

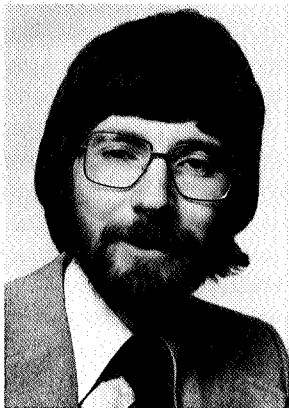
# Air Infiltration Review

a quarterly newsletter from the IEA Air Infiltration Centre

Vol. 1 No. 3 May 1980

## Senior Scientist

Dr Martin Liddament joined the staff of the Air Infiltration Centre as a Senior Scientist on 31 March. He graduated in applied physics at the University of Lancaster in 1971 and went on to study for a Ph.D at the University of Manchester, where his topic of research was the mathematical modelling of diffusion processes within the earth's turbulent boundary layer. Prior to his appointment at AIC, Dr Liddament worked at the Water Research Centre, where he was engaged in the mathematical modelling of groundwater flow.



As one of his first tasks, Martin Liddament is seeking information on mathematical models of air infiltration processes in preparation for the collection of suitable numerical data sets for their validation and development. He will be making contact with those known to be working on this aspect of air infiltration.

## Bibliographic Data Base

Our Librarian, Sheila Manning, has continued to compile the specialised data base of literature on air infiltration. Abstracts of all of the articles, together with their reference information, have been collected and copied on to magnetic tape ready for computation. By the time AIR goes to press, the data base and retrieval system should be operational.

The initial information gathered relates directly to air infiltration as a subject in its own right. We are now extending the scope of our search for published material to include relevant aspects of ventilation and air quality.

## Survey

The response to the AIC international survey of on-going research in air infiltration has yielded nearly fifty replies. This gives some indication of the extent of the current research in this field. However, this note may remind you that you have not yet completed and returned your questionnaire and it would be appreciated if this could be done as soon as possible please.

The survey forms will shortly be analysed by the AIC scientific staff and the results will be circulated to participants.

## Air Infiltration Handbook

Sweden is continuing its work on the preparation of an international handbook on airtightness of buildings and structural design to achieve minimum leakage. Arne Elmroth of the Royal Institute of Technology in Stockholm who is co-ordinating this work has recently circulated to the representatives of participating countries details of the information required for the various sections of the handbook. It is expected that the initial draft of the handbook will be completed in time for an introductory conference being arranged to take place in Sweden from 23–25 September, 1981.

## Visitors

Recent visitors to the AIC have included J. Railio and J. Rantamaeki of the Technical Research Centre of Finland. A description of air infiltration studies recently initiated in Finland indicated that progress was being made on three fronts.

1. The development of calculation models and the prediction of the effect of infiltration on energy consumption.
2. The development of practical methods of reducing air infiltration and an economic evaluation of their effectiveness.
3. The development of airtightness requirements and methods of measurement.

The present programme of research extends to the end of 1982.

As Finland is not a participating country of IEA, negotiations for an exchange of information have been established so that AIC participants can benefit from detailed knowledge of Finnish research. In particular data on the mathematical model studies are being sought.

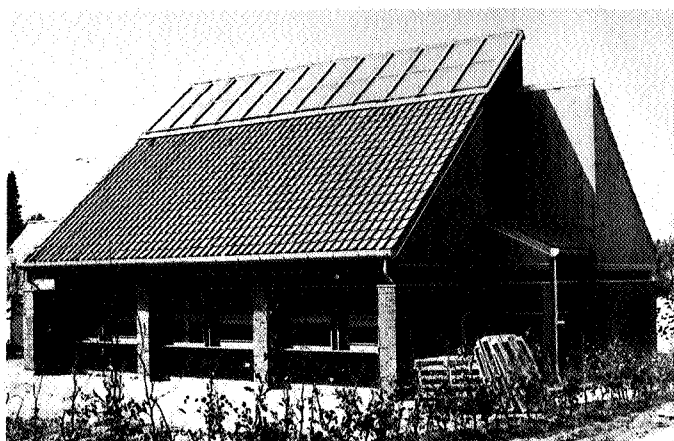
### **AIC Conference—'Instrumentation and Measuring Techniques'**

