

# Air Infiltration Review

a quarterly newsletter from the IEA Air Infiltration Centre

Vol. 2 No. 2 February 1981

## A Subject Index to AIRBASE



INTERNATIONAL ENERGY AGENCY  
energy conservation in buildings and  
community systems programme

Technical Note AIC-TN-3-81

A subject analysis of the AIC's  
bibliographic database - AIRBASE

January 1981



Air Infiltration Centre  
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The AIC's third technical note AIC-TN-3-81 is a subject analysis of *AIRBASE*—the AIC's bibliographic database. The note is divided into two parts; Section One consists of thirteen tables, each taking a different subject area and listing the reference numbers of relevant papers for topics with each area. Section Two of the report contains a complete list, in reference number order, of all papers in the database at the time of analysis. The report can thus be used as a subject index by looking up a subject in Section One and referring to Section Two for full details of the papers. In addition, an index to the principal authors of papers abstracted in *AIRBASE* is appended to the report.

AIC-TN-3-81 analyses the first 621 abstracts in *AIRBASE*. New abstracts are continually being added to *AIRBASE* as new material is published and as the subject coverage of the database is broadened. These new abstracts are published in a bi-monthly bulletin 'Recent Additions to *AIRBASE*' which is distributed to interested organisations in participating countries. The first two of these bulletins were published in November 1980 and January 1981 and contain abstracts Nos. 622-641 and 642-661 respectively.

Please contact Jenny Elmer at the AIC for a free copy of the *AIRBASE* index and to have your name added to the mailing list for future editions of Recent Additions to *AIRBASE*.

(restricted to participating countries)

## AIC's Numerical Database

Following the successful launching of the bibliographic database, *AIRBASE*, the Air Infiltration Centre is now compiling a numerical database comprising high quality air infiltration data derived from site testing.

The purpose of this work is to provide datasets against which mathematical models of air infiltration can be effectively validated. These datasets will not only be used by the AIC but will also be made available for the benefit of researchers in participating countries.

A number of organisations known to be involved in air infiltration research have already been contacted for assistance in providing data. We would, however, be interested to hear from any other organisations that have results of air infiltration rate measurements together with associated parameters, such as wind and temperature and induced pressure differences across the building envelope. It is important that the data should also include detailed information on the building structure and the characteristics of the air leakage routes.

Progress on the compilation of this database will be reported in a future edition of *AIR*.

## 2nd AIC Conference

A considerable proportion of energy used in buildings is as the result of excessive air infiltration. Thus there is an increasing requirement to design buildings which are more airtight but in which adequate ventilation is still maintained. At this Conference, the acceptable minimum rates of ventilation will be discussed and then recommendations will be given on the constructional techniques to achieve low levels of air leakage in both new and existing buildings. Methods of predicting and measuring the effectiveness of the infiltration reducing measures will also be presented. An international handbook covering these aspects of air infiltration is currently under preparation and this Conference will be a forum for discussing the recommendations proposed for inclusion in the handbook. A draft of the general section of the handbook is expected to be circulated to delegates several weeks before the Conference.

The Conference is aimed at those involved in the application of energy saving measures in buildings and so will appeal to building designers, energy consultants and property administrators as well as those engaged in research projects. However, the initial quota of places will be 10 per participating country and bookings must be made through the Steering Group Representatives. These are listed on the back page of this newsletter.

The provisional programme for the Conference is as follows:

### Monday 21

- afternoon
- Opening of Conference.
  - 'The role of the Air Infiltration Centre'  
Peter Jackman, UK.
  - 'Air Infiltration Handbook'  
Arne Elmroth, Sweden.
  - 'Indoor Air Quality and Minimum Ventilation'  
Hubert Wanner, Switzerland.
  - 'Indoor Air Quality in Well Sealed Buildings'  
Arne Logdberg, Sweden.
  - 'Effects of Energy Conservation Measures in Existing Buildings'  
Jan Forslund and Conny Rolen, Sweden.
- evening
- Conference dinner.

## 1st AIC Conference

### 'Instrumentation and Measuring Techniques'

The proceedings of this conference, held in October 1980, will be available soon price £35 sterling (US \$90) inclusive of post and packing, direct from the Air Infiltration Centre.

