helpers, or in schools where special class rooms are set aside for the handicapped children therein, at the same time as the

* When reference is made to 'natural extensions', the meaning is an increase in the cases of handicapped people resulting from an overall increase in population, combined with an increase or decrease in the causes which can provoke the damaging disease. When referring to extensions resulting from deliberate policy, the meaning covers large-scale reduction or total extinction of certain diseases, causes achieved by the intervention of medical treatment for the prevention of physical and mental handicapping, be this by general inoculation, birth control, special hygienic measures etc. Thus, for example, in Denmark, blood tests have almost led to the extinction of phenylketonuria while in Greece, general inoculation has done the same as regards poliomyelitis

This article is based on a paper presented at the 3rd International Congress of Hospital Engineering, Athens, 1974.

normal curriculum is being taught to the other children in their classes, the handicapped children follow a special training course, Likewise, it is possible to organise special classes in schools with a full daily curriculum or, finally, to run special day schools for handicapped children.

For heavily handicapped children, unable to cope with normal social and family life or living in communities whose structure is such that they cannot offer them a suitable emotional, social and living environment, asylums and hospitals provide the more satisfactory results.

Correct area distribution of the special buildings required depends on whatever policy exists for coping with the problems of handicapped children.

On the basis of data collected for each district, the number of handicapped children is assessed and these are then classified, as above. This provides a means for determining the needs of each district in special buildings which, in turn, form part of the district and national planning undertaken in each country, according to its overall financial and medical-care policies.

Day schools for children capable of being educated, asylums and hospitals are allocated by neighbourhoods, city quarters, towns or districts and the suitable location for them and their size are fixed. Special schools are classified with ekistic units, which they serve exactly as they are served by every normal kindergarten school, elementary or secondary school.

Sharing life

In this manner, there is a lessening in the difference in the behaviour of the children. Both normal and handicapped children share the same daily school life, they follow the same curriculum, they meet in the same society. The normal, healthy children learn to respect and help their less fortunate mates, while the latter are spared the feeling of isolation. The object of every civilised society is to help its handicapped members to become gradually normal members of that society.

Asylums and hospitals serve a small proportion of handicapped children, for which the impression existed that they would never be able to respond to any training. However, as scientific knowledge accumulated, it is becoming more commonly admitted that, in several cases, it is impossible to foretell the degree of independence which a child can attain as it grows. Consequently, the effort to improve it must be continuous.

There are also a few heavily handicapped children who suffer from serious problems in their health. In their cases, their mental and bodily abnormality is entrusted to special scientists aided by social workers. Apart from medical and educational care, a factor in training or therapy is to provide handicapped persons with a family environment. This helps psychologists and social workers to adapt these persons to a normal social life.

Care and training for handicapped children requires the planning of multipurpose building compounds, which can afford the functions of accommodation, hospitalisation, education and social life. The drafting of a programme of buildings presupposes a deep understanding of all requirements for the development of the handicapped child and for determining the special manner in which it should be met.

As a result, to determine all these complicated requirements cannot be the task of a scientist specialised in one line only. A group of specialists in this subject, doctors, architects, teachers and social workers, backed by scientistic from other branches of medicine and engineering could lay down the programme of buildings at any given time based on the particular requirements of each district and its economic possibilities. In particular, an architect designing these special buildings is up against the fact that the functional and technical solutions which he will propose are likely to have an entirely different influence on handicapped persons to those which they would have on normal persons. Thus the task of facing the problems of habitation becomes complicated by the unorthodox reactions of its inmates. The position becomes even more difficult by reason of the fact that it is almost impossible for a healthy person to sense what effect environment can have on the behaviour of abnormal mentalities.

Special buildings

Composition and planning of these special buildings cannot merely express the view of the planner concerning the environment, but must also express his knowledge of how the persons for whom they are destined will see them and react to them.

In greater detail it should be explained that it has often happened that buildings, at first sight perfect from the functional and comparison viewpoints, have proved failures by reason of an incorrect assessment of probable reactions to detailed features; e.g. the proportions and scale of spaces, because these were not checked from the angle at which they are seen by the inmates.

The sharp changes of mood which arise from the afflictions of handicapped persons and culminate in intellectual differences and paranoic behaviour are common knowledge. It is, consequently, easy to understand that planning of a special building must not be such as to enhance such disturbances but, on the contrary, should tend to calm them down and, in any case, should correspond to their damaging effects.

