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HOSPITAL ENGINEERING

International Federation Issue

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HOSPITAL ENGINEERING

The Journal of the Institute of Hospital Engineering
and of
The International Federation of Hospital Engineering

I.F.H.E.

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Front Cover: Laundry design and layout — see article Page 12.
Photo courtesy of Washex International.

International Federation News

Next IFHE Council Meeting

The Council Meeting in 1983 will be in Copenhagen, Denmark, on 26, 27, 28 and 29 May.

A very good programme is being organised by the Danish Association under the active leadership of our friend Aage Olesen. In due time you will receive the convocation letter with the Agenda which is to be prepared by the Executive Committee. But, please, RESERVE those four days in May 1983 in your diary now.

The Executive Committee will meet next October. Should some Council Members wish to have items prepared to be put on the Agenda of next Council Meeting in Copenhagen, please write to the General Secretary. Suggestions and comments cordially invited.

IFHE Executive Committee Meeting

At the IFHE Council meeting in May 1982 it was agreed that to execute Council's policies there should be an Executive Committee comprising the President, General Secretary, Treasurer, Vice Secretary and three Members of Council appointed by the President; the three members appointed for the period 1982-84 are Marvin Fischer (USA), Aage Oleson (Denmark), P B Oyebolu (Nigeria).

The first meeting of the Executive Committee was held in Madrid on 16/17 October 1982 at which the main business was to receive the comments from Council members on the draft Statute and Standing Orders which included the revisions made at the Council meeting in Amsterdam in May 1982. A number of comments were considered and further revisions are being incorporated in the version which is about to go to the printers. The General Secretary is sending the revisions to Council members for information.

Other matters considered were the content of a brochure to give information to those interested in becoming Members of IFHE under the new Statute and the best way of using IFHE's resources during 1982-84. The Committee agreed to concentrate on promoting IFHE to attract new members in order to expand its resources and to encourage existing Members to contribute to the Data Bank being set up in the USA under the direction of Marvin Fischer. Consideration was also given to ways in which IFHE can contribute to making the International Issues of 'Hospital Engineering' attractive to the new style Membership once the Statute and the brochure have been published.

The next meeting of the Executive Committee will be held in Copenhagen on 25 May 1983 and will be followed by the meeting of Council being arranged on 26, 27 and 28 May, 1983.

Réunion du Comité de L'IFHE.

(Fédération Internationale d'Ingénierie Hospitalière)

Lors de la réunion du Conseil de l'IFHE. Au mois de mai 1982 il a été décidé qu'afin de mettre en oeuvre la politique du Conseil, il convenait de créer un Comité Executif composé du Président, du Secrétaire Général, du Tresorier, du Secrétaire Adjoint et de trois Membres du Conseil à désigner par le Président; les trois membres nommés pour le période 1982 - 1984 sont les suivants: Marvin Fishcher (EUA), Aage Oleson (Danemark), P. B. Oyebolu (Nigéria).

La première réunion du Comité Executif, qui s'est tenue à Madrid les 16 et 17 Octobre 1982, a eu pour tâche principale de recueillir les commentaires émanant de membres du Conseil à propos du projet de Statuts et de Régles Permanents qui comportait les modifications apportées lors de la réunion du Conseil tenue à Amsterdam au mois de mai 1982. Un certain nombre d'observations ont été prises en compte et des modifications supplémentaires doivent etre incorporées au texte dont la mise sous presse est imminente.

Le Secrétaire Général se charge de faire parvenir les modifications aux membres du Conseil à titre d'information.

Les délibérations ont également portées, d'une part, sur la teneur d'une brochure destinée à informer des personnes qui seraient désireuses d'adhérer à l'IFHE dotée de ces nouveaux Statuts et, d'autre part, sur la manière la plus efficace d'utiliser les ressources de l'IFHE pour la période 1982 - 1984. Le Comité a convenu de la nécessité de concentrer les efforts sur la promotion de l'IFHE en vue d'attirer de nouveaux membres, ceci afin d'accroître ses ressources, et d'inciter les Membres existants à contribuer à la Banque de Données qui est en train de se créer au EUA sous la direction de Marvin Fischer.

Il a également été discuté des diverses manières dont l'IFHE pourrait aider à stimuler l'intéret de la nouvelle catégorie de Membres pour les Editions Internationales de "Hospital Engineering", une fois que les Status et la Brochure auront été publiés.

Generous donation to IFHE

The Federation gratefully acknowledges a generous donation received from Mr Ali U. Al-Zaid, of Riyadh, Saudi Arabia, as a personal contribution in support of IFHE's efforts towards the development and exchange of hospital engineering technology throughout the World.

Council will show IFHE's appreciation to Mr Al-Zaid.

Italian Federation Study Day

On the 2nd of October last in Bologna (Italy) a study day was organised by FE.NA.T.O. (the Italian Federation of Hospital Engineering) in conjunction with IFHE, as part of the 'HOSPITAL '82'—Convention on the Health Service, which included a large exhibition of electro-medical equipment and a series of interesting talks.

Among other conventions held in 'HOSPINTEX 82' were: 'Technology and Health Organisations' with the collaboration of Regional Medical Officers;
'Thermal Waters and Health' with the participation of French, German and Russian experts;
'Examples of Hospital Laundries' with the help of the Economic Superintendents;
'Sterilization and Disinfection in the Hospital' with the collaboration of the magazine 'Tecnica Ospedialiera' and the Centre for the study of Epidemics of Milan University;
'Emergency Departments and Civil Protection'
'Collective Purchasing and Quality Checking' and
'The Region, Industry and the University: scientific research', all with the heads of Regional Health Authorities;
'Professional training for workers and teachers in the social services for the Handicapped' in collaboration with the National Association of Handicapped Chidren's Families.

FE.NA.T.O.'s study day explored the following themes: "The role of technical services in District Health Authorities with particular reference to organisation, professionalism, responsibility and safety.

After the 300 participants, some of whom had come from the farthest regions of Italy, had been welcomed by the National President of FE.NA.T.O. and past-president of IFHE, Osvaldo Amato, the Minister for Health, and by various other political and technical personalities, the speeches began.

The sessions were presided over by Bruno Massara, Enrico Milone and Alberto Lena of the Council of IFHE and by Franco Rabino and Vittorio Rasia of FE.NA.T.O.

Mr Basil A Hermon CBE, treasurer of IFHE and Regional Works officer of South West Thames Regional Health Authority, opened the debate with his talk on the organisation of the British National Health Service and the 'Hospital Engineering Centre' at Falfield, with the aid of slides.

This speech proved very interesting and provoked many stimulating questions from the floor in the ensuing discussion.

Following this there were speeches by Messrs. Tagliaventi and Salizzoni, from the Department of Engineering in Bologna University, who spoke on 'The University structure and professional training of technical staff' and on the 'Procedure for Quality Guarantee of construction and maintenance of buildings and equipment for the Health Service', respectively.

Mr Carrescia from the Institute of Electrical Technology in Turin Polytechnic spoke about the 'Administration of Electrical services within the sanitary structure of the Italian Health Service,' and his talk was followed by one on "the Delegation of Responsibility for reasons of safety, within the structure of the health organisation" by Dr Giampietro, a Magistrate.

After the speech by Cobolli Gigli, Editorial Director of the magazine *Tecnica Ospedaliera*, the convention paused for lunch, offered by one of the sponsors. Mr Zuppello began the afternoon session with his talk on 'Problems of staff training in relation to Electronic Technology in the structure of the Health Organisation' and was followed by Mr Ferrari on 'The Safety of the plant and the Maintenance of Distribution Systems of Therapeutic Oxygen in Hospitals'.

The final speech was made by Messrs. Zappi, Rasia and Rabino on FE.NA.T.O.'s proposal for 'A multi-district Organisation of Technical Services in the National Health Service'.

There ensued an interesting discussion and a visit to the exhibition of the latest equipment for hospital use in 'HOSPITAL

Spanish Association News

El día 5 de abril la Asociación Española de Ingeniería y Arquitectura Hospitalaria celebró sa "IV Reunión Anual" en Valencia, bajo el lema "El Hospital y el Futuro".

El Programa estaba formado por una ponencia y cuttro paneles de discusión:
— "El Diserio funtional del Hospital del Futuro"
— "Arquitectura-Diseño"
— "Arquitectura-Construcción"
— "Instalaciones"
— "Mantenimiento"

Fué presidido por el Ministro de Sanidad de la Región de Valencia, Rector de la Universidad, y Secretario General de IFHE.

The IV Annual Meeting of the Spanish Association of Hospital Engineering was held on the 5th April in Valencia on the subject, "The Hospital and the Future".

The programme was developed in a written paper and four Discussion Panels:
— "Functional Design of the Hospital of the Future"
— "Architecture-Design"
— "Architecture-Building"
— "Installations"
— "Maintenance"

The IV Annual Meeting was presided over by the Health Minister of Valencia, the Vice-chancellor of the University and by the General Secretary of IFHE.

AEDIAH acaba de publicar dos Monografías: "Los Extintores en el Hospital" (26 págs.) "La Contaminación del Aire y el Riesgo de Infección en el Hospital" (40 págs) Idioma: Español.

AEDIAH has recently published two pamphlets, 'Fire-extinguishers in Hospitals' (26 pages) and 'Contamination of the Air and the risk of infection in Hospital" (40 pages). Both are written in Spanish.

Italian technical visit to Oxford.

A technical delegation from the Lazio Region of Italy ended a visit to the Oxford Regional Health Authority recently. The delegation, led by the Regional Minister, Giulio Santarelli and the Regional Health Minister, Giulio Pietrosanti, accompanied by senior officials of Inso S.p.A a company of the ENI Group were shown hospitals designed and built on the "Oxford Method" system by representatives of the Oxford Regional Health Authority.

The Visit coincided with the final design stage of the new hospital to be built by Inso S.p.A. using the Oxford Method at Ostia Lido, near Rome.

Energy Management Manuals

The Task Force on Energy Management in Health Care Facilities in Canada has completed its work on two energy management manuals. These manuals are available as a two-part set. Part I provides an Administrative overview of energy and Part II provides a more detailed approach for the Energy Practitioner.

Copies of both manuals will be mailed to existing Sustaining Members and non-members are reminded that they can obtain a set through a Sustaining Membership at a cost of $25/year for Canadian public health care institutions and $100/year for commercial organizations. The price of the set of manuals outside Canada is 25 Canadian Dollars.

The working committee of the Task Force is made up of representatives of Federal/Provincial Governments and Hospital Associations. It was formed in response to a perceived need for more vigorous promotion of energy management in the health care industry. To receive your copies through a sustaining membership, please send cheque or money order payable to the Energy Task Force and mail to:

Marilyn Culver, Executive Secretary, Task Force on Energy Management in Canadian Health Care Facilities, c/o 410 Laurier Avenue West, Suite 800, Ottawa, Ontario K1R 7T6, Canada.

IHF Special Study Visits, 1983

As announced in the June issue, the main IHF event in 1983 will be the 23rd Congress, which will take place in Lausanne, Switzerland, between 26 June-1 July. Full details will be sent automatically to all IHF members, and the Congress is open to non-members as well.

In addition, the International Hospital Federation is organising three special study visits in 1983: Focus on an area health system — USA (24 April-5 May). Integrated hospital and health care — Finland (29 August-8 September). Health care in the People's Republic of China (8-26 October).

First preference for places on these visits will be given to nominees of A, B and D IHF member organisations.

Details of each of these visits, and application forms, can be obtained from the International Hospital Federation, 126 Albert Street, London, NW1 7NX.

Hospintex takes form

The exhibition for hospital needs, HOSPINTEX — which will take place in conjunction with the 23rd IHF already has 120 exhibitors. The exhibition covers an area of 3500 m^2, with three pavillions from Hungary, Britain and Sweden and will offer something of particular interest to congress participants, guests, officials, exhibitors and potential clients. Five well-known hospital experts will be organising, after consultation with exhibitors, round table meetings about computer programming for hospitals; hospital engineering; nutrition, dietetics and catering; single-usage material and new textiles; hospital hygiene and cleanliness.

Efficiency, safety, rationalisation and financing of products and services for hospitals will be discussed by producers and users. The discussions are aimed to result in a greater awareness of the production possibilities and hospital needs, leading to the development of more effective products. HOSPINTEX is being designed to enable a real dialogue between users and producers, contributing to mutual progress.