A provisional programme has been prepared for the conference planned for 6–8 October, 1980. The proceedings will include sixteen prepared papers on subjects such as modern tracer gas measurements techniques and their application to various types of buildings; developments of pressurization test methods and their correlation with tracer gas measurements; and several techniques developed for the measurement of associated parameters.

The conference will take place at Cumberland Lodge, attractively set in the beautiful landscape of the Great Park at Windsor, about 25 miles (40 km) west of London, U.K. Attendance at the conference will be limited to four or five delegates per participating country and it is expected that reservations will be finalised by mid-June; please check with your Steering Group representative about vacancies.

### **Low energy houses in Denmark**

The Technological Institute near Copenhagen acted as hosts to the AIC Steering Group representatives for one of their six-monthly meetings held in March. Following the meeting, arrangements were made for the delegates to inspect the group of six low-energy houses at Hjortekaer. These houses are the outcome of the Low Energy Project of the Danish Ministry of Commerce which is being directed by the Thermal Insulation Laboratory of the Technical University of Denmark and is being undertaken in co-operation with six groups of private firms.



Each of the six houses is a single-family dwelling with a living area of about 120m<sup>2</sup>. Their expected energy consumption for space heating, ventilation and domestic hot water supply is expected to be no more than 18GJ (5000 kWh) per year.

The houses differ from each other in design, in materials of construction and in methods of heating. The key to the low energy consumption is the high degree of thermal insulation and airtightness, the heat recovery from the ventilation exhaust air, the use of alternative energy sources, i.e. the sun and the ground, and the advantageous use of internal heat gains. Some dwellings include heat pumps and all have controlled ventilation systems.

Recent air infiltration measurements using the tracer-gas technique with the mechanical ventilation systems blanked, revealed that in all the dwellings the air change rate (corrected to standard conditions) was less than 0.1 times per hour.

A test period of about eighteen months with simulated occupancy is soon to be terminated. The houses will then be sold but it is hoped that owners will give their permission for performance monitoring to continue.

### **New Book on Infra-Red Thermography**

Thermography  
Testing of the Thermal Insulation and Airtightness of Buildings  
Bertil Pettersson  
Bengt Axén  
Swedish Council for Building Research

Due to the demand for low-energy construction, increasing attention is being paid to both the insulation and airtightness performance of buildings. At present, no reliable data are available concerning the energy cost in terms of defects in insulation and airtightness. However, the results of a number of investigations indicate that such defects are very common, even in modern dwellings, and that these have a great influence on energy consumption.

The object of this publication (available in English) is to give an account of the usability and reliability of infra-red camera techniques for the location and mapping of defects in insulation and airtightness in completed buildings and to lay down a suitable procedure for the routine application of the method of thermography.

Each aspect of the topic is described in detail. After introducing the method, the book goes on to describe the energy consumption and energy requirements of a building, along with methods of testing and checking buildings. The influence of various parameters on the thermography of a dwelling is then described. This is followed by instructions on the interpretation of thermograms. A number of case studies are described with details of both the effectiveness of improvements and experiences gained regarding structural design, materials and workmanship. The book concludes with a brief history of the application of thermography in buildings.

This 230 page book (ISBN 91-540-3170-0) entitled 'Thermography—Testing of the Thermal Insulation and Airtightness of Buildings' by Bertil Pettersson and Bengt Axén is available from:

Svensk Byggtjänst  
Box 7853  
S-103 99 Stockholm  
Sweden

Price: 130 SKr

## BRE Research Colloquium

A research colloquium on natural ventilation and infiltration was held at the Building Research Establishment, Garston, U.K. in April. The colloquium was well-attended and attracted many delegates from overseas. The main topics were:

- Natural ventilation and infiltration measurements.
- Mechanisms and prediction of natural ventilation.
- Human behaviour in relation to natural ventilation.