The task of the planner is, therefore, to devise a composition of spaces such as will achieve surroundings that can combine the living of a normal life with the programme of the therapy indicated. That they should live a normal life is essential for handicapped persons because the object of the whole exercise is to draw them into a normal family life.

The cure is subject to changes, so that it may adapt itself to the needs of each case.

Some remarks on the manner in which young handicapped persons tend to face customary problems, can be said to have a general application in the following cases:

(*a*) Their orientation is usually based on their dwelling premises.

(*b*) The number of persons occuping that dwelling space usually satisfies them when it corresponds roughly to the environment to which they had been used (they must feel neither isolated nor lost in a crowd).

(*c*) A special private space of their own strengthens their sense of security and independence.

(*d*) Auxiliary spaces must not create problems by reason of being complicted.

(*e*) Changes in the dimensions of spaces breed fears. Consequently, spaces in which daytime hours are spent should follow the same scale of the sleeping quarters.

(*f*) Intensified and wearisome effort to realise simple mental or physical achievements creates a complex of wishing to avoid it. Dull and uninteresting architecture tends to strengthen such a complex.

(*g*) Easy comparison, correlation and observation leads to clarified functional symbolism, e.g. the same colour for functions of a similar nature and a different texture for differing functions.

(*h*) The effect of some breakage occasioned by the use of the wrong material, creates confusion and reluctance to use it again.

Open air

Life in the open air plays an important part in the development of children. Like all children in the world, handicapped children have just the same need for sunshine and fresh air. They need spaces for games and peaceful spots for quiet occupations. In other words, they need spaces for active movement and spaces where they can be calm. Successive such spaces permit an easy change of activities. Spaces of brisk movement tend to attract sluggish children while spaces reserved for quiet occupations draw the attention of the excited ones.

Familiarity with nature is also contributory to education. It makes it easier for the children concerned to acquire a sense of the volume of space, both internal and external, above and below. The child also becomes aware of the passage of time when seeing the change between day and night, feeling changes in temperature or watching changes in vegtation with each new season of the year.

Movement

The general composition of the compound presupposes the definition of zones (dwelling, education, vocational training, therapy, hospitalisation, entertainment etc.) according to the suitability of each space and to the interdependence of the functions. Linking these zones by lanes or corridors gives the entire compound a feeling or atmosphere of a neighbourhood.

Since the object is to make the inmates of such compounds familiar with normal living conditions and social life, the system of circulation should be arranged in such manner as to serve needs similar to those obtained in the layout of any urban neighbourhood. This has to be achieved without prejudice to the rational interconnection of the compound as a whole.

Finally, the ability to transfer the children from the open air to the dwelling quarters gives them a chance to differentiate between a natural and a man-made world, this ability to differentiate and classify is a definite asset to their condition.

By facilitating children to move freely among such spaces, their natural development is encouraged, and there is a great reduction in their sense of isolation and confinement.

Proposals

Confrontation on the part of technical quarters of the question of handicapped young persons would be rational if it relied mainly on close co-operation, not only as regards passive implementation of instructions but in research at great depth with specialised scientists in medicine, education and sociology to analyse and select targets for overall planning and, in any case, to ensure that handicapped persons should be treated as ' clients' and not as mere cases devoid of all personality.

The IFHE should draft the framework of a programme for various types of building compounds suitable for serving the needs of young, handicapped persons in which the co-operation of special institutions and scientific organisations would be invited. It might thus become possible to lay down international standards and possibly also to achieve an international policy for coping with these programmes. It is likely that Greece and, in particular its Technical Board, could contribute financially towards a fundamental task which would facilitate engineers and technical experts, especially those in developing countries where research still constitutes a costly undertaking.

Problemes des enfants handicapes

La Grèce fait un effort pour au moins s'aligner sur les autres pays en ce qui concerne les soins à apporter aux handicapés, mais même à l'échelle internationale aucune ligne de conduite n'a encore été bien définie sur la manière de traiter ces problèmes multiples.

Probleme des behinderten Kindes

In Griechenland bemüht man sich jetzt, in der Fürsorge behinderter Personen zumindest gleich viel zu tun wie andere Länder, aber auf internationaler Ebene gibt es noch keine klaren Richtlinien zur Bewältigung dieses komplexen Problems.