ISH International Trade Fair

Frankfurt 22 to 26 March 1983

The ISH International Trade Fair for Sanitation, Heating and Air-conditioning will be held at the special exhibition centre at Frankfurt in West Germany from 22 to 26 March next year. The fair, one of the largest on these subjects in the world, has become recognised as one of the best opportunities to study them in depth, and more than 1000 exhibitors are expected, with more than 25 per cent of them being from overseas. The list of those expected reads like a who's who of the relevant manufacturers in all these overseas. The list of those expected reads like a who's who of the relevant manufacturers in all these fields, and is far too long to be reproduced here. The categories represented include:

Sanitation Technology
Prefabricated installations, Water purification, Water heating, drainage, fountains, sanitary equipment, specialised hospital equipment, and a wide range of valves and other pipe-work fittings.

Heating Technology
The exhibitors include those showing Boilers, Oil heaters, Gas heaters, radiators, tanks and other containers, insulating materials, corrosion protection systems, water treatment, heat recovery and solar technology, measuring and control devices, pumps, guttering, outlets and rain-pipes, chimneys and exhaust pipes.

Air-conditioning
Exhibits will include Ventilating technological equipment and plants, air-conditioning equipment, refrigerating equipment and air-coolers.

Theme
The theme of the fair is 'The Economic Use of Energy', and it is intended to offer solutions to common problems, to suggest improvements and to look at future possibilities. The organisers believe that the fair offers an unrivalled opportunity for the exchange of views and information between experts, and there will be a comprehensive series of presentations and other meetings in which topical themes will be discussed.

Late exhibitors
Although bookings for stand space have been closed officially it is at least possible that one or two late entrants might be squeezed in in some categories. Time is of the essence, however, and an immediate approach should be made to the organisers. The permanent trade fair complex has its own full-time organising staff, Messe- und Austellungs-Gmbh, Ludwig-Erhard-Anlage 1, POB 97 01 26, D600 Frankfurt am Main 97, West Germany. Telex 04 11 558, Telephone 7575-0.

In the United Kingdom the Messe (Fair) organisation is represented by Collins & Endres, 36 Sackville Street, W1X 1DB, Telex 262236 LOP G, Telephone 01-734 0543. In other countries there are also local representatives, but you will be put in contact with them by the Messe organisers in Frankfurt.

Travel and Accommodation
The local organisers have full details of a range of travel packages for visitors, which it is recommended should be booked quickly. Although Frankfurt has a wide choice of hotels, they get booked up a very long time ahead for the main fairs.

Institute News

North Western Branch Visit

On Tuesday evening 19th October, members of the North Western Branch visited the new County Fire Service Headquarters at Swinton.

The programme commenced with a technical talk on smoke control by a senior fire prevention officer and this was followed by a conducted tour of the new control centre from which the operators control the movements of the fire service in the Manchester area using computerised equipment.

The whole evening proved to be most interesting and enjoyable.

The next branch meeting will be on SPC telephone exchanges by Plessey Communications Limited at their offices in Faulkner Street, Manchester at 6.00 pm on Thursday, 9th December.

CEI Notice to all Chartered Engineers

Notice is hereby given that the Eighteenth Annual General Meeting of The Council of Engineering Institutions will be held at The Institution of Civil Engineers, 1-7, Great George Street, London SW1, on Tuesday, 29th March, 1983, at 1600 hours, for the purpose of transacting the following business:

1. Presentation and consideration of the annual report of the Board and the audited statement of accounts for the year ended 30th September, 1982.
2. Appointment of auditors for the year ending 30th September, 1983, and fixing their remuneration.
3. Declaration of the results of the ballot for the election of elected members of the Board.

Following the formal business of the meeting there will be an opportunity for informal discussion. During this period no resolutions will be accepted and no votes taken.

By Order of the Board
D B Wood
Secretary

Note: All Chartered Engineers are entitled to attend and vote at this meeting.

Copies of the Annual Report and Accounts will be available at the meeting. Members unable to attend the AGM and who wish to receive a copy of the Report and Accounts should send an addressed envelope to The Secretary, CEI, 2, Little Smith Street, London SW1. Summary reports including the accounts will be sent to all Chartered Engineers in due course.

Letter to the Editor

Pipe Freezing — a warning

Sir,

On page 19 of the September 1982 issue of *Hospital Engineering* appeared an article entitled "Pipe Freezing — a Useful Tool for the Engineer". This is a very useful technique but it has its dangers.

Earlier this year a specialist contractor was engaged to freeze a pipe, in an excavation at a hospital, so that it could be repaired. Two of the contractor's men died because of a hazard which might not be apparent.

When the method is used to freeze a pipe which is located in an excavation (e.g. for repair of a buried pipe) there is the danger that the evaporating nitrogen will displace oxygen in the excavation and the repair workers will suffocate.

In these circumstances the excavation should be regarded as a confined space even though it appears to be wide open to the air. All the appropriate precautions should be taken (see Health & Safety Executive Guidance Note GS 5).

Any hospital engineer who has such specialist work done would be well-advised to draw the attention of the contractor to this hazard.

G E Miller, Principal PTO, Works Safety, DHSS, London.

Health Authority wins second Award

Fuel savings of more than 30 per cent at one of its hospitals have won Leicestershire Area Health Authority a second top "save it" award in three years.

The authority has come first in the commercial section of the Gas Energy Management (GEM) award scheme, organised by East Midlands Gas with its project at the 120 year old Loughborough General Hospital — Leicester General Hospital won a similar award two years ago.

The original gas-fired boiler installation at Loughborough consisted of two large boilers for heating only and one small boiler supplying hot water. Following discussions with the Emgas Technical Consultancy team it was decided to carry out a phased upgrading of the installation.

The small boiler was replaced with a Beaumont gas water heater and an Ideal Super Concord boiler, rated at 850,000 BTUs per hour, was installed to serve the X-ray and out-patients departments. Separate circuits complete with controls and circulating pumps allow these departments to be heated independently.

A further phase, which includes the replacement of the two existing boilers, a new control system and monitoring equipment to relay performance to the main station nine miles away at Groby Road hospital, is under way.

Total gas consumption at the hospital is 127,077 therms and following completion of the project savings are expected to be 39,000 therms — 30.7 per cent.

The award was presented to the health authority by British Gas managing director for marketing Mr Ron Probert at a special ceremony in Sheffield today. GEM awards are presented at both regional and national level to customer and gas technical consultancy units who together have made the most outstanding contribution to the most efficient use of fuel during the past year.

"Thanks a million — and a half!"

The success of the Wessex Bodyscanner Appeal — which has now reached its £1½ million target — has been described as "stunning" by Professor Donald Acheson, Chairman of Southampton and South-West Hampshire Health Authority.

"To raise such a massive amount of money in so short a time has required a truly Herculean effort," he said. "The entire project has been a stunning success."

Professor Acheson recalled that the Appeal had started in January 1980 — about 1,000 days ago.

"The achievement of the £1½ million target means that during that time, the Appeal Fund has swollen, on average, by £1,500 per day — seven days a week for 34 months!

"By any standards, that is a magnificent achievement made possible by the generosity of thousands of people from all over the Wessex Region," he said.

"The National Health Service has a million and a half reasons to be grateful to them and to the Appeal organisers and trustees who have worked so assiduously."

Dr Richard Balquière, Lecturer and Research Fellow in the Department of Radiology and C. T. Scanning at the Royal Marsden Hospital in Sutton, Surrey, has been appointed as Consultant to run the service. Dr Blaquière trained in Radiology at the Southampton General Hospital from 1977 until this year.

Professor Acheson was confident that the new bodyscanning service would be in operation at Southampton General Hospital by the summer. Following agreement with the Consultant on the choice of machine to be purchased, rapid progress will be made on the necessary installation work.

"It is our determination that the service will begin as soon as humanly possible," he declared.

In the meantime, the Health Authority was allocating more funds to expand its current use of bodyscanning facilities in Midhurst.

Appointment of District Works Officers North Western RHA

Wigan	D. H. Mellows, CEng MIMechE FIHospE MIPlantE
Bury	J. Baxter CEng MIMechE FCIBS
Rochdale	H. Potts CEng MIMechE FIHospE
Salford	K. Wright MINucE MIHospE
Stockport	G. Drennan
Tameside and Glossop	R. H. Yorke BSc DMS CEng MIEE MICBS AMBIM MIWM
Oldham	R. T. Hollinshead ARICS
Trafford	A. Millington TEng (CEI) FIHospE MRSH
North Manchester	A. Watson MPhil CEng MICE MIMechE MRSH
South Manchester	R. D. Wilson, CEng FIMarE FIHospE
Blackburn, Hyndburn and Ribble Valley	F. G. Parr TEng (CEI) MIPlantE MIHospE
Preston	E. Whiteley MIOB AICW MBIM

Forthcoming Branch Meetings

South-Western Branch *Hon Sec: A J Graver Cheltenham (0242) 21361*

6th December	Energy Management for Building D Wilcox, Avon County Council and M Lees, Avon AHA	SW Gas Training School, Keynsham, Bristol.
8th December	Latest Research and Approval of Heat Pumps A Jackson, Managing Director, Denco Holdings Ltd.	University of Bristol, Small Lecture Theatre, Queen's Buildings.

Southern Branch *Hon Sec: R. P. Boyce Chichester (0243) 78141*

15th January 3pm	Incinceration/Heat Recovery	Queen Alexandra Hospital Portsmouth

East Anglian Branch *Hon Sec M. Brooke Great Yarmouth (0493) 50411*

15th January	Catering Equipment.	Presentation by Hobart Ltd, Cambs.

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

10th December	Annual Dinner Dance	Penns Hall Hotel, Sutton Coldfield
25th January	Impressions of a Holiday in Sri Lanka Dr R. P. Graham	Dental Hospital, Birmingham

London Branch *Hon Sec P. C. Vedast (01) 807 7340*

25th January	Control of Pollution and Waste Disposal	Wolfson Lecture Theatre National Hospital, Queen Square

North Western Branch *Hon Sec E. A. Hateley Manchester (061) 236 9456 ext 352*

9th December	Talk and demonstration on Further Advancements in Communications, at Plessey Limited Offices.	
26th January	Visit to Christie Hospital, Manchester	

Welsh Branch *Hon Sec T. Roche Bridgend (0656) 721276*

8th December	Balancing Valves in Heating Systems K. Stone, Crane Valves	University Hospital of Wales, Small Dental Lecture Theatre
12th January	Water Treatment (Nalfloc)	Board Room Singleton Hospital, Swansea

Those wishing to attend any of the above meetings please contact the relevant Branch Secretary.

The author, who is from the Department for Fluid Dynamics NT-TNO, Apeldoorn, Holland, first presented this article as a paper at the 7th IFHE Congress in Amsterdam in May 1982.

The importance of a Wind Tunnel Investigation in the design of hospitals

J A LEENE

Introduction

The use of wind tunnels for the design of airplanes and even for motor cars is well known. It may not be generally known, however, that many newly-designed buildings, building complexes and residential quarters have been tested in wind tunnels prior to construction.

The necessity of wind tunnel testing is clearly demonstrated by the almost classic example of the adverse wind climate around an isolated slab-type building at ground level.

Although the flow, even around such a simple design, is too complex to be described in a few words, the principal effect is that the high wind velocity flow near the top of the building is deflected downward to the base.

The reason why the undisturbed velocity at greater height is higher than close to the ground is the drag of the rough earth surface with all kinds of natural (mountains, woods, etc.) and artificial (buildings and structures) obstacles.

Above rough urban areas the wind speed at 100m height is about twice that at the meteorological standard height of 10m.

Wind effects on buildings comprise the wind climate at pedestrian level, near entrances, passages, the dispersal of exhaust gases from chimneys and parked motor cars, the waste-air discharge from air-conditioning outlets, and wind pressures on inlets and outlets of the air-conditioning system.

For all types of buildings a study of the wind effects is most important. This applies in particular to hospitals, since in view of the patients' health a good in- and outdoor climate without the nuisance caused by wind or too high waste-gas concentrations is required. A wind tunnel investigation at the early stage of the design of a hospital should therefore be an integral part of hospital engineering.

Some results from a wind-tunnel investigation on a 1/250 model of the new Academic Medical Centre in Amsterdam will be presented to illustrate the kind of information that can be gained from such tests.