In the first session, the importance of quantifying and tracing air infiltration was stressed and methods to control infiltration, in order to reduce energy consumption, were described. One of the most rigorous methods of control was the use of 'airtight' construction techniques, with ventilation maintained by mechanical means. With this arrangement the potential advantages of heat recovery can be exploited. For existing buildings, it was shown that worthwhile reductions in energy consumption could be achieved by tracing and rectifying excessive leakage. The relevance of pressurization tests on buildings was discussed and, in particular, the use of 50 Pa as the reference pressure differential at which leakage values were conventionally being quoted.

Methods of predicting and modelling air infiltration were described in the second session. During the course of this session a number of delegates emphasised the urgent need for high quality data sets for the validation of mathematical models. The benefits and roles of single- and multi-cell models were also discussed at length. Further studies into the effects of ageing and the effects of fluctuating pressures on infiltration were proposed.

In the final session, methods of studying the behavioural aspects of ventilation were described. These included visual observations and photographic techniques supported by the use of interviews and questionnaires. It was noted that even in very cold weather people often opened bedroom windows. A fairly well-defined correlation between outside air temperature and window opening was also illustrated.

The occasion not only provided a useful means of relevant information exchange but also gave the AIC staff opportunity to meet those directly engaged in infiltration research and to outline the role of the Centre in furthering their interests.

The full proceedings of the colloquium are expected to be published by the Building Research Establishment in due course.

## Forthcoming Conferences



8th C.I.B. Congress  
'Building Research Worldwide'  
16–19 June, 1980 at the University of Oslo,  
Norway

A wide-ranging programme includes a session, 4A, on the subject of energy conservation: building envelope, roofs, walls and openings.

Conference information is available from:

Congress Service, Box 55, Blindern, Oslo 3, Norway



ASHRAE Annual Meeting will this year  
take place in Denver, Colorado, U.S.A.  
from 22–26 June, 1980

At least thirty sessions are planned and included is a symposium entitled 'Calculating Infiltration: An Examination of the Models' on Tuesday, 24 June, 1980. The following papers will be presented:

'Application of a Generalized Model of Air Infiltration to Existing Homes'. James T. Cole, Thomas S. Zawachi, Robert H. Elkins, John W. Zommer and Robert A. Macross.

'Calculating Infiltration: An Examination of Handbook Models'. J. E. Janssen, A. N. Pearman and T. J. Hill.

'The British Gas Multi-Cell Model for Calculating Ventilation'. D. K. Alexander and D. W. Etheridge.

'Infiltration-Pressurization Correlation: Simplified Physical Modelling'. M. H. Sherman and D. T. Grimsrud.

Further information on the symposium may be obtained from:

David Grimsrud  
Building 90, Room 3078  
Lawrence Berkeley Laboratory  
University of California  
Berkeley  
California 94720  
U.S.A.

and on the main ASHRAE meeting from:

Ralph Burkowsky  
ASHRAE  
345 East 47th Street  
New York  
NY 10017  
U.S.A.

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## Enquiries

The AIC has been established to provide a technical service to research workers in the field of air infiltration in buildings. An international network of communication has been established with the nominated organisations in each country acting as the primary links to the Centre. If you wish to make an enquiry, please first introduce yourself to one of the nominated organisations in your country. You will find them listed on the back page of this newsletter. They will be pleased to help you gain the maximum benefit from the AIC's resources.

Should you be in a non-participating country, then please contact the AIC direct and we will be pleased to discuss in what way the services might be available to you. Call us by telephone (+44 344 53123) or telex (848288 (BSRIA G)) or write to the address given overleaf.

## Representatives and Nominated Organisations

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