Problemi dei bambini mentalmente ritardati

La Grecia sta facendo uno sforzo per almeno eguagliare gli altri Paesi nella cura dei bambini mentalmente ritardati ma, anche in campo internazionale non è stata stabilita una precisa linea di condotta sul come far fronte a questo problema assai complesso.

A boilerhouse safety alarm

by J. P. ADDISON T.Eng., M.I.Plant.E., M.I.Hosp.E. and A. K. EDWARDS

A boilerhouse is often looked after by a single operator, who, if an accident or illness occurs, may be unable to call for help. This article describes an automatic system designed and installed by the authors at New Cross Hospital, Wolverhampton to protect the operator in the event of an emergency.

Boiler operators, working on a shift basis manning boiler plant, usually work alone, often in a remote and/or isolated part of the hospital. The boiler operator is usually completely alone from approximately 17.00 hours to 08.00 hours Monday to Friday and the major part of Saturday and Sunday each week, when the other trades staff have finished work.

During these hours when the operator is completely alone the boilerhouse integrity is entirely reliant upon the operator. If he becomes unable to operate the boilers due to an accident or illness, then the boiler plant and subsequently the hospital is in jeopardy. The employer also has a responsibility to ensure that the operator is not left injured or unwell for several hours; many may feel this is equally as important, if not more important, than the boilerhouse integrity. In any event regular checks of the boiler operator's safety in turn ensures that the boilerhouse plant is being controlled and thereby the integrity of the boilerhouse is maintained.

Hospital managements are sure to realise the importance of carrying out routine checks during the hours when the operator is alone; there are numerous ways which are adopted to do this, but any system used should incorporate the following features:

(*a*) *The checking system adopted should be simple*
There is no point in introducing a system that is difficult to operate due to its complexity; it leads to misunderstanding and the greater likelihood of error.

(*b*) *The checking system should be foolproof*
Most systems which rely to a large extent on the 'human element' are not foolproof. True, they may work quite satisfactorily for most of the time, but it is usually when one needs them to work correctly they let you down. Also, if there are two ways of doing something, one of which is wrong, someone at sometime will do it the wrong way. Any system introduced for checking the safety of the boiler operator should keep to a minimum the 'human element'.

(*c*) *The checks should be regular*
The ideal would be to have a continuous check on the operator, but this cannot be done without considerable expense and/or loss of the operator's freedom. For example there are two ways that the checking could be done continuously: first the number of operators on duty at one time could be increased to two, or visual monitoring of the operator could be introduced.
It is necessary therefore to have a compromise on the frequency of checks. The frequency required is a matter for individual hospital managements to decide, but the checks should be carried out at regular time intervals, e.g. at 1 hour intervals or at half hour intervals, and not at a frequency per shift, e.g. four per shift, eight per shift.

(*d*) *The system should be acceptable to the operator*
Some operators may not take kindly to what they consider an infringement of their freedom and may misunderstand the purpose of a checking system. Operators may feel that a system is not introduced as much to secure their safety but more to 'spy' on them. It is vital, therefore, that the system is acceptable to the operator/s and is fully explained to them.

(*e*) *Emergency action should follow a check that indicates that the operator is in difficulties*
Following a check that indicates that the operator is in difficulty emergency action should follow, and this action should be preplanned and carried out to a set procedure. The action taken must be a matter for hospital management to lay down precisely, but ideally it should:
(i) get assistance to the boiler operator quickly
(ii) restore the boilerhouse integrity as soon as possible.

Automatic safety alarms

The problem of carrying out regular checks on the safety of the operators at our New Cross Hospital has been solved by an automatic safety alarm linked from the boilerhouse to a continuously manned position elsewhere on the hospital grounds (in this case the telephone switchboard).

The alarm system is automatically switched on and off, and is in operation for the period (previously mentioned) when the boiler operator is completely alone.

The alarm operates every hour and sounds alarms within the boilerhouse *only*. The boiler operator has three minutes approximately to reset the alarm; if he fails to reset it in this time the link to the continuously manned position is automatically energised and the alarm is raised at this position. The person at the continuously manned position then takes emergency action to the preplanned procedure.

A test switch on the alarm in the boilerhouse enables the boiler operator to test that the alarm in the con-

Mr. Addison was formerly and Mr. Edwards is with the Wolverhampton Area Health Authority tinuously manned position is working satisfactorily, without sounding the boilerhouse alarms, and this test switch also enables the boiler operator to summon assistance at any time he has particular difficulties without having to wait for the alarm to operate at the next hourly interval.