Sommaire en Français

L'utilisation d'un tunnel aérodynamique pour la planification d'hôpitaux

Cet article décrit les effets du vent sur le Centre Académique Médical nouvellement construit à Amsterdam, démontrés dans le cadre d'une étude faisant appel à l'utilisation d'un tunnel aérodynamique, et souligne l'importance que revêt ce phénomène pour l'ingénierie hospitalière.

Parmi les effets du vent figurent le "climat de vent" dont les zones piétonnières, les pressions du vent s'exerçant sur les orifices d'admission et d'evacuation du système de climatisation situés dans les murs et toits du complexe, ainsi que la dispersion des gazes de combustion émis par les installations de production d'énergie et de l'air évacué à l'atmosphère par le système de ventilation.

Les résultats démontrent que la mise en place de moyens de protection contre le vent, tels que passages couverts et écrans, permet d'apporter une solution.

L'auteur en conclut que grâce à l'utilisation d'un tunnel aérodynamique, les problèmes dûs à des vents excessifs ou au mauvais fonctionnement des systèmes de climatisation, et qui sè posent fréquemment dans le cas de structures élevées, peuvent être évités car le tunnel permet de les identifier dès le stade de la planification.

Simulation

The natural wind not only increases in speed with increasing height above ground level — called wind gradient — but is also very turbulent and gusty in nature (*see Figure 1*). Following the work of Jensen[1], Counihan[2] a.o. special wind tunnels were built at MT-TNO Apeldoorn in which real wind conditions are simulated, allowing building models to be tested on a 1/250 scale. (See reference 3 for a detailed description of these boundary-layer wind tunnels.).

A special feature of these wind tunnels is the long stretch of roughness elements upstream of the test section to generate a turbulent boundary layer corresponding to the full-scale situation.

As far as the emission of gases from chimneys, roof outlets etc. is concerned, similarity between model and full-scale dispersion will exist if the momentum ratio of wind (a) and gas (g) is the same in both cases.

Often the specific mass of gas and of ambient air do not differ much, in which case only the rule:

$$\left.\frac{U_g}{U_a}\right._{\text{model}} \quad \left.\frac{U_a}{U_a}\right._{\text{full scale}}$$

must be fulfilled.

If the above mentioned rules are satisfied, the following relationship between source strength Q and concentration C can be deduced:

$$\left.\frac{L^2 C U_a}{Q}\right._{\text{model}} = \left.\frac{L^2 C U_a}{Q}\right._{\text{full scale}}$$

where:
L = characteristic model dimension
C = gas concentration
Q = source strength
U_a = mean wind speed

A more familiar form of formula 2 is:

$$\left.\frac{C U_a}{Q}\right._{\text{full scale}} \quad \frac{1}{S_2}\left.\frac{C U_a}{Q}\right._{\text{model}}$$

where: S = model scale.

The right-hand term of (3) is determined by means of a wind-tunnel measurement, and from this concentration coefficient the real concentration on full scale can be calculated if a wind speed U_a and gas emission Q are known.

The building to be tested is modelled in detail, but of the surrounding buildings up to a full-scale distance of about 300m only the main geometry is reproduced. The model is placed on a rotating disk to make it possible to vary the wind direction with respect to the model.

Method of Measurement

The wind speeds around the model — mostly at pedestrian height — are measured by means of small thermistors whose main dimensions show resemblance to those of an adult person. These thermistors are fed with a constant electric current to a temperature in still air of about 80°C.

As the heat loss to the surrounding air increases with increasing wind speed, the temperature decreases, resulting in an increase in thermistor resistance. This dependency has been calibrated before testing the model in the wind tunnel, and thus the wind speed follows from measurement of the voltage across the thermistor.

Due to the thermal lag of the thermistor material fast wind speed fluctuations cannot be measured, but only actual 10-min. mean values.

The facilities at MT-TNO *Apeldoorn provide for the automatic* measurement of wind speeds around a model building at up to 120 measuring points at one go, so that determination of the wind climate at all wind directions between 0° (north) and 345° with 15° intervals takes only 15 minutes.

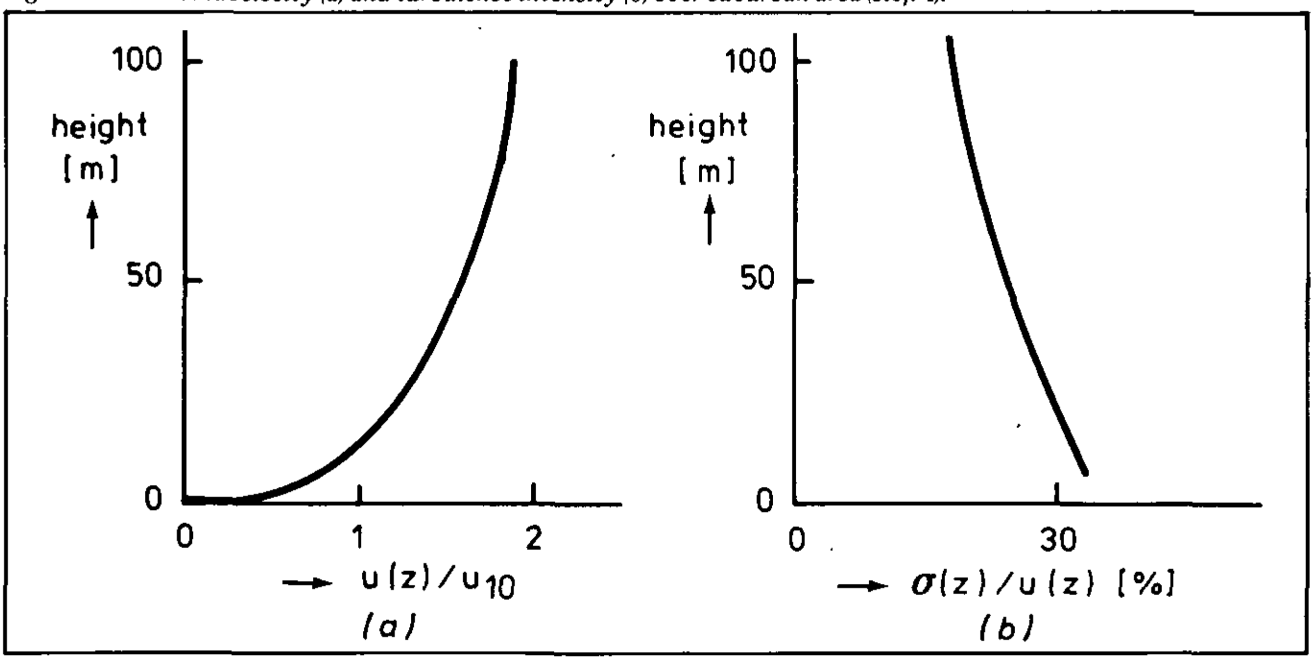
In this way the effect of remedial wind-protecting means can be determined very quickly.

Wind pressures are measured by means of 0.7mm small holes in the exterior walls and roof of the model. To these openings small capillary tubes are fitted, which are connected to a pressure transducer via a pressure scan system.

With regard to pressure the static pressure in the wind tunnel upstream of the model is used, which corresponds to the barometric pressure at full scale.

By sampling each individual fluctuating pressure signal for long enough its time-mean value can be determined. Due to the fluctuating character of the pressure signal, it takes more time to make pressure measurements than velocity measurements, but as small alterations in the

Figure 1: Mean windvelocity (a) and turbulence intensity (b) over suburban area (Ref. 4).



model do not influence these significantly, pressure measurements need to be performed for the original model configuration only.

Gas concentrations are measured by adding a small amount of isobutylene tracer gas (< 1%) to the air emitted from a source.

This contaminated air is sucked in from small holes in the faces and roofs of the model building, and supplied via capilliary tubes to a scanning valve. With this valve all concentration measuring points can be sequentially connected to a detector where the isobutylene is electrically charged by means of photo-ionisation. The electric charge is removed by a cathode present in the detector, and by measuring the electric current, the tracer gas content of the air can be accurately determined down to 1 ppm ($1 cm^3/m^3$).

Criteria

The quality of the wind climate around a building can best be described by the frequency with which high wind speeds occur. How the wind speeds measured on the model in the wind tunnel can be related to the number of days a chosen wind speed limit is exceeded, using natural wind statistics of a nearby meteorological station is described in detail in P. Vermeulen's paper[5].

To be able to judge whether a situation of strong winds or high gas concentrations is acceptable or not, sound criteria must be defined. As to wind nuisance the criteria given in *table 1*, which stem from the work of Hunt a.o. [6], have been adopted by MT-TNO.

These values are rather global, however, no distinction being made between young and old, sick and healthy people.

Dependent on the nature of the source, gases emitted in the ambient air can give rise to high odour levels, while other gases can be hazardous to the population.

A maximum odour concentration of 5 o.u. (odour units) will in general be acceptable, but for vulnerable areas such as those near hospitals, a maximum concentration of 1 o.u. is advised [7] (1 odour unit is the amount of smelling substance present in $1 m^3$ pure, non-contaminated air that can be distinguished by 50% of an odour panel).

For harmful gases such as CO, NO_x etc. the Labour Inspectorate

activity	location	comfortable	comfortable	uncomfortable
walking	building entrances, parks	< 35	35 - 70	> 70
strolling	shopping centers	< 15	15 - 30	> 30
sitting	terraces, galleries	< 1	1 - 10	> 10

Table 1 Accepted frequency (days per year) of exceeding the 5 m/s mean wind speed value at head level in the western part of the Netherlands.

Table 2 Global odour emission from different sources

Source	Qualification	Odour emission o.u./h
human being	office work	175
pig	90 kg weight	5000 - 25000
destruction plant	dead cattle	10^8
local bus	running stationary	10^6

Authorities give Maximum Accepted Concentrations (MAC-values), to which a person may be exposed during an 8-hour working day [8], while much lower values are advised as Maximum Immission Concentrations (ground concentrations) by the National Health Board for the environment [9].

Some values are cited in *table 3.*

Results from the wind-tunnel tests on the AMC Design

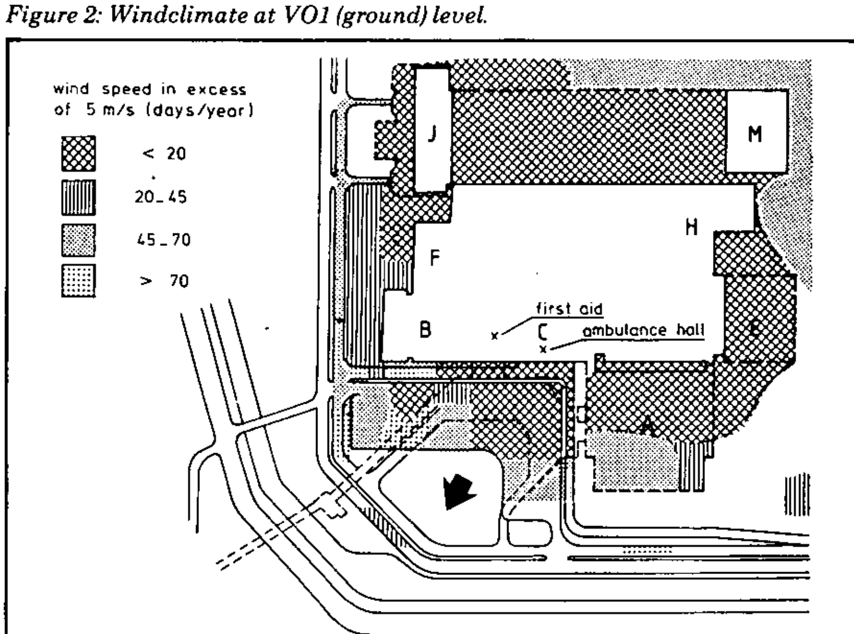
The wind climate around the building complex

The wind speeds have been measured at a large number of locations at

Table 3 Emission of combustion-gas components and their MAC- and MIC-values.

gas	MAC-value	MIC-value	motorcars stat.	motorcars slow	local bus (Diesel) stat.	nat. gas furnace	household refuse combustion
	ppm	ppm	g/h	g/h	g/h	g/m^3	g/kg
CO	50	35	409	274	73	1,3	2
C_xH_y	—	—	45	34	34	1	0,5
NO	25	1	0,84	68	48	1,8	2,5
NO_2	5	0,3					
SO_2	5	0,1	0,42	1	12	—	1

Figure 2: Windclimate at VO1 (ground) level.



ground level VO 1 and first floor level VO and at some places above the low-rise part of the complex.