This publication is available to organisations in both participating and non-participating countries. It contains a total of 19 papers with discussions, presented by 15 internationally renowned contributors. The most recent developments in air infiltration instrumentation and measurement techniques are described under the following subject headings:

- Alternative measurement procedures.
- Automatic monitoring using tracer gas techniques.
- Pressurization test methods.
- Correlations of tracer gas and pressurization measurements.
- Other measurements.

Order your copy now, using the enclosed form.

### Tuesday 22

- morning
- Visit to building sites illustrating modern Swedish practice.
- afternoon
- 'Building Design for Minimum Air Infiltration'  
Arne Elmroth and Per Levin, Sweden.
  - 'House Design and Construction in the UK'  
Michael Finbow, UK.
  - 'Superinsulated Houses'  
Harold W. Orr, Canada.
  - 'House Doctors Program—Retrofits on Existing Buildings'  
David Harrje, USA.
  - 'Alternative Methods for Predicting the Effectiveness of Energy Saving Measures in Large Buildings'  
Per-Olof Nylund, Sweden.

### Wednesday 23

- morning
- 'Influence of Different Parameters on Infiltration Heat Loss'  
Willem de Gids, Netherlands.
  - 'Effect on Energy Use of the Interaction Between the Construction and Installed Services of Buildings'  
Per-Olof Nylund, Sweden.
  - 'Air Flows in Building Components'  
Johnny Kronvall, Sweden.
  - 'Site Measurement Techniques'  
David Harrje, USA.
  - 'Long Term Infiltration Measurements in a Full Scale Test Structure'  
David Grimsrud, USA.
  - 'Continuous Measurements of Air Infiltration in Occupied Dwellings'  
Peter Collet, Denmark.
- afternoon
- Technical visit to the Division of Building Technology, Royal Institute of Technology.

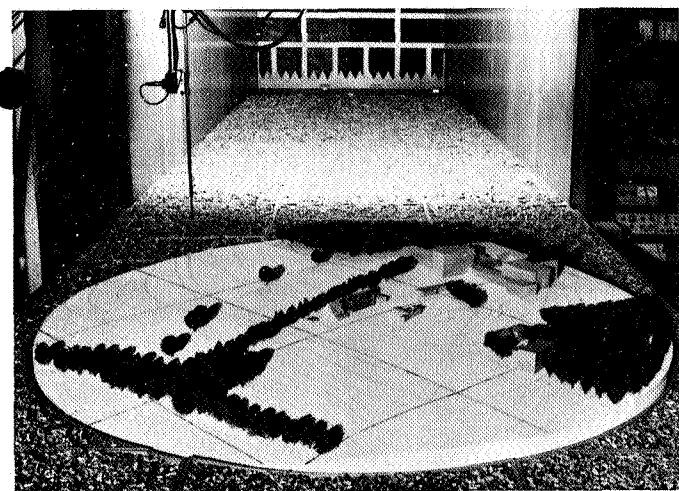
## Natural Ventilation by Design

This was the subject of a symposium organised by the UK Chartered Institution of Building Services and held at the Building Research Establishment, Garston, UK on 2nd December 1980. The symposium was chaired by James Dick, former Director of the Building Research Establishment.

The first paper was presented by Geoff Brundrett of the Electricity Council Research Centre. The theme of his talk was ventilation criteria in terms of health, comfort and the integrity of the building fabric. The demands of fresh air necessary to dilute harmful contaminants and to control moisture were discussed.

The second paper was concerned with natural ventilation principles in design and was presented by Peter Jackman of the Air Infiltration Centre. After discussing the combined effects of temperature difference and wind on air infiltration, Peter went on to describe a two-storey dwelling designed to provide adequate ventilation under mild, calm climatic conditions. At other times the ventilation rate would be excessive, resulting in unnecessary energy loss. Possible ways of reducing the variation in infiltration rate were described.