A further feature of the alarm located in the continuously manned position is a pushbutton to stop the audible alarm, this does not however stop the alarm indicating visually that the boiler operator is in difficulties, the visual indicator will continue to operate until the alarm is reset in the boilerhouse.

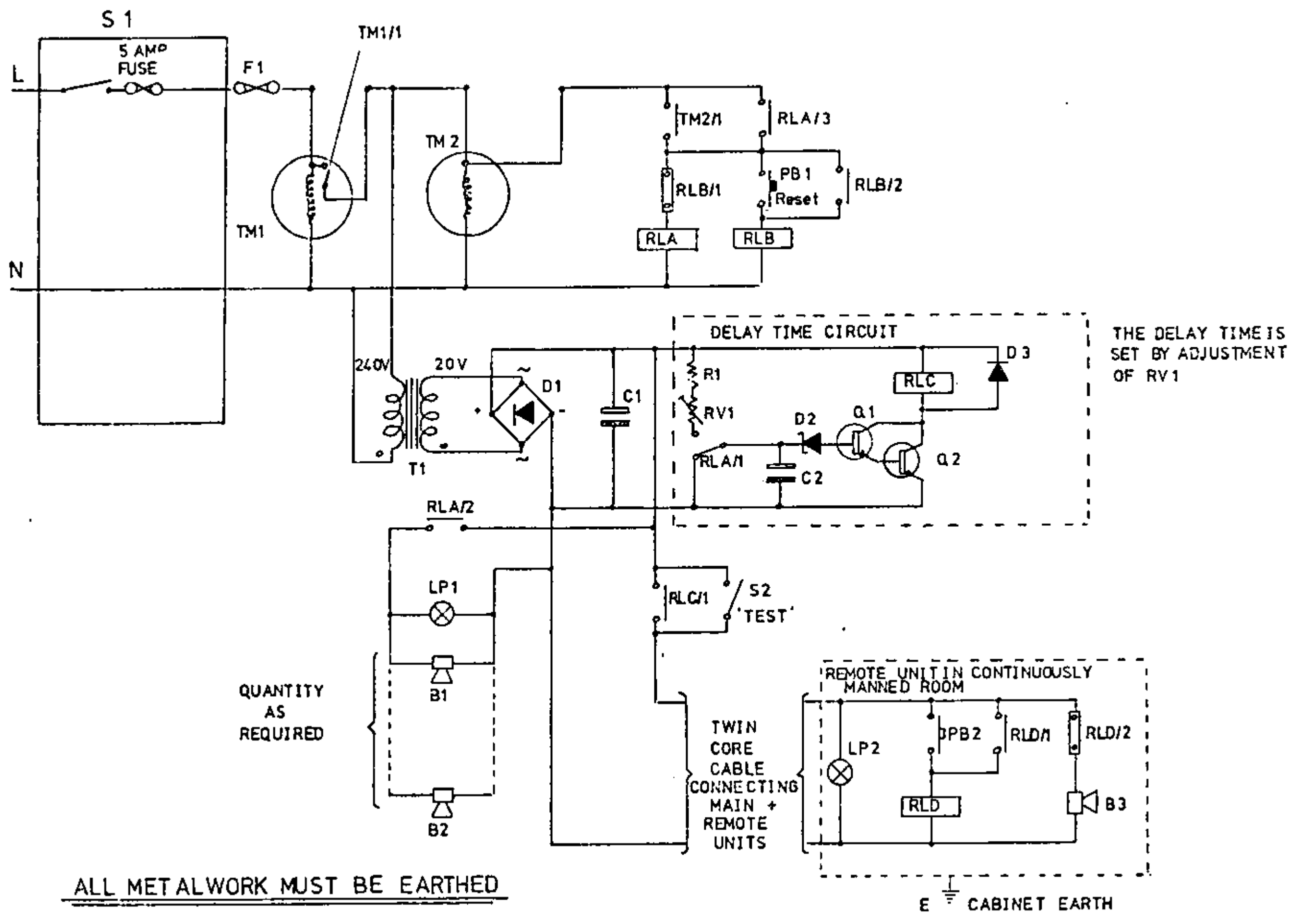
The alarm has been in use now at the New Cross Hospital for over seven months and proved perfectly satisfactory.

Safety-alarm details

Below are given the details required to produce the alarm and the estimated cost of components. We estimate it would take an electrician two days to assemble install, set up and test the alarm based upon running up to 500 m of 'linking' cable between the two units. Individual site conditions will determine the exact time required.