At ground level (*see figure 2*) the *wind climate appears to* be favourable on the whole, in spite of the presence of a high-rise building.

In the entrance area at the north corner of the complex with access to Casualty and the ambulance reception area a wind speed of 5 m/s is exceeded on far less than 10 days a year. This area is shielded from the frequent south-west winds by the building, and further by the platform at VO-level.

Locally, however, there can be wind-nuisance in front of the northern corner and on the main road opposite the polyclinic. To a smaller extent this is also the case at the east façade of the building and in the precinct below the polyclinic at the west corner.

Although the wind climate in the area between E and M destined for despatch facilities is not favourable, the wind-reducing effect of a partly open covered way above this area has been investigated. It appears that when such a covered way is fitted, the wind nuisance is reduced from 21 to 10 days a year.

The wind climate above the platform at VO floor level (*see figure 3*) is also favourable especially below the covered way above the entrances for visitors and that giving access to the poly hall, where a wind speed of 5 m/s is exceeded for only 3, 5 days a year.

In sharp contrast to this is the wind climate prevailing on part of the pedestrian bridge to the metro station where a wind speed of 5 m/s is exceeded during 98 days a year, which is even more than the free-field value of 88 days. The critical wind direction appears to be east.

This first design of the pedestrian bridge was fitted with roof and open long sides with balustrades.

Providing a 50% permeable wall along the east side of the bridge reduced the number of days with wind nuisance from 98 to 58 per year, which is still too high, however.

As the ultimate lay-out of the bridge had not been decided upon, no other remedial actions to improve the wind climate above the bridge were taken at this stage of design.

The wind climate above the low-rise buildings (*see Figure 4*) has been investigated in order to find out if it would be possible to construct one or more terraces on top of these buildings.

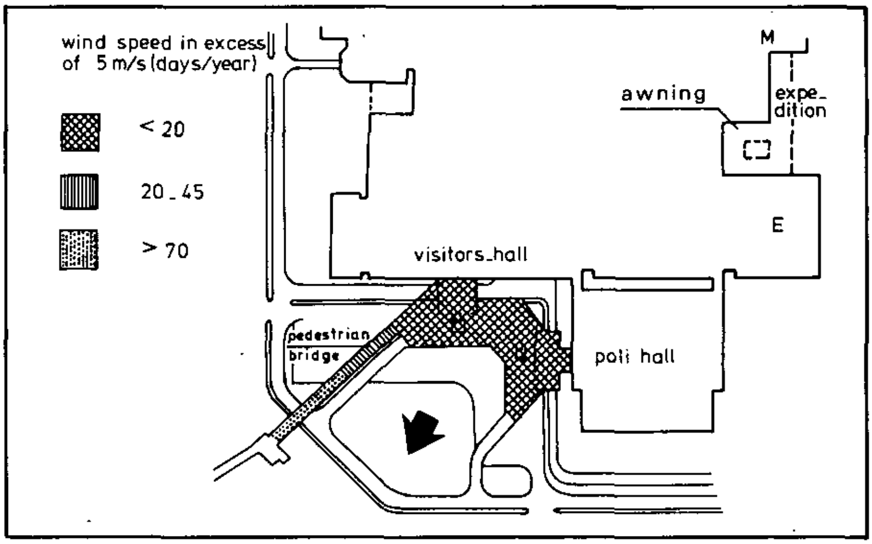


Figure 3: Windclimate at VO floor level.

It appears from the model test that the wind speeds above building M can be high due to the unshielded exposure to the frequent south-west winds.

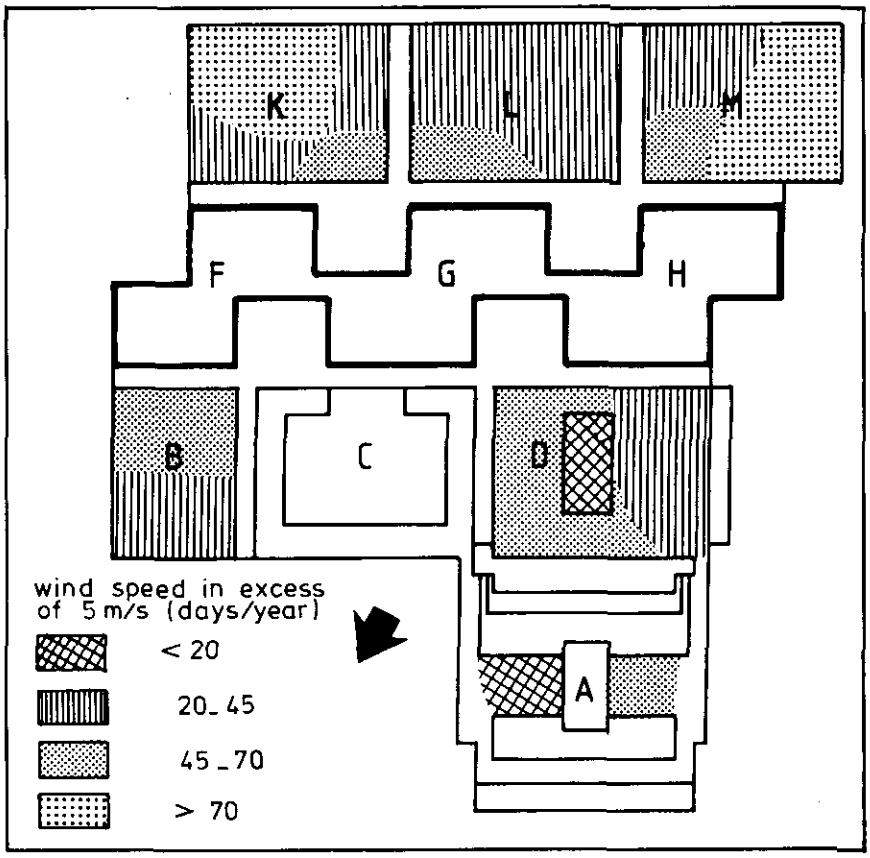
Only at the middle of D and north-east of the middle of A wind nuisance is limited to 17 days a year, which is too high for a terrace area.

At a later stage of design wind-tunnel investigations were continued with a new lay-out of the bridge which was unroofed now.

Wind speeds were measured at 10 points on the bridge. The average number of days a wind speed of 5 m/s is exceeded appears to be 100, while 50% open fences reduce this to 60 days a year.

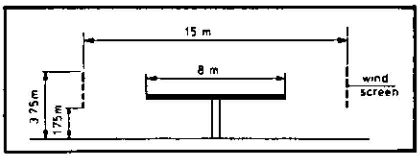
The fences on a full scale can also consist of trees, for wind shield

Figure 4: Windclimate above the low-rise part of the building complex.



purposes their geometry is far less important than their porosity.

The distance to the bridge at which such wind screens are to be positioned is not arbitrary, however, the optimum distance is shown in *Figure 5, Cross-section of the pedestrian bridge with wind screens.*



Wind pressures

Wind pressures were measured at 115 points on the hospital. They are presented in coefficient (C_p) form by relating them to the stagnation pressure $\frac{1}{2} p U_{10}^2$ of the wind speed.

$$C_p = \frac{\text{measured pressure} - \text{barometric pressure}}{\frac{1}{2} p U_{10}^2}$$

(p = air density; U_{10} = wind speed at standard meteorological height of 10 m). From this a small selection has been made to illustrate some effects of the position of measurement in relation to the wind direction.

In *Figure 6* the variation of wind pressure with wind direction is shown for some measuring points on the roofs of the building.

Most wind pressures are negative (suction), which is normal for flat roofs. There are some exceptions, however, like at location 144 on the low-rise building roof, where at north-western winds the pressure coefficient appears to be positive Cp = +.25. This effect is caused by the wind flow being lifted up in front of the high-rise bed house. Another point emerging from these results is that mean pressure levels on roofs of high-rise and low-rise buildings do not differ significantly, so the vertical wind gradient of the oncoming flow is not reflected in the pressures on the roofs. The building façades experience much higher maximum wind pressures, while the influence of wind direction is greater, too. The measuring points 138 and 151 are situated at the same VO-level, but the suction pressure at the side face of the bed house is highest. Small variation in wind direction between east and south-east, such as can occur at full scale in a short period of time, can give a variation in the pressure coefficient of from Cp = +0.9 to Cp = -1.1. In the example the air-conditioning system is still required to operate at high wind speeds up to

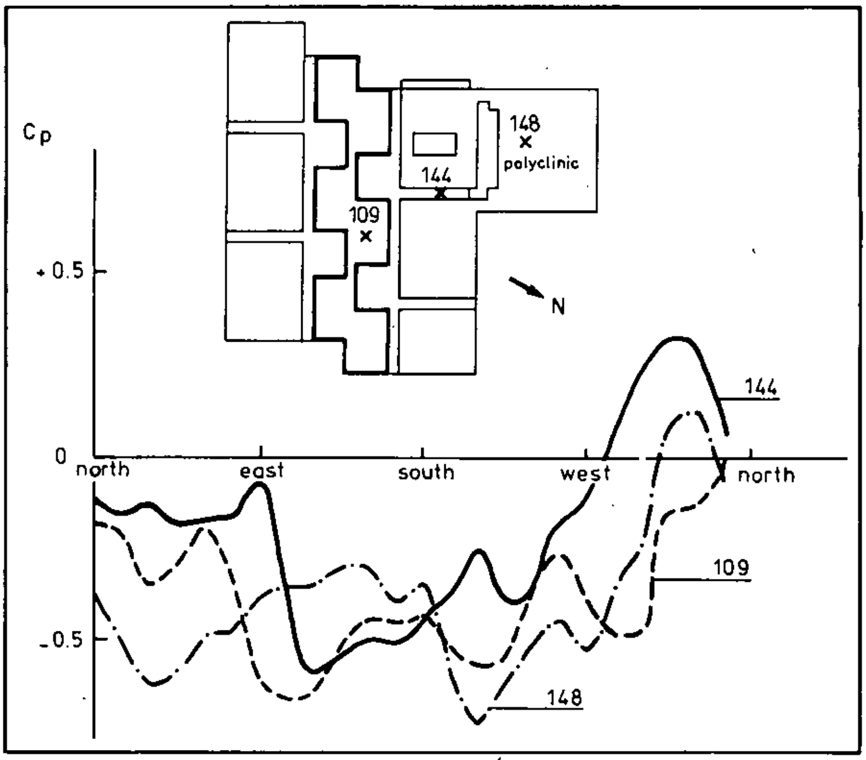
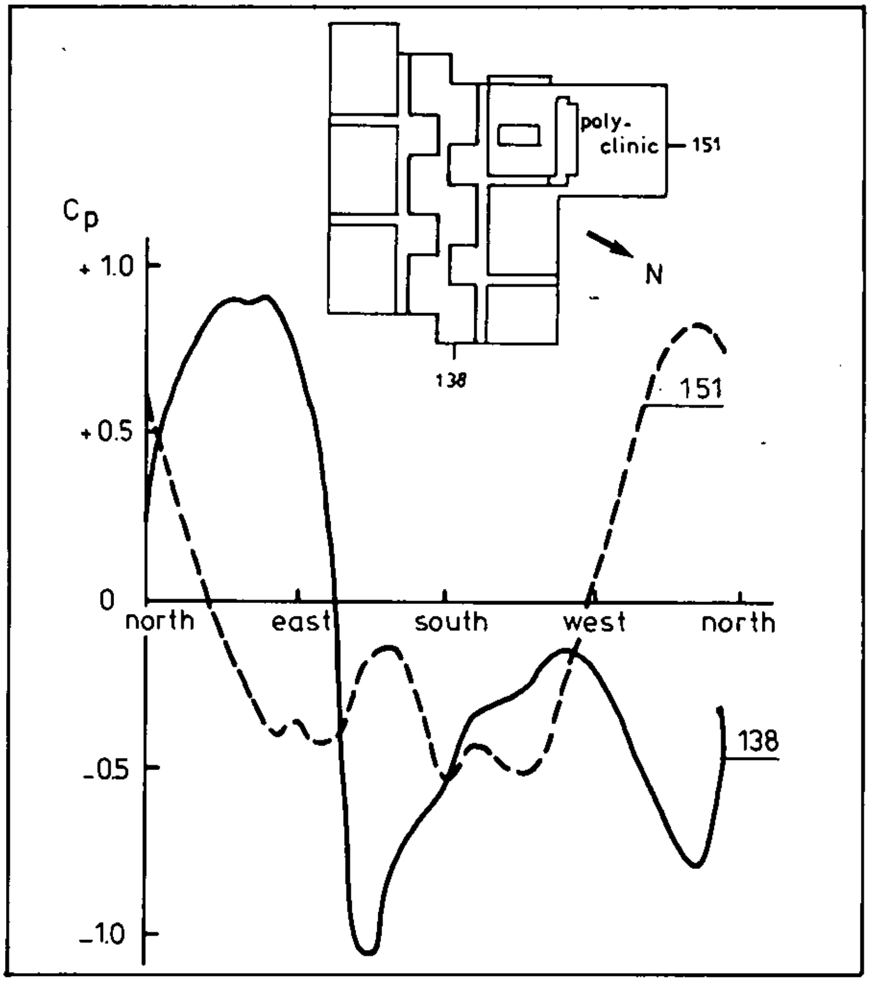


Figure 6: Pressure coefficients on roofs of A.M.C.
Figure 7: Pressure coefficients on walls of A.M.C.