After the lunch break, during which there was a tour of the ventilation measurement equipment and wind tunnels at the Building Research Establishment, Peter Warren of the BRE presented the results of recent measurements of ventilation rates and air leakage characteristics made in modern UK dwellings. Measurements indicated a mean air infiltration rate of 0.7 air changes per hour. This result was compared with modern Swedish dwellings which have an average rate of air exchange some three to four times lower. Nevertheless, the level of natural ventilation found in these UK houses was thought to be the minimum necessary to prevent condensation problems. A substantial proportion of the air infiltration took place through paths other than the cracks around windows and doors.

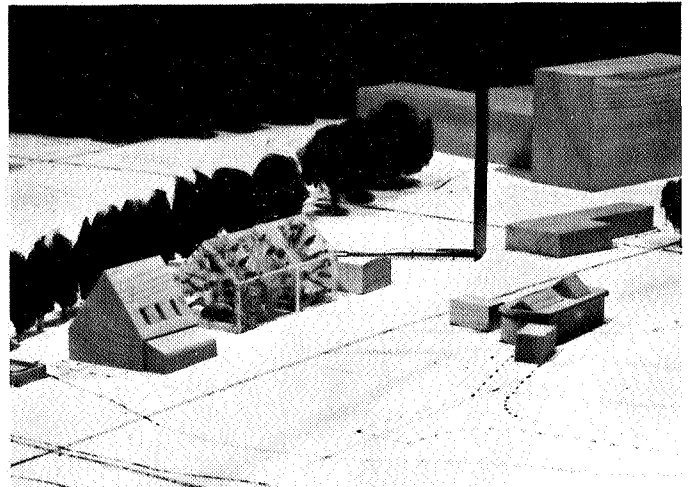


*BRE environmental wind tunnel showing typical model and upstream flow conditioning section*

Mr J. E. Holt of Colt International Ltd then discussed the problems associated with the ventilation of industrial premises. The minimum ventilation requirements are largely determined by the industrial process. In particular, the design of the ventilation system had to take into account the worst possible conditions, these being no wind combined with high summer

air temperature. Energy savings can be achieved at other times by the use of powered ventilation as appropriate and by the close control of the ventilation system.

This paper was followed by a contribution from Mr J. M. Singh of the Department of Health and Social Security on natural ventilation in modern hospitals. He discussed the use of natural ventilation in perimeter ward areas and outlined the results of test measurements made in a new hospital. The various factors contributing to the ventilation process were described.



*Close-up shot of model of BRE low energy house showing pressure tappings and hot wire anemometer in foreground*

The final paper was by Mr B. A. Taylor of the Property Services Agency. The paper dealt with the efforts of the PSA to reduce energy consumption due to air infiltration in UK Government buildings. A practical example was illustrated where substantial energy savings were achieved in a post-war building by using silicon rubber sealing mastic to reduce the air infiltration through openable windows. The need for a simple method of measuring natural ventilation rates was stressed, as this would enable potential energy savings to be quantified, thus enabling investment decisions to be soundly based.

The main topic of discussion was the role of natural ventilation in the design of energy efficient buildings. Was this the correct approach or should we move towards tight building design incorporating mechanical ventilation and heat exchange systems? This was reflected in Mr Dick's concluding remarks when he referred to the Swedish Council for Building Research publication entitled 'Airtightness and Thermal Insulation Building Design Solutions' and raised the question as to whether or not we in the UK should aim to seal our buildings to the standard set by the Scandinavians.

A bound volume containing the papers presented at this symposium is available along with the discussion notes at £6.00 to members of CIBS and at £7.50 for non-members from:

The Publications Department  
The Chartered Institute of Building Services  
Delta House  
222 Balham High Road  
London SW12  
U.K.

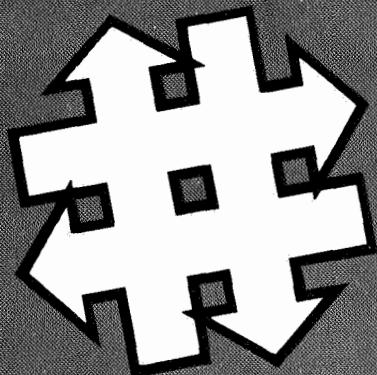
## New Book on the Design of Well-sealed Buildings

Airtightness and thermal insulation—building design solutions.  
Carlsson, B., Elmroth, A., Engvall, P.-A.  
Swedish Council for Building Research.  
D37:1980

# Airtightness and thermal insulation

## building design solutions

Björn Carlsson Arne Elmroth Per-Åke Engvall



Byggtforsknings

Following the issue of the 1975 Swedish Building Code, completely new designs for a building's outside shell became necessary to fulfill the Code's new requirements for thermal insulation and airtightness. A working group was set up within the Swedish Council for Building Research to take stock of these designs and to review the best design solutions possible. This book presents the group's findings and recommendations.