Safety-alarm circuit diagram normal positions of contacts

TM1/1	—	open	RLB/1	—	closed	RLB/2	—	open	PB2	—	open
TM2/1	—	open	PB1 'reset'	—	open	RLA/2	—	open	RLD/1	—	open
RLA/3	—	open				RLC/1	—	open	RLD/2	—	closed



Suppliers' Addresses

Radio Spares Components Ltd., PO Box 427, 13–17, Epworth Street, London EC2P 2HA. Telephone 01-253 1222

Walter Kidde Co. Ltd., Belvue Road, Northolt, Middlesex UB55QW. Telephone 01-845 6611

AMF/Venner, Kingston By-Pass, New Malden, Surrey KT3 4PB. Telephone 01-942 2442

Farnell Electronics Ltd., Canal Road, Leeds LS12 2TU. Telephone 0532-636311

Hawnt Electronics Ltd., Firswood Road, Birmingham B33 0TQ. Telephone 021-784 2485

Components

Item	Description	Estimated cost	Supplier
		£	
S1	13 A fused spur fitted with 5 A Cartridge fuse. Any suitable make	1·00	—
S2	Tag-type toggle 3 A d.p.d.t. stock number 316–793	0·65	Radio Spares
F1	Fuse holder and anti surge fuse		Farnell or
	Fuse holder: Belling Lee L1045/C5 size '0'	0·67	manufacturer
	Fuse: Bulgin delay fuse F238 2 A size $1\frac{1}{4}\times\frac{1}{4}$"	0·10	direct
TM1	System-programmer switch Paragon 7-day time switch 7007–21 208–240 V	19·20	AMF/Venner
TM2	1 cam timer Edgcumbe Peebles		Farnell or
	Order code: 1 CAM/1switch/1rev/h/240V/50 hz timer	10·75	manufacturer direct
RLA	Relay 230 V a.c. Coil 50/60 Hz 33A	2·22	Radio Spares
RLB	stock number 348–813	2·22	
RLC	Relay 24 V d.c. 475 Ω/Coil 7 A	1·93	Radio Spares
RLD	stock number 348–784	1·93	
PBI	Black pushbutton C290/K1	0·47	Farnell
PB2	list number C290/K1/black	0·47	
T1	20 V rectifying transformer stock number 196–151	2·40	Radio Spares
LP1	28 V 40 mA filament indicator red bezel	0·37	Radio Spares
LP2	stock number 576–226	0·37	
D1	Silicon-bridge rectifier 63 stock number 261–491	0·40	Radio Spares
D3	Diode OA202 or equivalent stock number 271–583 (5 per packet)*	*0·40	Radio Spares
D2	Zener diode BZY88–C12 stock number 282–173	0·15	Radio Spares
C1	1000 μF 50 V capacitor	*1·14	Radio Spares
C2	stock number 101–670 (3 per packet)*	—	
Q1	Transistor BFY51	0·21	Radio Spares
Q2	stock number 293–640	0·21	
R1	1 kΩ 0·5 W fixed resistor (10 per packet*)* stock number 0·5W CC resistor 1 kΩ	0·11	Radio Spares
RV1	470 kΩ miniature preset resistor stock number 185–634	0·27	Radio Spares
B1	Tone sounder: 24/50 V. Any sounder will serve	25·00	In our case
B2	the purpose; quantity will depend upon the area to be covered. The sounder should be distinctive	25·00	two YO–5 5 in sounders were purchaesd. Walter Kidde Ltd.
Component case (Boilerhouse) Chassis	2015 standard enclosure with A5114 flat plate Includes key-operated door lock	6·00	Hawnt Electronics
Component case (remote station)	A standard 15 cm×15 cm×5 cm adaptable box with cover plate is sufficient for mounting components	1·50	any electrical wholesaler
Connection cable	2-Core Cable p.v.c. insulated for 50 V cross section Area not less than 0·0006 sq. in. or 0·5 mm² The length will depend upon individual needs. *per 100 m reel	*5·50	Any suitable supplier
Printed circuit board	It may be desirable to use a piece of printed circuit board to mount the components in the boilerhouse unit. The majority of the components will fit directly on to this *List number VB122	1·10	*Farnell or other suitable supplier
	TOTAL ESTIMATED COST (excluding v.a.t.)	119·24	

Setting-up procedure

(*a*) Position on and off dial tappets on TM1 system control timer so that the safety alarm is operative at the desired times.