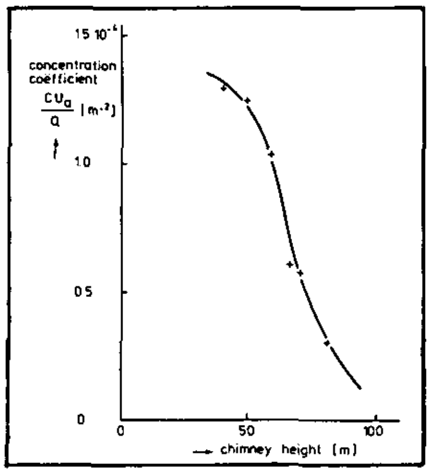


U_a = 20 m/s extreme wind pressures varying from +85 Pa to -175 Pa on the roofs and of +250 Pa on the building façades should be accounted for. These pressures are not to be neglected when they are compared with the duct losses of the air-conditioning system.

Dispersal of gases

Noxious gases. Gas emission from the power station situated west of the AMC takes place by means of a 60m high stack. While ground concentrations for emissions from free-standing stacks can be calculated, this can not be done when interaction between the flows around the stack and the neighbouring building is to be expected. From wind-tunnel tests it appears that the concentration near the air inlets above the ward is highest for a wind-upward position of the stack with respect to this high-rise building part. In *Figure 8*, the effect of stack height on the concentration level is presented.

Figure 8: Coefficient of maximum smoke-gas concentration near the air inlets on top of the ward in relation to height of the chimney of the power station.



For a stack lower than the wards (~ 50m) the concentration is maximum, while a height of over 90m is required to keep the wards free from these gases. At the planned stack height of 60m the maximum concentration coefficient measured is $1{,}1.10^{-10}$. For a stack flow of $50m^3/s$ and a NO_x -content of 400 ppm, the NO -emission is $400.10^6.50 = 20.10^{-3}$. The maximum NO_x -concentration above the wards at a low wind speed of 2 m/s will then be

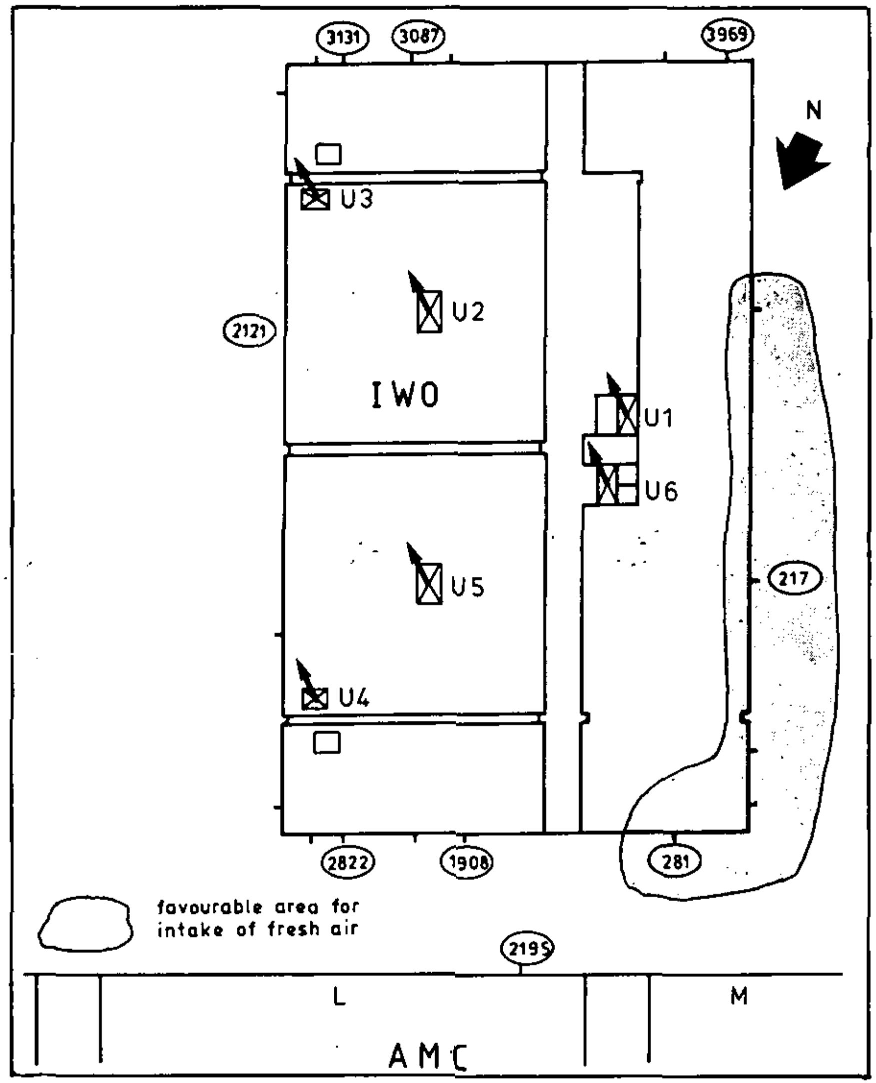
$$C = \frac{1{,}1.10^{-10} . 20.10^{-3}}{2} = 1{,}1.10^{-6}$$

Of all the waste air emitted by ventilation from the AMC building the air discharged from the pig house in the detached IWO-building could give complaints arising from too high an odour level.

The emitted air from one outlet shows that the odour concentration near the IWO is lowest, but above the wards it is highest when the emission source lies up wind of the AMC, while wind from the opposite direction gives an adverse effect. An explanation of this phenomenon is that in the latter case the IWO building is situated in the wake of the AMC high-rise part of the building *with a strong backward flow,* by which the gas emissions are distributed over the whole IWO-roof area.

In *Figure 9* the maximum contaminated air concentration near the air inlets on the face of the IWO is indicated at the maximum waste-air emission of 250000 m^3/h and a wind speed of U = 2 m/s. A minimum concentration of 200-300 ppm is measured near the west corner of the IWO and a maximum of 4000 ppm near the south corner. As the odour emission of the great variety of animals — from mice to pigs — is not known, it is impossible, strictly speaking, to determine from the wind-tunnel tests whether or not the odour level near inlets and at ground level will be too high. An estimation can be made, however, on the basis of the odour emission data for pig houses (*see table 2*), if the assumption is made that dung production is *porportional to the weight of the* animals and odour emission is proportional to the dung area. The odour emission from the animals can be calculated in that case to be 335 pig-equivalents, or about $1{,}5.10^6$ o.u/h. To keep the odour concentration within

Figure 9: Maximum concentration of waste air at the façades of the pig house at maximum emission (Q = 250,000 m^3/h; Ua = 2 m/s)



the pig house below 5 o.u./m^3 an amount of ventilation air of

$$\frac{1,5.10^6}{5} = 300.000 \text{ m}^3/\text{h is needed.}$$

The design value for the ventilation flow being 20% lower, the odour concentration inside the pig house is 6 o.u/m^3. When contaminated air from the pig house is emitted above the IWO it will reach the air inlets of the IWO building with odour concentrations diluted at least 250 times (= 4000 ppm). So outside the pig house the odour concentration will be much below the standard for acceptability of 1 o.u/m^3.

Conclusion

By means of a wind tunnel, investigation on a model of a hospital, the wind climate, the nuisance from gas emission and the level of wind pressures of air inlets and outlets can be determined at an early stage of design.

Problems due to wind, which are unpleasant wind climate or a poorly functioning air conditioning system, which are frequently experienced with high buildings, can thus be avoided.

The effects of remedial measures such as the use of wind screens or covered ways, or a displacement of emission sources, or air inlets can be established on a model scale with relatively simple means.

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Laundry Design and Layout

W G FUELL CEng MIMechE

Operational Policy

An essential preliminary to any laundry design is the establishment of a firm operational policy whereby the total requirements of the laundry and linen service are determined and agreed by all parties involved. This constitutes the brief communicating the requirements to the designer and is perhaps the single most important ingredient in successful laundry design. It is imperative that once policy is established there should be no deviation.

Some aspects of the operational policy may need to be implemented coincidental with the completion of the laundry particularly when it has been decided to introduce modern blend fabrics, eg new national nurse dress. A decision of this nature requires that finishing equipment specific to handling these fabrics is included in the selection of plant, and should this change not take place and cotton garments remain in use, a satisfactory finish to these garments will not be achieved, thus causing dissatisfaction to the wearer and all the attendent problems that accompany this situation. Therefore to achieve satisfaction from the laundry as designed the agreed operational policy must be implemented in full.

Category Reference	% Breakdown per Laundry Man Assessment	Arts/Weeks on 120,000 capacity	Weight per article ozs	Total weight lbs	Weight per hour lbs	Articles per hour	Foul/Infected Load Arts	Foul/Infected Load lbs	Soiled Load Arts	Soiled Load lbs	Foul/Infected Load/hour Arts	Foul/Infected Load/hour lbs	Soiled Load per hour Arts	Soiled Load per hour lbs
1	14.1	16,920	32	33,840	995	498	846	1,692	16,074	32.148	25	50	473	946
2	11.7	14,040	20	17,550	516	413	7,020	8,775	7,020	8,775	206	258	206	258
3	2.7	3,240	34	6,885	202	95			3,240	6,885			95	203
4)		80) 120	8	40	1	2			120	40		)	4	1
5)		40)	54	135	4	1				135		)		4
6	2.0	2,400	7	1,050	31	71	–		2,400	1,050			71	31
7	11.9	14,280	8	7,140	210	420			14,280	7,140			420	210
8	9.1	10,920	10	·6,825	201	321			10,920	6,825			321	201
9	2.8	3,360	10	2,100	62	99	3,360	2,100	—	—	99	62		
10	1.9	2,280	7	997	29	67	684	300	1,596	697	201	9	47	20
11	3.2	3,840	14	3,360	99	113	1,152	1,008	2,688	2,352	34	30	79	69
12	7.1	8,520	5	2,662	78	251	8,520	2,662	—	—	250	78		
13	9.7	11,640	12	8,730	257	342	582	436	11,058	8,294	17	13	325	244
14	0.6	720	30	1,350	40	21			720	1,350			21	40
15	4.0	4,800	42	12,600	370	141	240	630	4,560	11,970	7	18	134	352
16	7.5	9.000	8	4,500	132	265	900	450	8,100	4,050	25	13	238	119
17	0.8	960	10	600	18	28	960	600	—	—	28	17		
18	2.2	2.640	8	1,320	39	78	132	66	2,508	1,254	4	2	74	37
19	0.9	1,080	32	2,160	63	32			1,080	2,160			32	64
20	1.0	1,200	14	1,050	31	35			1,200	1,050			35	31
21	0.7	840	8	420	12	25			840	420			25	12
22	1.3	1,560	6	585	17	46			1,560	585			46	17
23	0.8	960	24	1,440	43	28	48	72	912	1,368	2	2	27	40
24	3.9	4,680	6	1.755	52	138	3,042	1,140	1,638	615	90	33	48	18
	100.0	120,000		119.094	3,502	3,530	27,486	19,931	92,514	99,163	988	585	2,721	2,917

Average weight per article 0.99 lbs

Foul/Infected work as percentage of total load. $\frac{27{,}486 \times 100}{120{,}000} = 22.9\%$

Table 1: Projected load to 120,000 articles/week based on percentage breakdown of existing laundry load.