The book falls naturally into three parts. The first introductory section discusses in general terms the problems of achieving airtight construction; the centre section gives detailed descriptions of actual design solutions; and the final section discusses three projects which include the construction of 34 test houses at three separate sites.

The main centre section of the handbook considers both wood frame and cellular concrete construction. Design solutions are presented for different types of joints; each solution is lucidly presented and illustrated by clear, informative diagrams. Brief descriptions of each construction method are accompanied by proposals for suitable methods of carrying out the work. Also discussed are the properties and effectiveness of sealing materials for joints.

Overall the book acts as a detailed guide to airtight construction of wood frame and cellular concrete dwellings. This translation into English from Swedish was produced by the Air Infiltration Centre as part of our services to research in air infiltration.

Copies of this 144 page handbook are available from:

Svensk Byggtjänst  
Box 7853  
S-103 99 Stockholm  
Sweden  
Price: 40 Skr

## Recent Acquisitions

The following papers have recently been acquired by the Air Infiltration Centre's library.

1. Energy efficient housing—a prairie approach.  
Energy Research Development Group, University of Saskatchewan  
October 1980  
  
*A practical handbook for constructing an energy efficient house, or reducing energy loss from an existing home. Updates the 'Low Energy Passive Solar Housing Handbook'*
2. Tamura, G.T.  
Carbon dioxide measurement in open-classroom school with outside air supply damper closed to conserve energy. Division of Building Research, National Research Council of Canada  
October 1980
3. Klengel, M.  
Zum Problem der Lüftungswärmeverluste an Hallentoren (Ventilation heat loss through factory shed entrances) St Gebäud, September 1978, Vol. 32 No. 9 p276–279, = AIC Translation No. 10  
  
*Analyses the ventilation heat loss through open factory doors and discusses the effectiveness of air locks and air curtains (in German and English)*
4. Natural ventilation by design.  
Proceedings of CIBS Symposium, London  
2 December 1980, 63 pps  
  
*Contains six papers about the principles and problems of natural ventilation*
5. Walsh, P.J., Spencer, J.W., Gurr, T.A.  
Descriptive guide for program ZSTEP. Thermal performance of buildings.  
CSIRO—Division of Building Research, 1980  
  
*Describes a program for simultaneous calculation of the thermal performance of up to ten zones in a building*
6. Aluminium Window Association  
Guidance to specifiers in the use of mastics and sealants on site.  
1980  
  
*A short guide to materials and methods for sealing the joint around an aluminium window.*
7. Shepherd, P.B. and Gerharter, J.E.  
Techniques for control of air infiltration in buildings. Johns Manville Sales Corporation Report FESA-TS-2070  
April 1979  
  
*Discusses materials and systems for reducing or eliminating air infiltration through identified leakage sources.*
8. Carlsson, B., Elmroth, A., Engvall, P.-A.  
Airtightness and thermal insulation—building design solutions.  
Swedish Council for Building Research D37:1980  
  
*Gives comprehensive and detailed instructions for the design and construction of airtight buildings.*
9. Miles, J.C.H., et al  
The effect of domestic air treatment equipment on the concentration of radon-222 daughters in a sealed room. Royal Society of Health Journal, Vol. 100 No. 3, June 1980, p82–85  
  
*Reports tests of an electrostatic precipitator, a humidifier and a dehumidifier on the concentrations of radon daughters in a room.*
10. Kronvall, J.  
Air flows in building components.  
Lund Institute of Technology, 1980, 194 pps  
  
*A comprehensive doctoral thesis dealing with different aspects of air movements in building components.*
11. British Standards Institution  
Code of practice for design of buildings: ventilation principles and designing for natural ventilation.  
British Standard BS5925:1980
12. Collé, R., McNall, P.E.  
Radon in buildings.  
NBS Special Publication 581  
June 1980  
  