(*b*) Adjust cam on Timer TM2 so that the contact TM2/1 is in the closed position approximately 30 s.

(*c*) RV1 is adjusted so that relay RLC operates approximately 3 min after RLA operates.

Sequence of operation

(*a*) When contact TM1/1 closes, timer TM2 runs at 1 rev/h, and power is also applied to rectifier

D1 via transformer T1. The output of D1 rectifier is approximately 24 V d.c.

(*b*) When contact TM2/1 closes (once every hour), relay RLA energises setting off alarms B1 and B2. Contact RLA/3 is a latching contact so that relay RLA remains energised until the reset push button PB1 is operated.

(*c*) Relay RLA operating also changes over contact RLA/1 so that capacitor C2 begins charging at a rate set by RV1.

(*d*) If the alarm has not been reset by the time capacitor C2 has charged up to approximately 12·5 V transistors Q1 and Q2 switch 'on' energising relay RLC.

(*e*) Relay RLC energising closes contact RLC/1 thus supplying 24 V d.c. to the remote unit setting off alarm B3.

(*f*) Alarm B3 can be silenced by operating push-button PB2 which energises relay RLD. This is held in the energised state by contact RLD/1 and power is removed from the alarm B3 by contact RLD/2 opening.

(*g*) Lamp LP2 and relay RLD remain energised until the main unit is reset.

(*h*) The operator resets the main unit. operating pushbutton PB1, this energises relay RLB.

(*i*) Relay RLB operating opens contact RLB/1, de-energising relay RLA.

(*j*) Relay RLB remains energised by contact RLB/2, until the contact TM2/1 opens.

(*k*) Switch S2 can be operated to test the remote unit or to inform the staff in the continuously manned room that assistance is required. This is accomplished by switch S2 'shorting out' contact RLC/1 and thus applying power to the remote unit.

Note

It is desirable that the mains connection to the safety alarm is taken from the 'essential supply' of the electrical distribution.

Signal d'alarme dans une salle des chaudières

Il arrive bien souvent qu'un seul homme est responsable d'une salle des chaudières et en cas d'accident ou de maladie celui-ci peut se trouver dans l'impossibilité d'appeler du secours. Cet article décrit un système automatique conçu et installé par les auteurs au New Cross Hospital, Wolverhampton, Angleterre, pour protéger cet employé en cas d'urgence.

Ein Kesselhaus-Sicherheitsalarm

Ein Kesselhaus liegt oft in der Obhut eines einzigen Mannes, der bei einem Unfall oder wenn er plötzlich krank wird, vielleicht nicht in der Lage ist, Hilfe herbeizurufen. In diesem Artikel wird ein automatisches System beschrieben, das von den Verfassern entworfen und im New Cross Hospital in Wolverhampton in England installiert wurde, um die Bedienungsperson im Notfall zu schützen.

Un allarme di sicurezza per centrali termiche

Una centrale termica è spesso sotto il controllo di un solo operatore che, nel caso di incidente o malattia, può eventualmente trovarsi in una posizione di non poter chiedere aiuto. Questo articolo descrive un sistema automatico progettato ed installato dagli autori all'Ospedale di New Cross, Wolverhampton, per proteggere l'operatore in caso di emergenza.

Communication network in San Francisco

The communications network of the newly completed $22 million Presbyterian Hospital of the Pacific Medical Center in San Francisco, USA, not only includes an intercom system but colour television as well. The system was custom-built by GTE Sylvania Inc. for the 8-floor 311-bed hospital, which is one of the most modern acute-care medical centres in the USA.

The heart of the system is the nurse call, through which patients verbally communicate their needs to a floor nurse. Presbyterian Hospital uses six units strategically located on each general nursing floor during the day. At night, when there is less traffic, the hospital is able to reduce nursing staff by channeling all patient–nurse communications into two units per general nursing floor.

The system permits a nurse to put a patient requiring more care on a priority basis. A call from a 'priority' patient takes precedence over all but emergency calls. Calling patients are identified as to room and bed number on a readout panel.

The MC450 Medi-Com, a hospital intercom system, speeds staff communications while reducing regular telephone traffic.

The system electronically seeks out unused circuits to speed communications. It can also be used for general loudspeaker paging throughout the hospital or selective paging by areas or groups of areas. A separate intercom system is used in operating rooms for 2-way communications with medical galleries.