Sommaire en Français

Conception et Aménagement Intérieur d'une Blanchisserie

W G FUELL

M. Fuell déclare qu'avant d'envisager les plans de n'importe quelle blanchisserie il est essentiel pour commencer d'établir une politique d'exploitation ferme définissant tout ce que l'on attend de la blanchisserie et du service de la lingerie, exigences qui devront être convenues par toutes les parties concernées.

La réussite de n'importe quel plan de blanchisserie dépend totalement de la nécessité de faire correspondre la capacité de l'installation à la quantité de travail à fournir effectivement. Il convient aussi d'établir le pourcentage de linge très sale/infecté. M. Fuell suggère que les plans d'une blanchisserie devraient prévoir de lignes de circulation rectilignes mais qu'il y aura inévitablement une certaine circulation transversale du fait de l'élément très sale/infecté que comporte la quantité de travail à faire.

L'auteur met en garde contre les risques d'une mécanisation excessive. Si un système tombe en panne, le mouvement manuel du travail risque de se trouver gêné par le manque d'espace au sol. Dans l'évaluation du type d'installation et de la fonction qu'il doit fournir, il faut déterminer les différents types de fini requis.

M. Fuell énumère les divers services à l'intérieur d'une blanchisserie. Sa liste comprend la réception et le stockage du linge sale, l'évaluation de la capacité des machines, les finisseuses air/vapeur, la production calendrée et les systèmes de lavage continu à transfert par lots. Il discute les diverses sources d'énergie notamment la vapeur, l'eau et l'électricité.

Il termine son article en spécifiant que toutes les blanchisseries devraient être conçues de manière à économiser l'énergie au maximum. L'article est illustré au moyen de diagrammes et graphiques.

Table 2: Allocation of articles to process classifications. For the purpose of comparison with design data supplied and various design and machine loading computations the total workload of the laundry has been segregated into generic classifications as follows:

No.	Items included
1	Top sheets, cot sheets and other articles of similar weight and size.
2	Draw sheets
3	Counterpanes
4	Tablecloths
5	Miscellaneous large flatwork
6	Aprons
7	Pillowcases
8	Small flat pieces
9	Surgeons and Nurses gowns
10	Pyjama trousers
11	Nightgowns and nightshirts
12	Terry squares
13	Terry towels and laundry bags
14	Dressing gowns
15	Cellular blankets
16	Miscellaneous tumble dry
17	Surgeons vests and trousers
18	Pyjama jackets
19	Coats and overalls
20	Uniform dresses
21	Shirts
22	Miscellaneous
23	Jackets and Trousers (outdoor)
24	Patients clothing (underwear)

Determination of workload

The success of any laundry design is wholly dependent in matching the plant capacity to the workload. This should take account of the existing workload and the assessment of any additional workload.

The establishment of the existing workload should present no problem. The Linen Services or Laundry Manager should be in possession of this information, and if he is not, should be able to obtain the required details by carrying out production counts over a period of a few weeks.

The assessment of the additional workload is not so easy. If no specific information is available an assessment can be made based on the existing workload generated by a known number and type of beds and proportionally increasing this load in relation to the number and type of the additional beds.

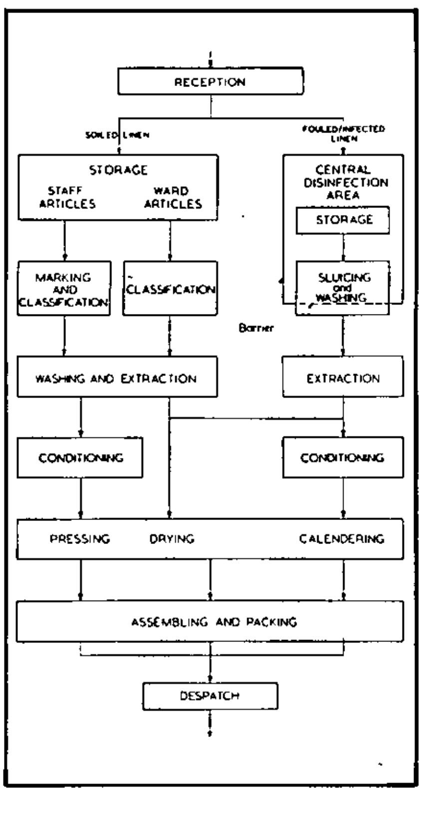
Table 1 shows an assessment of the workload for a 120,000 articles per week laundry, based on the percentage breakdown of all classifications taken from the existing workload of approximately 98,000 articles per week. The

Table 3: Assessed Foul/Infected Load (120,000 arts/week)

Category		Classification	Projected load to 120000 arts per week	Proportion of foul/ infected %	No of foul/infected arts/week	Average weight per article (ozs)	Total weight per week (lbs)	hourly load (lbs)
Flatwork Large	1	Top sheets	16,920	5.0	846	32	1,692	50
	2	Draw sheets	14,040	150.0	17,020	20	8,775	258
Flatwork Small	9	Surgeons and Nurses Gowns	3,369	100.0	3,360	10	2,100	62
	10	Pyjama Trousers	2,280	30.0	684	7	300	9
	11	Nightgown and Nightshirts	3,840	30.0	1,152	14	1,008	30
Tumble Dry	12	Terry Squares and bibs	8,520	100.0	8,520	5	2,662	78
	13	Terry towels and laundry bags	11,640	5.0	582	12	436	13
	15	Cellular Blankets	4,800	5.0	240	42	630	18
	16	Misc Tumble dry	9,000	10.0	900	8	450	13
Press Work	17	Surgeons Vests and trousers	960	100.0	960	10	600	17
	18	Pyjama jackets	2,640	5.0	132	8	66	2
	23	Jackets and trousers (outdoor)	960	5.0	48	24	72	2
	24	Patients clothing (underwear)	4,680	65.0	3,042	6	1,140	33
					27,486		19,931	585

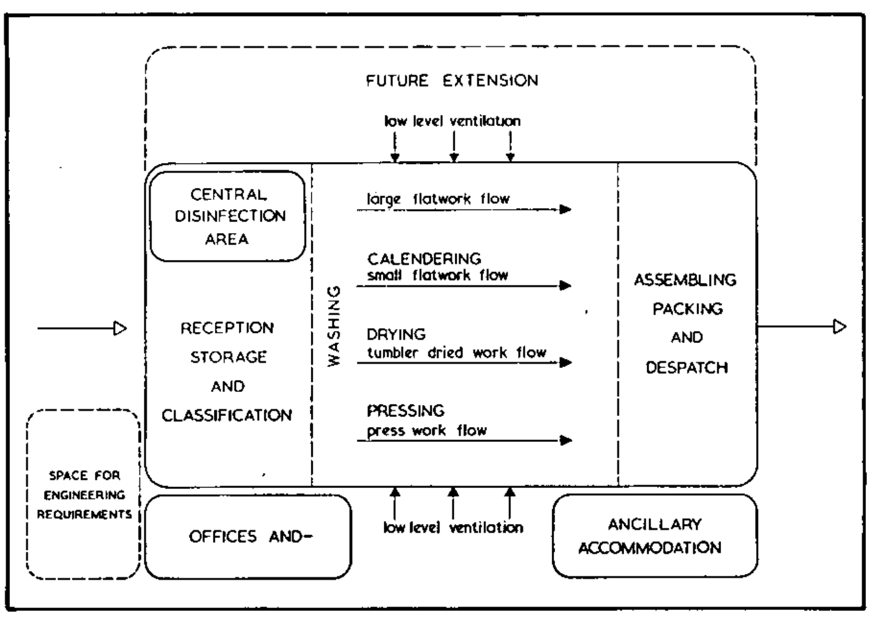
Foul/infected work as a percentage of total load of 120,000 arts/week = 27,486 / 120,000 x 100

+ 22.9%



← *Figure 1: Workflow diagram*

Figure 2: Diagrammatic layout of laundry accommodation ↓



reference numbers given in the first column of this table represent the classifications given in *Table 2.* The average weight per article given in column of Table 1 was determined by weighing 10 articles of each classification, taken at random and taking one tenth of that weight as the weight per article.

The percentage of foul/infected linen should also be established at this stage to enable the plant capacity for the Central Disinfection Area to be determined. It is useful to compile a schedule of this work as given in *Table 2.* The whole of the information in this table is derived from the column headed "proportion of foul/infected %", this having been established in conjunction with the laundry manager. This table also indicates the finishing lines which this work is required to pass. This information enables the designer to allow for the necessary cross-flow of work into the requisite flow lines.

Health Building Note 25 (HBN 25) quotes this proportion of the load as 10% which is normal for acute hospitals with a small element of long stay psychiatric or geriatric patients. however where there are high levels of psychiatric, mentally sub-normal and geriatric beds the proportion of foul/infected work has been known to be as high as 60% of the total workload. With foul/infected loads of this proportion one would consider designing the laundry on a total barrier principal for the washing plant.

Work Flow Pattern

Ideally the laundry design should provide for straight line flow patterns but because of the foul/infected element of the workload some cross flow will be inevitable after the work has passed through the central disinfection area; this follows the recommendations contained in HM(71)49. The laundry will only function effectively if the building is planned in strict accordance with the production line sequence ie receipt, processing and dispatch. *Figure 1* shows the general workflow pattern.

It is essential to build in some flexibility to accommodate future variations. *Figure 2* shows a diagrammatic layout of laundry accommodation which indicates the advantage of straight production lines when a future extension to the laundry is required.

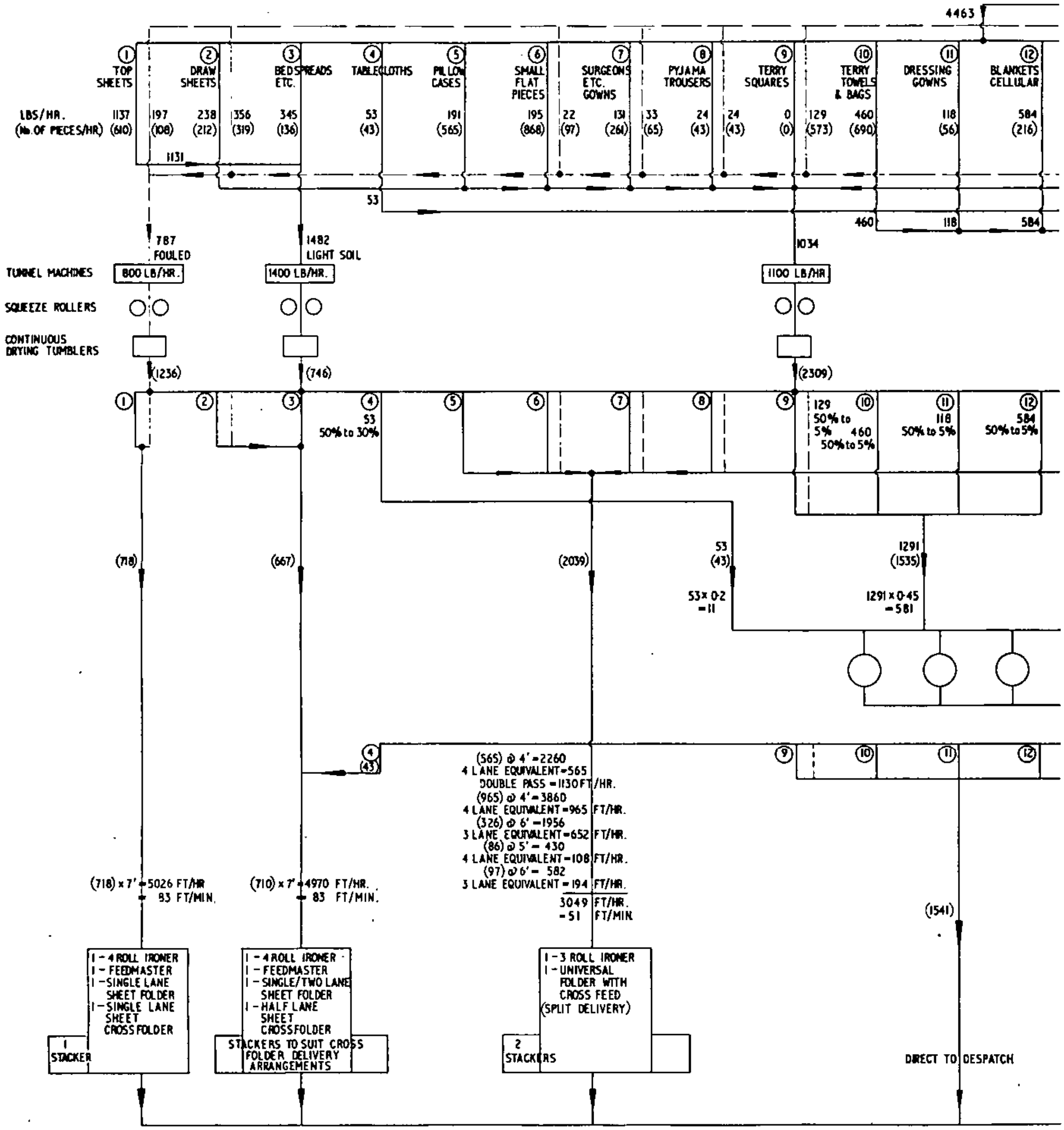
It is important, however, to beware of over-mechanisation in the laundry design. Excessive provision for mechanised transportation of linen makes the laundry totally dependent of the conveyors and when, for any reason, this system breaks down, manual movement of work to maintain throughput can be impeded by the conglomeration of conveyors. It is therefor recommended that, in planning a laundry, careful thought is given to maintaining maximum floor access between machines, wherever possible.