*Proceedings of a round table discussion on radon in buildings. Includes five review papers and 20 brief reports.*

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## Forthcoming Conferences

1. I.E.A. Conference 'New Energy Conservation Technologies' West Berlin, 6–10 April, 1981.
2. 'Comparative Experimentation of Low-Energy Houses' Université de Liège, 6–8 May, 1981.
3. '3rd National Scientific-Technical Conference on Heating Ventilating and Airconditioning' Varna, Bulgaria, 13–15 May, 1981.
4. ASHRAE Semiannual Meeting, Cincinnati, USA, June 28–July 2, 1981.

## Representatives and Nominated Organisations

Participant	Steering Group Representative	Other Nominated Organisations		
Canada	R. Dumont, Division of Building Research, National Research Council, Saskatoon, Saskatchewan, Canada S7N 0W9. (Tel: 306.665.4200)	J. Shaw, Division of Building Research, National Research Council, Ottawa, Canada, K1A 0R6. (Tel: 613.993.1421) (Telex: 0533145)		
Denmark	P. F. Collet, Technological Institute Gregersensvej, DK 2630 Tastrup, Denmark. (Tel: 02-996611) (Telex: 33416)			
Italy	M. Cali, Istituto di Fisica Tecnica, Politecnico di Torino, Corso Duca degli Abruzzi, 24, 10129 Torino, Italy. (Tel: 011-537353) (Telex: 220646)	Roberto Zecchin, Istituto di Fisica Tecnica Universita degli Studi Via Marzolo, 9/11, 35100 Padova, Italy.	Walter Esposti, ICITE, Viale Lombardia, 49, Fraz. Sesto Ulteriano, 20098 S. Giuliano Milanese (M1), Italy.	
Netherlands	W. de Gids, Institute for Environmental Hygiene-TNO, P.O. Box 214, Delft, Netherlands (Tel: 015-569330) (Telex: 38071)			
Sweden	L. Sundbom, Swedish Council for Building Research, St. Göransgatan 66, S-112 30 Stockholm, Sweden. (Tel: 08-540640) (Telex: 10398)	A. Elmroth, Royal Institute of Technology, Division of Building Technology, Fack, S-100 44 Stockholm, Sweden. (Tel: 08-787 70 00) (Telex: 10389)		
Switzerland	P. Hartmann, EMPA, Section 151, Ueberlandstrasse, CH 8600 Duebendorf, Switzerland. (Tel: 01-8234251) (Telex: 53817)			
The Oscar Faber Partnership (UK)	D. Curtis, The Oscar Faber Partnership, Marlborough House, Upper Marlborough Road, St. Albans, Herts, AL1 3UT. Great Britain. (Tel: 0727-59111) (Telex: 889072)	G. J. Kennedy, ETSU, AERE, Harwell, Oxon, OX11 0RA, Great Britain. (Tel: 0235-834621) (Telex: 83135)	P. Robertson, BSRU, University of Glasgow, 3 Lilybank Gardens, Glasgow, Great Britain. (Tel: 041-334-2269) (Telex: 778421)	BSRIA, Old Bracknell Lane, Bracknell, Berks RG12 4AH, Great Britain. (Tel: 0344-25071) (Telex: 848288)
USA	H. Ross, Department of Energy, Buildings Division, Mail Stop GH-068, 1000 Independence Avenue S.W., Washington D.C. 20585, USA. (Tel: 202/252-9191) (Telex: 255 710 822 0176)	R. Grot, Building Thermal & Service Systems Division, Centre for Building Technology, National Bureau of Standards, Washington D.C. 20234, USA. (Tel: 301/921-3560)	D. T. Grimsrud, Energy & Environment Division, Building 90, Room 3078, Lawrence Berkeley Laboratory, Berkeley, California 94720, USA. (Tel: 415/486-4023) (Telex: 255 910 386 8339)	Dr D. Harrje, Centre for Energy & Environmental Studies, Princeton University, Princeton, New Jersey 08544, USA. (Tel: 609-452-5190/5467)



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