Classified Advertisements

OFFICIAL APPOINTMENTS
SITUATIONS VACANT
COURSES, EQUIPMENT ETC.

To place an advertisement in this section, please write or telephone:
Classified Advertisement Department, *HOSPITAL ENGINEERING*
Peter Peregrinus Ltd.
Station House, Nightingale Road,
Hitchin, Herts. SG5 1RJ, England
Telephone: Hitchin (s.t.d. 0462) 53331, ext. 276

APPOINTMENTS AND SITUATIONS VACANT

MISCELLANEOUS

Classified advertisements for the next issue of HOSPITAL ENGINEERING published 5th December, should be received not later than Friday, 21st November.

CLASSIFIED ADVERTISEMENTS
continued from previous page

HOSPITAL MAINTENANCE ENGINEER

LIBYA EXCELLENT SALARY

Our Client, the Oil Industry Medical Society, needs an engineer to be responsible for the maintenance of both general and specialized equipment used in a small but well-equipped Hospital in Tripoli. In addition to the operation of the main electrical, mechanical, water and air conditioning systems he will also be required to maintain special medical equipment such as X-ray machines, monitors and electro-cardiograms.

An H.N.C. or higher qualification, combined with at least two years' practical experience of similar maintenance work in a hospital, is required for this appointment. In addition, the applicant must be versatile and possess practical ingenuity as specialist contractors are not easily available. The salary for a married engineer with a diploma would be about £6,000 per annum and with an engineering degree about £7,000.

A furnished apartment is provided and benefits include generous allowances, and a loan for a car purchase, 32 days annual travel-paid leave in UK and an interim vacation.

Applicants should write, in complete confidence, giving career details and quoting reference LIBYA/FR to:

F. Rothwell C.B.E., Whitehead Recruitment Limited, Whitehead Consulting Group, 2d Wimpole Street, London W1M 7AA.

1974 WHITEHEAD

REGULATIONS FOR THE ELECTRICAL EQUIPMENT FOR BUILDINGS

These regulations (formerly the 'Wiring rules'), which have been published by the IEE since 1882, are effectively the UK national code for the safety of electrical installations, specially from fire and shock, in and around building generally.

They are recognised in the statutory Electricity Supply Regulations 1937, as fulfilling the requirements of these regulations for consumers' installations. They supplement these and other statutory regulations by prescribing, in detail, methods (not necessarily the only methods) of complying with the statutory regulations.

vi + 224pp., 14th edition, 1966, reprinted in metric units incorporating amendments 1974, £3

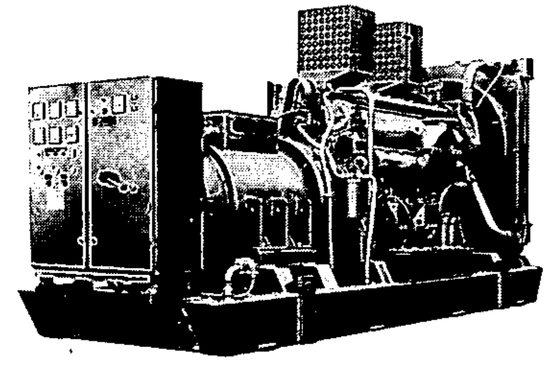
Inquiries, orders and remittances should be sent to:

Publication Sales Department, IEE, Station House, Nightingale Road, Hitchin, Herts. SG5 1RJ, England

MIG Generating Sets

with the PLUS factor★

★Not only do we manufacture—we can carry out installation, commissioning and maintenance in your Country!



One of our standard range with integral fuel tank base; comprising 50 engine types and 5 makes of alternator—manual, auto stand-by, parallel running, canopied or trailer mounted.