In many processes in the laundry it is necessary to hold sufficient quantities of work to maintain continuous

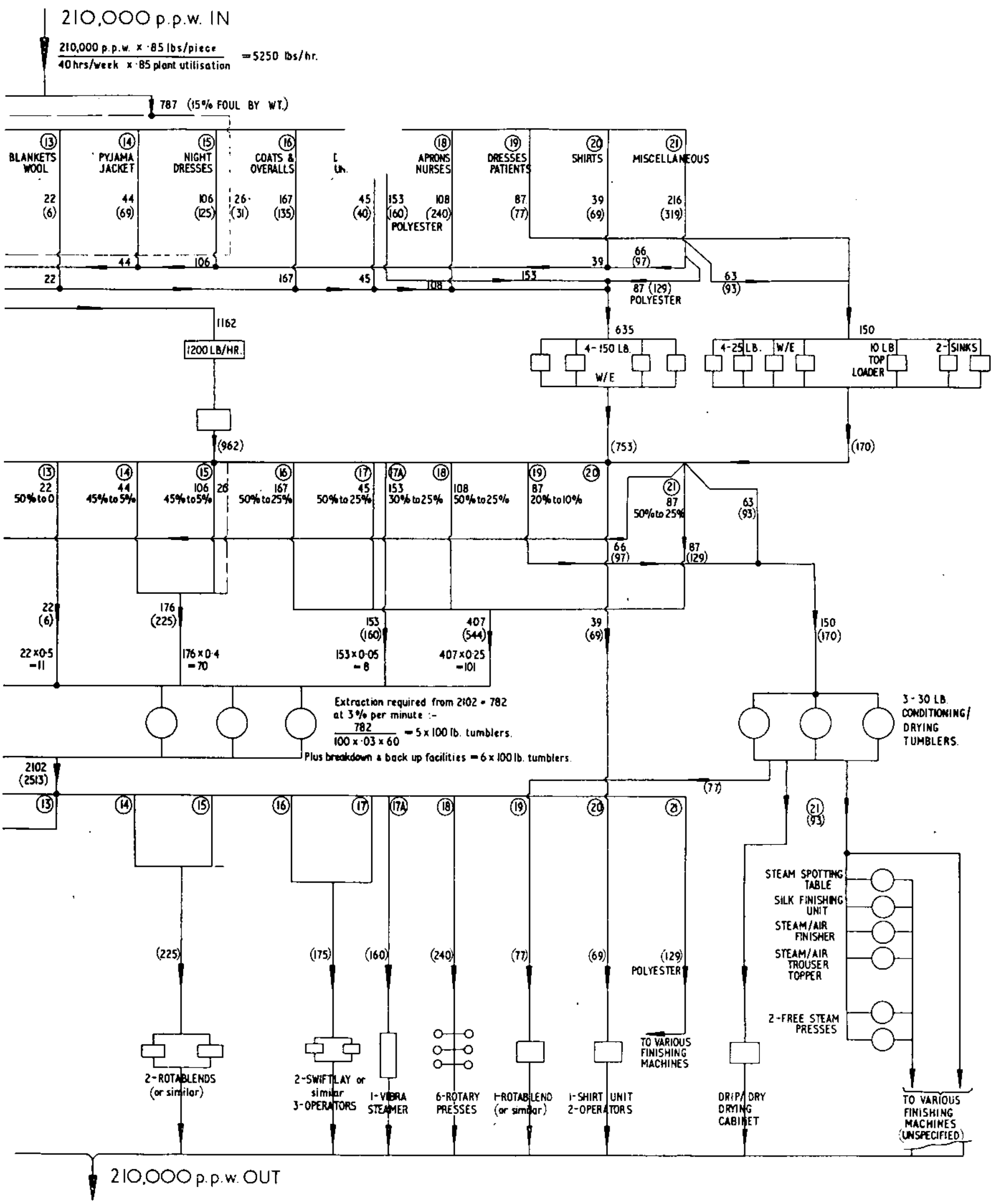
Table 4: Guide to the common types of articles in Health Service use, and illustrates alternative types of finish.

Type of Article	Calendar	Fully Dried and Folded	Press	Steam Form or Tunnel
Top sheets	/			
Draw sheets	/			
Cot sheets	/			
Counter sheets	/			
Counterpanes	/			
Curtains, large and small	/			
Tablecloths	/			
Pillowcases	/			
Tea towels	/			
Roller towels (Huck)	/			
Theatre towels	/			
Mattress covers	/			
Towels (Terry)		/		
Bags (patients and staff)	/	/		
Cloths	/			
Napkins (Terry)		/		
Bandages		/		
Blankets — cellular		/		
Blankets — wool		/		
Aprons	/		/	
Caps			/	
Gowns Baby		/	/	
" Dressing		/	/	
" Operation		/	/	
" Nurses		/	/	
" Surgeons		/	/	
Dresses Nurses			/	/
" Theatre sisters			/	/
Trousers — Surgeons			/	
Masks theatre		/	/	
Drapes theatre	/			
Vests theatre	/		/	
Trousers uniform			/	
Overalls			/	
Coats — white			/	/
Coats — coloured			/	/
Boiler suits			/	
Cover air ring	/			
Belts			/	
Pyjama jackets		/	/	/
Pyjama trousers		/	/	
Nightdresses		/	/	/
Shirts			/	/
Teeshirts			/	/
Petticoats		/	/	
Slips		/	/	
Pinafores			/	/
Stockings		/		
Socks		/		
Jackets patients			/	/
Trousers patients			/	/
Dresses patients			/	/
Skirts			/	/
Dressing gowns patients			/	/
Curtains net			/	
Curtains cubicle	/			
Stretcher canvas		/		
Blouses			/	/
Cardigans		/	/	
Jumpers			/	/
Ties			/	
Vests		/		
Pants		/	/	
Bags Terylene or Nylon		/		

BRIEF AND DESIGN INTENT



— FOR AN AREA LAUNDRY.



production, particularly in the calendering section. Conveyors generally are not capable of producing this storage capacity and in these circumstances trollies are still considered to be the most satisfactory way of providing this in process storage.

Assessment of Type of Plant and Capacity

In order to assess the type of plant and its required function it is necessary to determine the various types of finish that are required. Assistance in this matter will be provided by the laundry manager but *Table 4* gives a guide to the common types of articles in Health Service use and illustrates alternative types of finish.

From the established workload and the type of finish required you will find a flow diagram similar to that shown in *Figure 3*, of great assistance in determining the required capacity for each item of plant. It forms a Brief and Design Intent for the laundry designer.

The required hourly outputs should be determined on the basis of 85% machine utilisation which equates to 34 effective production hours of a nominal 40 hour week. This allows generally for laundry staff tea beaks, and routine maintenance of plant other than replacement of major machine parts or major breakdowns.

The following are the general requirements and criteria used in assessing the area and plant capacity of the various departments within the laundry:

1. Soiled Linen Reception and Storage
The General provision in this department is to allow for up to 8 hours storage of unclassified work, plus 2 hours storage of classified work. This takes account of a bank holiday weekend where the dirty linen generated during 4 hospital days is delivered back to the laundry during the first two working days of the laundry.

2. Assessment of Machinery Capacity

Washer Extractors 1.1 loads per hour based on an overall cycle time of 55 mins.
Washer Extractors used for foul/infected work 0.9 loads per hour, based on overall cycle time of 66 minutes.
Separate washing machines and hydro extractors operating in tandem the overall cycle time is 55 minutes per batch.
Washing machines (without extraction) 1.5 loads per hour based on a 40 minute cycle time.
Conditioning tumblers 4/5 loads/hour.
Fully drying tumblers 2.5 loads/hour.
Press outputs: Rotary 35 article/hour average.
Cabinet Units 2 operator 80 arts/hour
3 operator 120 arts/hour

3. Steam Air Finishers 50 arts/hour

4. Calender Production Calender production depends on,

a. Type of articles and degree of standardisation
b. Moisture retention of articles prior to ironing
c. Working steam pressure (actual)
d. Diameter of roller, number of rolls, and running speed
e. Calender Clothing
f. Condensate arrangements (trapping).
g. Adequate air venting from beds.
h. Adequate roll suction arrangements.

HBN 25 assumes a 4 Roll machine producing 700 hospital sheets per hour or 3,000 small pieces per hour dried to about 2% to 4% above bone dry weight from an initial moisture retention of about 40% above bone dry weight.

5. Batch Transfer Continuous Washing System — The trend now is to move to this system which comprises a batch transfer tunnel washing machine in a process train using a squeeze press and bank of drying tumblers. The production outputs will depend on the number of compartments employed in the washer. Performance reports on a number of these systems are available from the DHSS.

In order to achieve thermal disinfection in these machines the number of stages should not be less than eight with a 2 minute cycle time per stage.

It is essential to specify the actual workload the machine is expected to handle and the required final moisture retentions in the linen in order to achieve the required production capacity of the system. This also serves to ensure that the requisite number of drying tumblers is provided.

Where this system is required to deal with mixed classifications including fully dried work, a queuing theory has to be applied because of the differing cycle times for the tumblers. The problem with this arrangement is that the soiled linen coming into the laundry does not arrive in the correct proportions to maintain the correct sequencing of the batches of the different classifications to maintain maximum output. It has been observed in practice that several compartments of the washer are fed with long cycle time processes with the consequent effect of the washer production being halted, waiting for tumblers to become available for receiving the next load. It is therefore advisable to consider conditioning only with this system and transferring fully dried work to batch tumblers for the remainder of the fully drying process.

Design of Services

Steam

The average steam requirements of a laundry will vary with the type of plant used; particularly that used in washing. The average steam requirement for a laundry is approximately $3^1/_2$lbs of steam per lb of work processed where using washer extractors, but will be reduced by at least 50% if continuous batch transfer tunnel washers are used; because of their contraflow water arrangements.

However one must not fall into the trap of estimating steam demand from average steam usage. With washer extractors, peak flow rates are required in order to raise the temperature of the water within about 3 minutes, and therefore manufacturers recommended flow rates must be observed. With an all washer extractor laundry one would normally allow for not less than 3 machines demanding steam simultaneously. With batch transfer machines generally the steam demand maintains a more uniform flowrate.

The steam consumption of a drying tumbler varies according to design, but in general terms, steam consumption of the order of 2 to $2^1/_2$ times the potential hourly production of dry work is fairly typical. Thus, a tumbler capable of drying 100 lbs of towels in 20 minutes, ie 300 lbs/hour, will use about 700 lbs of steam power per hour. Steam will be used at this rate as long as the fans are switched on and steam is supplied to the heater battery, irrespective of the load in the machine.

The steam demand of calenders is fairly constant provided that the moisture retention in the articles, after washing and conditioning is constant. For example, a calender comprising 4 — 24 diameter rolls running at 96

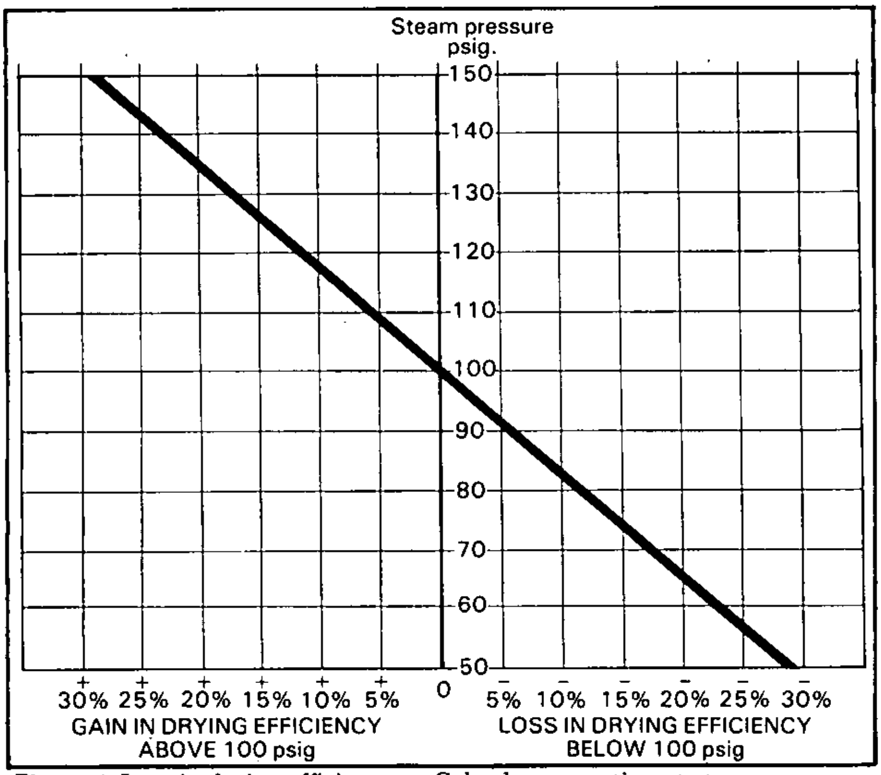


Figure 4: Loss in drying efficiency on Calenders operating at steam pressures below 100 psig.

ft/minute will produce about 720 sheets per hour and consume 900 lbs to 1,000 lbs of steam per hour, provided that the conditions given under "Calender Production" are fully observed. As a general rule the steam usage of a modern calender is approximately 0.7 lbs steam per pound of work processed.

Adequate steam pressure is important in calender operation and *Figure 4* shows how the efficiency of the calender varies at steam pressures below and above 100 lbs per square inch.

Twin table rotary presses require between 50-60 lbs of steam per hour depending on size but cabinet units will vary from 80-100 lbs of steam per hour depending on the number of garments being processed.

Steam consumptions for hot air tunnel finishers vary according to the steam pressure of the system and the number of garments processed and can range from 150 lbs/hour when processing about 200 garments/hr to about 900 lbs/hr when processing about 1,200 garments/hr. This steam consumption is generally at a constant flow rate whilst the machine is in operation.

Of the total steam used in a laundry about 33% is used in the wash house and about 66% is used for finishing. It is desirable to split the steam distribution in the laundry, ideally a branch serving the washing plant, one serving the drying tumblers and one serving the finishing department. In the finishing departments and tumbler section all steam supplies must be adequately drained.

Water

Water requirements are given generally in HBN 25 but as an approximate guide 2½ gallons of water are used per pound of work without water recovery. Again this will be reduced if batch continuous washing systems are employed as the water consumptions on these machines are approximately half of that used in a washer extractor, because of the contraflow system of water usage in the machine.

Do not size the system on an average hourly rate. It is expected that the filling of a batch machine to the required level should not take longer than about one minute, therefore, high flow rates are required — up to as high as 400 gallons per minute per machine. Again it is recommended that installations incorporating 5 or more washer extractors the simultaneous demand should allow for not less than 3 Machines demanding water at any one time. Using continuous batch transfer machines the water flow rates are reasonably constant. It is clearly important to design the water supply system with an adequate pressure head to overcome the resistance set up by the high flow rates demanded by batch washers.

Electricity

The installed electrical load in a laundry can be estimated at 0.02 KVA per 100 articles per week of capacity. The electrical consumption is approximately 5.5 kwh per 100 lbs dry weight of work and is inclusive of heating, lighting and ventilation. The load is highly inductive and therefore low power factors can be experienced. In a recent trial on a continuous batch transfer washing system where each compartment was driven by its own 2 HP motor, the power factor was found to fall to as low as 0.4.

The power factor penalty clause in many electrical supply tariffs to my knowledge, have, to date, not generally been invoked. However the Electricity Boards now have this under serious consideration and it may now be a matter which should be considered and investigated at the design stage. The Department intend to examine power factor patterns in laundries looking at individual machines as well as the total supply.

Sequencing of Machines

There is a tendency to sequence the operation of machines, particularly washer extractors, to reduce electrical peak loads. This has a tendency to reduce actual throughputs of machines because of the varying process times employed and due allowances must be made if sequencing is employed.

The sequencing control applied to the battery of tumblers used in conjunction with a continuous batch transfer tunnel system is necessary to direct loads from the squeeze press to the next available tumbler. However when this system is called on to process fully dried work concurrently with conditioned work careful balance of feeding the washing section is necessary to ensure that successive batches are balanced in relation to their respective time cycles in the tumblers, otherwise considerable production capacity of the washer could be lost.

Ventilation

This subject is fully covered in HBN 25 and I do not propose to go into detail in this paper. I do, however, draw attention to fire precaution arrangements associated with the ventilation system. To assist the fire fighting process, provision should be made for smoke removal from the building by the installation of automatic roof ventilators and/or provision made for the alarm system to automatically switch on the roof extract system. Where roof smoke outlets are installed, particularly where rain sensors are fitted, the system should include for a 'fireman's overide' control to open the vents if they are closed. It is often an advantage to divide the number of outlets into zones.

To maintain satisfactory environmental conditions in the laundry, particularly where staff are employed in areas of high heat gain, localised air movement is necessary, either roof input units with diffusers about 8 0 above floor level or a duct with 'punka louvres' are found to be satisfactory. Full air conditioning of a laundry is not recommended.

Performance Specification

Specifications must fully convey to the tenderer the performance requirements of every item of plant and also call for all necessary information to ensure that the claimed performance can be achieved within the whole installation.

Schedules should be included requiring the tenderer to state services requirements, eg steam pressures, water pressures, flow rates, etc from the necessary services.

The specification should clearly state the required moisture retentions at each stage of the laundry process quoted as moisture retention above 'bone dry weight' of the fabric, eg water retentions after squeeze press, after tumblers, work entering and leaving ironers, etc.

With machines that are loaded by bulk weight, ensure that the manufacturer states the recommended weight per batch for the various classifications. Many problems have arisen where designers have determined the total capacity of plant based on the maximum batch weight and applied it to all classifications, whereas for bulkier items such as cotton cellular blankets, the batch weight is very much reduced. Do not accept performance figures quoted by manufacturers in terms of outputs in Kg or lbs/hr — this depends on operator performance which can vary considerably.

The specification for calenders should state the total workload that the machine is required to process quoting the initial and final moisture retentions expected.

An example for guidance is cotton sheets — initial moisture retention 40% with final moisture retention of 4% — 2% all above 'Bone dry' weight.

When specifying the requirements for continuous batch transfer washing and extraction systems give a full schedule of the total workload you want the machine to handle. Ask the tenderer to complete the schedule by stating the weight per batch against each item — some classifications require to be down rated from the nominal quoted weight. These details will enable you to examine the potential output against your workload schedule. Ask the tenderer to quote the moisture retentions expected, based on your workload, for the work leaving the squeeze press and finally from the drying tumblers; this is a measure of the systems performance in adequately preparing the work for the final finishing process, eg calendering and pressing.

It is essential to specify or obtain the whole of the above performance data to enable the design and performance to be evaluated under the commissioning phase of the project.

Patients Clothing Service

This service can be satisfactorily dovetailed into a new laundry design and in many cases into existing laundries. The success of the service depends on an accurate assessment of the load and ensuring, that in operation, all items are adequately identified by a suitable marking system; poor marking of linen is the main cause of failure of such a service.

When this service is provided in a central laundry it is often impossible to identify where the unmarked items have come from and mountains of clothing accumulate in the laundry because the staff are unable to trace its origin.

There is a trend towards the provision of laundrette type of unit on hospital sites where there is a high proportion of patients' clothing and in some cases these launderettes are designed to cater for more than one hospital. This is proving to be a satisfactory way of handling this type of service. In designing such a unit similar principles apply as for the large laundry unit, the one main difference being that the washing and drying plant are usually smaller capacity machines. The DHSS are studying this subject in order to prepare some guidance in due course.

Economics of Scale

The Departmental Cost and Area Guide (DCAG) cost allowances, excluding 'on costs', are given in Figure 5 and demonstrate the economy scale for the four laundry capacities given in HBN 25.

When considering the 180,000 and 250,000 article per week laundry capacity it is important to evaluate very carefully your transport costs as the economy of scale in building can be negated if the geography of the catchment areas is extensive.

As a guide the laundry capacity which produced the most economical operational costs, based on the annual cost returns gives on the Annual Cost Form 16, is the 120,000 articles per week unit and this is becoming the most popular size. All laundries should be designed to provide for maximum energy savings. Although the DCAG cost allowances do not provide for this, there is sufficient evidence available to show that short term pay back can be achieved on capital expended. This aspect was covered more fully in the article by V E Skegg in the August 1982 issue, entitled 'Energy Conservation'.

Figure 5: Cost Allowances — Building a New Laundry. Datum 15.8.80.

Size in articles/week.
55,000
120,000
180,000
250,000

DCAG cost allowance
£ 8897,000
£1,670,000
£2,371,000
£3,093,000

Capital cost in £ per article per week output (planned)

55,000	£16,31 = 1007	
120,000	£13.92 = 85.3% = 14.7%	
180,000	£13.17 = 80.7% = 19.3%	
250,000	£12.37 = 75.8% = 24.2%	

Economy in scale

120,000 Arts/Wk	14.7% less than 55,000 Art/Wk
180,000 Arts/Wk	14.6% less than Arts/Wk
250,000 Arts/Wk	4.9% less than 180,000 Arts/Wk

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Scale DHA 3 £15,576–£19,001.

Hartlepool Health Authority estate comprises four hospitals, a Child Health Centre and several smaller clinics. The existing General Hospital is being developed as a District General Hospital. Scheme II of this development is to open in early 1984. The hospitals serve a catchment population of 151,000.

The District Works Officer will be wholly accountable to the District Health Authority. Candidates should be able to demonstrate both professional and managerial capability at a senior level.

Applications are invited from all former Area Works Officers, Area Engineers, Area Building Officers and District Works Officers employed in the NHS in England and Wales.

For informal discussion and further information, please contact Mr Malcolm Cairns, District Administrator on Hartlepool 66654, Ext. 425.

Application forms and Job Description available from the District Personnel Manager, Personnel Department, General Hospital, Holdforth Road, Hartlepool, Cleveland. Tel: Hartlepool 66654. Ext. 287.

Closing date Monday, 20th December, 1982.

Applications are welcome from both men and women

HARTLEPOOL HEALTH AUTHORITY

SOUTH WEST THAMES REGIONAL HEALTH AUTHORITY

ENGINEER'S DIVISION

Steriliser Technician Engineer (M/F)

(Grade TA I or TA II dependent on qualifications and experience)

Salary scale TA I : £7,031 — £8,293
TA II: £6,268 — £6,996
Plus £149 p.a. London Weighting.

To carry out surveys and inspections, and prepare reports and validation records on new and existing steriliser installations within the Region. Training will be provided where appropriate.

The post is based at Guildford, but as extensive travelling within the Region is an integral part of the job, applicants should own a car and hold a clean current driving licence.

Application form and job description available from: Headquarters Personnel Officer, South West Thames Regional Health Authority, 40 Eastbourne Terrace, London W2 3QR. Tel: 01-262 8011 ext 69. For an informal discussion, please phone Mr Tom Jones, tel: 01-262 8011 EXT. 432.

Closing date: 23 December, 1982.