Please ask for our brochures

MARINE & INDUSTRIAL GENERATORS LTD

Church Wharf, Corney Road, London W4 2RA England

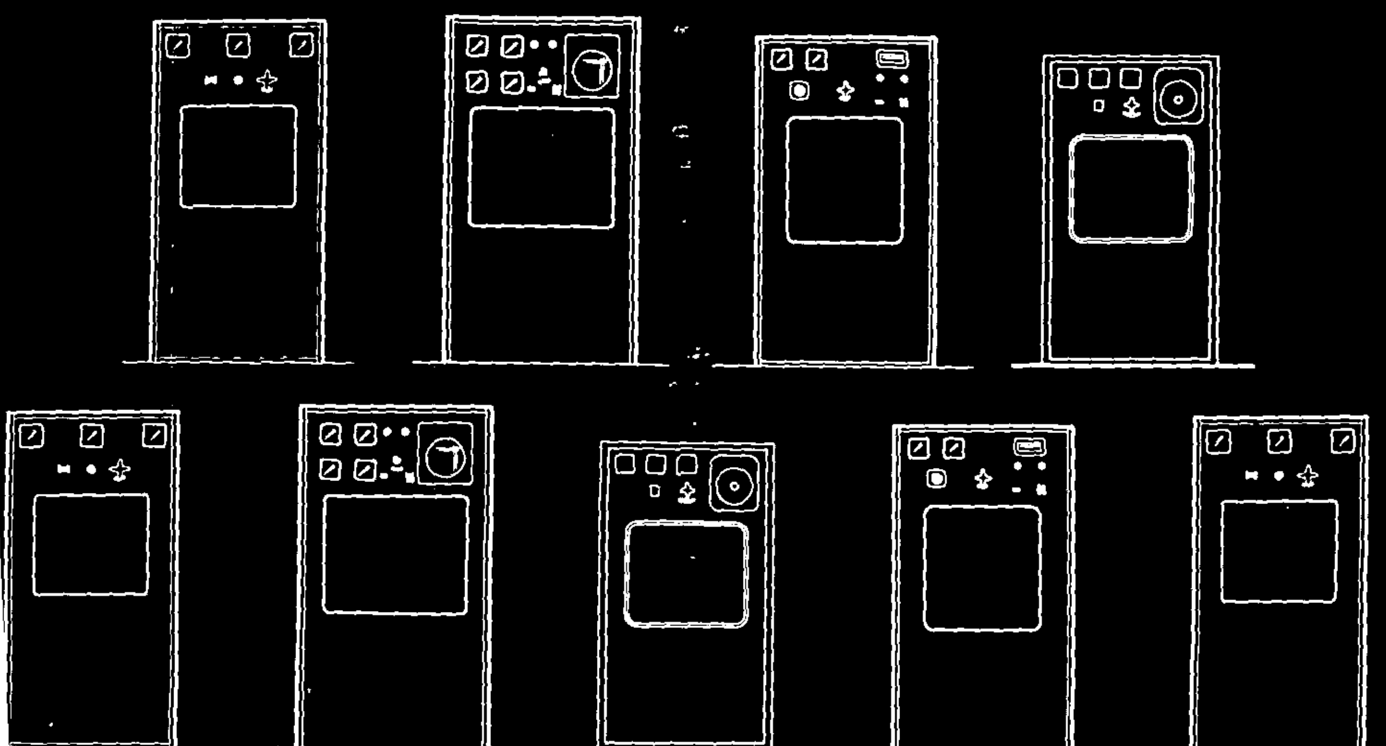
Tel. 01-994 7088/2862. Telex: 935072

Index to Advertisers

Please mention 'Hospital Engineering' when replying to advertisers

Printed in England by C. F. Hodgson & Son Limited, 50 Holloway Road, London N7 8JL

THACKRAY



All autoclaves look very much the same but...

The latest range of Thackray automatic high speed autoclaves including Porous Load, Downward Displacement, Rapid Cooling Fluids and Laboratory Units incorporate many unique features and user benefits.

All models incorporate the Autoclam® steam sealed sliding door which can only be opened when the chamber is at atmospheric pressure. This is an inherant safety feature which eliminates the necessity for complex pressure locking devices and thus reduces maintenance requirements.

The Porous Load autoclave incorporates a highly efficient air removal stage, with a unique partial pressure air detection system. This system will automatically cancel the cycle and interlock the door controls should residual air produce adverse sterilizing conditions.

Thackray autoclaves, all of which conform to BS 3970 and HTM 10, are available in a range of standard chamber sizes. These are designed to take full 10, 15, 21 and 28 cu. ft. loads even taking into account the space usually lost due to loading arrangements.

In order to ensure that your Thackray autoclave will always give you the best results, we operate an after sales service that is second to none. This includes standard service calls, planned preventive maintenance contracts, and a 24 hour emergency service which operates 365 days a year.

For further information, please contact:
Chas. F. Thackray Limited, Head Office: P.O. Box 171, Park Street, Leeds LS1 1RQ. England.

®Autoclam is a registered trade mark of Chas. F. Thackray Limited